

Final Report

CR 455

Intersection Analysis for CR 455 at Ridgewood Avenue

March 2014

Prepared for:



LAKE COUNTY
FLORIDA

Lake County Department of Public
Works
437 Ardice Avenue

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TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	3
SECTION 1 - OVERVIEW	5
1.1 INTRODUCTION	5
SECTION 2 – EXISTING CONDITONS.....	7
2.1 FIELD INVENTORY.....	7
2.2 TRAFFIC VOLUME DATA.....	13
2.3 CRASH DATA	14
2.4 INTERSECTION DELAY	17
2.5 QUALITATIVE ASSESSMENT.....	18
SECTION 3 - ANALYSIS.....	20
3.1 – SIGNAL WARRANT ANALYSIS.....	20
3.2 – RIGHT TURN LANE WARRANT ANALYSIS	23
3.3 – ALL-WAY STOP WARRANT ANALYSIS.....	24
3.4 – ROUNDABOUT JUSTIFICATION WARRANT ANALYSIS.....	27
SECTION 4 – RECOMMENDATIONS	30
APPENDIX	32

LIST OF FIGURES

Figure 1: Location Map.....	6
Figure 2: Condition Diagram.....	8
Figure 3: Crash Diagram	16

LIST OF EXHIBITS

Exhibit 1: Looking south into the intersection along CR 455 9

Exhibit 2: Looking north from the intersection along CR 455 9

Exhibit 3: Looking north into the intersection along CR 455..... 10

Exhibit 4: Looking south from the intersection along CR 455 10

Exhibit 5: Looking west into the intersection along Ridgewood Avenue 11

Exhibit 6: Looking east from the intersection along Ridgewood Avenue 11

Exhibit 7: Looking east into the intersection along Ridgewood Avenue..... 12

Exhibit 8: Looking west from the intersection along Ridgewood Avenue 12

LIST OF TABLES

Table 1: Weekday Turning Movement Percentages 13

Table 2: Crash Summary..... 15

Table 3: Summary of Delay Studies 17

Table 4: Comparison of Performance..... 28

EXECUTIVE SUMMARY

This report presents the results of an Intersection Analysis for the intersection of CR 455 and Ridgewood Avenue located in Montverde, Lake County. The intersection is plus-shaped with CR 455 running north-south, and Ridgewood Avenue running east-west. Based upon signal warrant analysis, roundabout analysis, all-way stop analysis, crash analysis, Synchro analysis, field observations and engineering judgment, the following recommendations were developed:

1. **It is recommended that an eastbound right turn lane not be installed at this time.** The right turning volumes were not sufficient to warrant a separate turn lane based on the criteria provided in the report “The Development of Criteria for the Treatment of Right Turn Movements on Rural Roads” and in the FDOT Plans Preparation Manual (PPM).
2. **It is recommended that an all-way stop not be installed at this time.** The analysis reveals that an all-way stop is only warranted in the interim before the installation of a traffic signal. However there are no critical safety or operational conditions requiring immediate remediation, and Synchro analysis shows a deterioration in the overall operation of the intersection with an all-way stop.
3. **A traffic signal is warranted at the intersection of CR 455 and Ridgewood Avenue.** Of the nine warrants for signalization provided in the Manual on Uniform Traffic Control Devices (MUTCD), Warrant #3 (Peak Hour) was met. This warrant was met due to relatively high volumes on eastbound Ridgewood Avenue. However, there were only three crashes reported at the intersection in the past 3-year reporting period that would be considered susceptible to correction with a traffic signal, and the eastbound left turn delay is minimal at 1.42 vehicle hours, and does not exceed the 4 vehicle-hours required to satisfy the peak hour delay in Condition A of Warrant #3 (Peak Hour). Should a traffic signal be installed at this location, it is recommended that it be placed on flash during the non-peak hour with the signal indications facing Ridgewood Avenue flashing red and the signal indications facing CR 455 flashing yellow. A traffic signal could be installed at an approximate cost of \$72,000 and has a B/C Ratio of 8.03.
4. **A roundabout is justified at the intersection of CR 455 and Ridgewood Avenue.** Based on the information provided in this report, the roundabout justification categories for Community Enhancement and Low Volume Signal Alternative have been justified. There were no safety issues noted at the intersection, however a traffic signal was warranted based on peak hour traffic volumes. A roundabout is a viable alternative to a traffic signal and provides better operational

performance than a signal. In addition, this intersection serves as a gateway to the scenic town of Montverde, an upscale community which prides its scenic beauty and rural community lifestyle. A roundabout would be more aesthetically pleasing than a traffic signal and the operation provides for a slower moving, but continuous, flow of traffic rather than the stop and go and the delay associated with a traffic signal. Based on the findings of the Town of Montverde CR 455 Master Corridor Plan, residents have expressed an interest in gateway features and traffic calming features entering the town and the Green Mountain Scenic Byway Committee opposes any new signalized intersections along the corridor. A roundabout could be installed at an approximate cost of \$225,000 and has a B/C Ratio of 2.96.

SECTION 1 - OVERVIEW

1.1 INTRODUCTION

GMB Engineers & Planners, Inc. was retained by Lake County Public Works to perform an Intersection Analysis for the existing unsignalized intersection of CR 455 and Ridgewood Avenue. The intersection is located in the Town of Montverde in Lake County, Florida, as shown in Figure 1. The purpose of this report is to perform various types of analysis to determine the most effective geometric configuration and traffic control to enhance safety and efficiency at the intersection.

The analysis methods used in completing this study are consistent with the Manual on Uniform Traffic Control Devices (MUTCD 2009 Edition), Manual on Uniform Traffic Studies (MUTS), and engineering judgment. The remainder of this report documents the existing conditions, analysis and recommendations.



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CR 455 at Ridgewood Avenue

FIGURE 1
Location Diagram

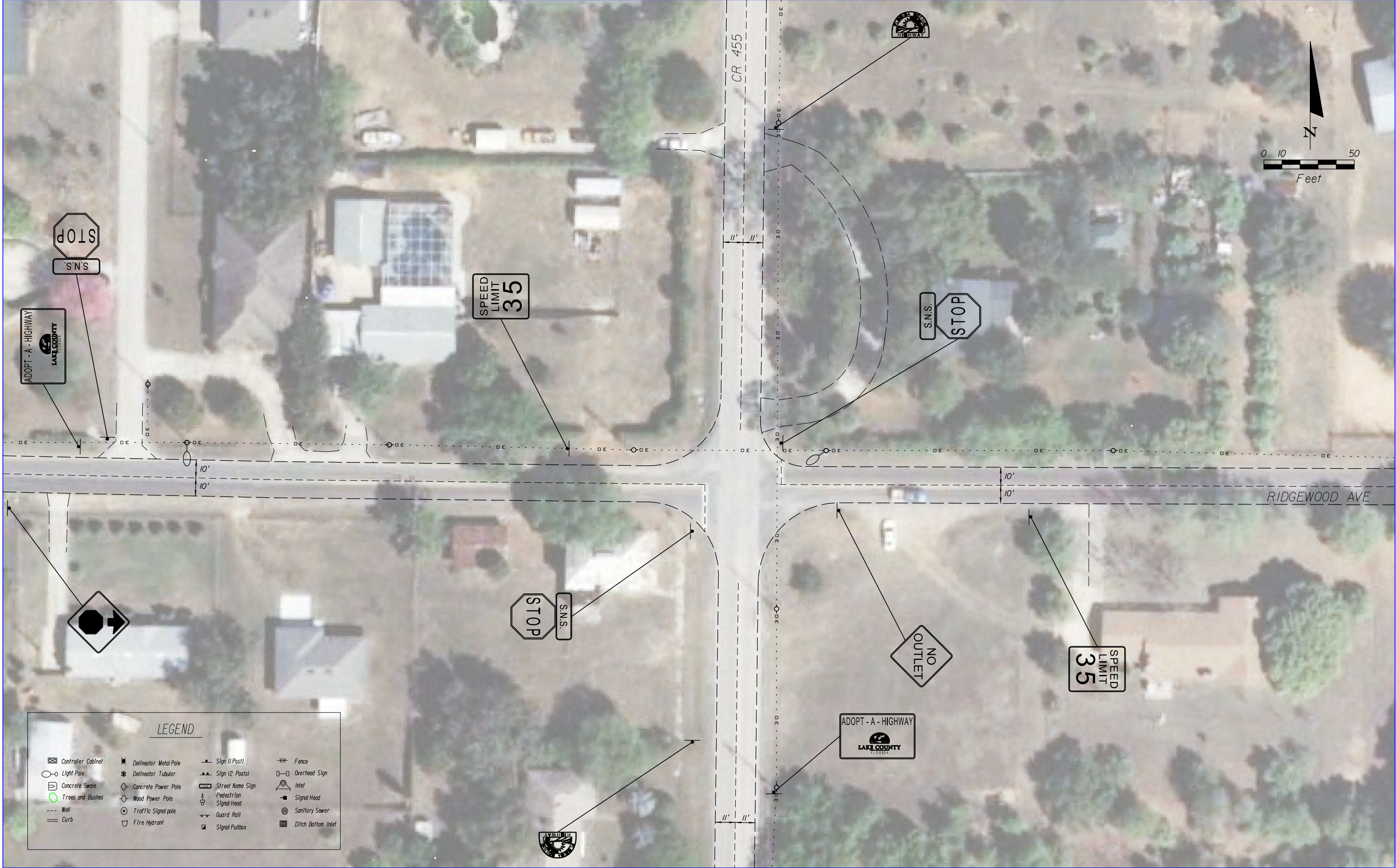
SECTION 2 – EXISTING CONDITONS

2.1 FIELD INVENTORY

The intersection of CR 455 and Ridgewood Avenue is located in the Town of Montverde in Lake County, Florida. The existing condition diagram, Figure 2, depicts the existing conditions at the study intersection including the general roadway geometry, pavement markings, land use, and intersection traffic control. In addition, photographs of the existing conditions around the intersection are provided at the end of this section. The conditions stated in this report reflect conditions as observed on the date of the qualitative assessment.

The study intersection is four-legged, with CR 455 running north-south and Ridgewood Avenue running east-west. CR 455 and Ridgewood Avenue are both 2-lane undivided rural design type roadways. Lane widths are 12' on CR 455 and 11' on Ridgewood Avenue. There are no turn lanes at the intersection and there are no sidewalks along either Ridgewood Avenue or CR 455. CR 455 is free-flow through the intersection whereas Ridgewood Avenue is controlled with stop signs. Advance cross road warning signs (W2-1) with flashing beacons are installed on both CR 455 approaches and stop ahead warning signs (W3-1) are installed on both Ridgewood Avenue approaches. There are no signalized intersections within the influence area of the study intersection.

CR 455 provides a connecting route to SR 50 and Old Highway 50 to the south, and CR 561 to the north. The speed limit is posted at 35 mph along both CR 455 and Ridgewood Avenue. The surrounding land within the vicinity of the intersection is rural and consists primarily of larger tract single family residences. The town of Montverde and the Montverde Academy are less than one mile north of the intersection. Overhead utilities extend along the east side of CR 455 and the north side of Ridgewood Avenue. There is a single street light in the northeast quadrant of the intersection.



LEGEND

- | | | | |
|--------------------|-----------------------|------------------------|--------------------|
| Controller Cabinet | Delineator Metal Pole | Sign 11 Post | Fence |
| Light Pole | Delineator Tubular | Sign 12 Posts | Overhead Sign |
| Concrete Sinal | Concrete Power Pole | Street Name Sign | Inlet |
| Trees and Bushes | Wood Power Pole | Pedestrian Signal Head | Signal Head |
| Wall | Traffic Signal pole | Guard Rail | Sanitary Sewer |
| Curb | Fire Hydrant | Signal Pullbox | Ditch Bottom Inlet |

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DATE	DESCRIPTION	DATE	DESCRIPTION

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STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	PROJECT NO.
CR 455	LAKE	11-098.05

CONDITION DIAGRAM
CR 455 and Ridgewood Ave.

FIGURE NO. 1

**CR 455 at Ridgewood Avenue
North Approach**



Exhibit 1: Looking south into the intersection along CR 455



Exhibit 2: Looking north from the intersection along CR 455

**CR 455 at Ridgewood Avenue
South Approach**



Exhibit 3: Looking north into the intersection along CR 455



Exhibit 4: Looking south from the intersection along CR 455

**CR 455 at Ridgewood Avenue
East Approach**



Exhibit 5: Looking west into the intersection along Ridgewood Avenue



Exhibit 6: Looking east from the intersection along Ridgewood Avenue

CR 455 at Ridgewood Avenue
West Approach



Exhibit 7: Looking east into the intersection along Ridgewood Avenue



Exhibit 8: Looking west from the intersection along Ridgewood Avenue

2.2 TRAFFIC VOLUME DATA

24-hour traffic counts were collected on Tuesday, January 14, 2014, representing a typical commuter weekday. The weekday counts on CR 455 recorded that 2,687 vehicles approached the study intersection in the northbound direction and 2,408 vehicles approached the study intersection in the southbound direction. On Ridgewood Avenue, 1,158 vehicles approached the study intersection in the eastbound direction and 697 vehicles approached the study intersection in the westbound direction. These volumes clearly indicate that CR 455 is the mainline and Ridgewood Avenue is the side street. The 24-hour traffic counts were supplemented with 8-hour intersection turning movement counts to determine directionality. The turning movement counts were collected between 6:30 a.m. – 8:30 a.m., 11:00 a.m. – 1:00 p.m. and 2:00 p.m. – 6:00 p.m. These hours represent the highest eight hours obtained from the approach counts. From this data, the a.m., mid-day and p.m. peak traffic hours were found to occur from 7:00 a.m. to 8:00 a.m., 12:00 p.m. to 1:00 p.m. and 5:00 p.m. to 6:00 p.m., respectively. The overall peak hour for the intersection was found to occur during the a.m. peak hour. The volumes on CR 455 reveal a weekday traffic flow pattern that is directional in nature, with higher southbound flows during the a.m. peak, which reverses to higher northbound flows during the p.m. peak hours. On Ridgewood Avenue, the eastbound flow of traffic was consistently higher than that of the westbound flow of traffic for both the a.m. and p.m. peak hours. During the mid-day peak hour, traffic flows on northbound and southbound CR 455 were fairly evenly distributed. The flows on Ridgewood Avenue were lower than those on CR 455, but the eastbound and westbound flows were fairly evenly distributed as well. There was one pedestrian and two bicyclists observed crossing the intersection along CR 455 during the 8-hour turning movement counts. The following table summarizes the distribution of turning movements through the study intersection:

Movement	Northbound	Southbound	Eastbound	Westbound
Left-turn/U-turn	17.3%	4.8%	35.7%	45.4%
Through	70.9%	75.8%	16.8%	35.1%
Right-turn	11.8%	19.4%	47.5%	19.5%

The 8-hour turning movement counts, 24-hour approach counts and pedestrian/bicycle counts are provided in greater detail in the Appendix.

2.3 CRASH DATA

According to crash records obtained from Lake County, there were seven crashes reported at or near the vicinity of the study intersection during the latest 36-month period covering August 2, 2010 through August 2, 2013. These crashes consisted of two angle crashes, one left turn crash, one sideswipe crash, one improper backing crash, one crash where a vehicle lost control and one crash where no improper driving was reported. There were no fatalities and only one of these crashes resulted in injuries; however the total property damage for the seven crashes amounted to \$75,600. None of the crashes involved pedestrians or bicyclists. The two angle crashes and the one left turn crash are considered susceptible to correction by a traffic signal.

**TABLE 2
CRASH SUMMARY**

SECTION: _____ COUNTY: LAKE
 MAJOR ROUTE: CR 455 CITY: MONTVERDE
 LOCATION: At Ridgewood Avenue
 STUDY PERIOD: 2-Aug-10 TO 2-Aug-13 ENGINEER: JNK

CRASH REF. NO.	DATE	DAY	TIME	DOB	AGE	PED /BIKE / MOTORCYCLE	ALCOHOL/D RUGS	CRASH TYPE	FATAL	INJURY	PROPERTY DAMAGE	DAY/ NIGHT	WET/ DRY	CONTRIBUTING CAUSE
1	6/22/2011	Wednesday	6:00 PM	6/7/1959	52	NONE	DUI	LOST CONTROL	0	0	\$20,000	DUSK	DRY	DUI
2	12/5/2011	Monday	8:18 PM	4/2/1963	49	NONE	NONE	ANGLE	0	0	\$8,000	NIGHT	DRY	DISREGARDED STOP SIGN
3	1/29/2012	Sunday	11:55 AM	3/12/1940	72	NONE	NONE	NO IMPROPER DRIVING	0	2	\$25,000	DAY	DRY	NO IMPROPER DRIVING
4	2/5/2013	Tuesday	4:03 PM	1/4/1968	45	NONE	NONE	IMPROPER BACKING	0	0	\$600	DAY	DRY	CARELESS DRIVING
5	3/9/2013	Saturday	7:53 AM	5/27/1995	18	NONE	NONE	ANGLE	0	0	\$7,500	DAY	DRY	DISREGARDED STOP SIGN
6	5/29/2013	Wednesday	6:09 PM	5/30/1978	35	NONE	NONE	SIDE SWIPE	0	0	\$7,000	DAY	WET	FTYRW
7	8/2/2013	Friday	6:00 PM	6/30/1978	35	NONE	NONE	LEFT TURN	0	0	\$7,500	DAY	DRY	FTYRW
Total									0	2	\$73,600			

CRASH TYPE																
TOTAL CRASHES	FATAL CRASHES	INJURY CRASHES	TOTAL INJURIES	PROP. DAMAGE	PED /BIKE / MOTORCYCLE	ANGLE	LEFT TURN	RIGHT TURN	REAR END	SIDE SWIPE	HEAD ON	IMPROPER BACKING	NO IMPROPER DRIVING	LOST CONTROL	HIT FIXED OBJECT	HIT PEDESTRIAN
7	0	1	2	7	0	2	1	0	0	1	0	1	1	1	0	0
	0%	14%	NA	NA	0%	29%	14%	0%	0%	14%	0%	14%	14%	14%	0%	0%

CONTRIBUTING CAUSE																
ONE VEHICLE	LIGHTING CONDITION		ROAD CONDITION		NO IMPROPER DRIVING	CARELESS DRIVING	FTYRW*	IMPROPER LANE CHANGE	IMPROPER TURN	DROVE LEFT OF CENTER	DUI**	FOLLOWED TOO CLOSE	DISREGARDED STOP SIGN	PED CROSSING ROADWAY	OTHER	
	DAY	NIGHT	DRY	WET												
3	5	2	6	1	1	1	2	0	0	0	1	0	2	0	0	
43%	71%	29%	86%	14%	14%	14%	29%	0%	0%	0%	14%	0%	29%	0%	0%	

Note:
 *FAILURE TO YIELD RIGHT OF WAY
 **DRIVING UNDER THE INFLUENCE



CRASH PERIOD: AUGUST, 2010 - AUGUST, 2013

CRASH SYMBOL LEGEND			
	Collision w/ Pedestrian		Rear End Crash
	Fatally		Sideswipe
	Fixed Object		Out of Control
			Overturned Vehicle
			Improper Backing
			Left Turn Crash
			Right Angle Crash
			Head-On Crash
			No Improper Driving

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION


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STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
ROAD NO.	COUNTY	PROJECT NO.
CR 455	LAKE	11-098.05

CRASH DIAGRAM
CR 455 and Ridgewood Ave.

FIGURE NO.
2

2.4 INTERSECTION DELAY

Intersection delay studies were performed during the a.m., mid-day and p.m. peak hour periods. Delay measurements were calculated on those vehicles exiting left from eastbound Ridgewood Avenue. Vehicles exiting through or right from Ridgewood Avenue experience minimal delay and were therefore excluded from the delay calculations. The results of the delay studies are summarized below:

	Max Queue (vehicles)	Average Delay (seconds)	Approach Volume (vph)	Total Delay (veh-sec)	Total Delay (veh-hours)
7:00 – 8:00 a.m.	11	23.80	215	5,117	1.42
12:00 -1:00 p.m.	5	8.84	70	619	0.17
5:00 – 6:00 p.m.	4	14.55	66	960	0.27

The delay measurements revealed that the highest delay recorded at the EB left turn lane was 1.42 vehicle-hours yielding an average delay of 23.8 seconds per vehicle during the a.m. peak hour period. The longest queue length recorded on this approach was 11 vehicles. The highest delay of 1.42 vehicle-hours fails to exceed the 4 vehicle-hours required to satisfy Warrant #3, Condition A of the MUTCD. Summary sheets for the delay study are provided in the Appendix of this report.

2.5 QUALITATIVE ASSESSMENT

A qualitative assessment (QA) was conducted at the study intersection during a typical weekday in February 2014 in order to evaluate the existing operating conditions occurring at the intersection, and to identify areas where improvements would be potentially beneficial to the overall safety and efficiency of the intersection. A registered professional engineer performed the QA during the a.m. peak hour, which recorded the highest 1-hour volume of traffic during the 8-hour turning movement count period.

1. Vehicles traveling on CR 455 appeared to be traveling at or somewhat above the posted speed limit of 35 mph. Vehicles arrived at the intersection randomly on all approaches since there are no adjacent signalized intersections. CR 455 appears to be more of a rural collector road type whereas Ridgewood Avenue appears to be more of a residential collector. Volumes were observed to be significantly higher on CR 455 compared to Ridgewood Avenue, and the volumes on the eastbound approach of Ridgewood Avenue were significantly higher than those on the westbound approach. Traffic flow on CR 455 was free flowing and did not exhibit any signs of congestion.
2. Vehicles turning left from eastbound Ridgewood Avenue were, for the most part, able to complete the maneuver with minimal delay due to availability of gaps in the cross traffic along CR 455 and in the opposing westbound flow of traffic. This changed dramatically around the time frame of 7:25 a.m. – 7:40 a.m. During this time, the eastbound queues built up due to increased traffic on both CR 455 and Ridgewood Avenue, and to the decrease in available gaps that are a byproduct of the heavier congestion. The maximum queue observed on the eastbound approach during this time was 12 vehicles. The eastbound right turn movement also experienced this delay since there are no separate turn lanes. The remaining approaches experienced minimal delay since CR 455 is free-flow, and volumes on westbound Ridgewood Avenue are very light. It is surmised that the sudden increase in left turn traffic is due to rush hour commuter traffic and parents traveling to the Montverde Academy to drop off their children, and the coinciding increase in right turn traffic is due to rush hour commuter traffic heading to the urban centers of Clermont and Orlando.

3. The intersection of CR 455 and Ridgewood Avenue is located at the top of a crest curve. The south, east and west approaches have gradual grades so that visibility to and from the intersection is unimpeded. The roadway profile falls off rather quickly on the north approach, and the presence of trees and utility poles further impede the view; however sight distance still appears to be, at minimum, around 460', which exceeds the minimum stopping sight distance of 360' for a 45 mph design speed.
4. Pedestrian activity was very light. During the QA, only two pedestrians were observed at the intersection. There were no bicyclists observed at the intersection despite the intersection being part of the Green Mountain Scenic Byway, which extends along CR 455 between CR 561 to the north, and Old Highway 50 and points east, to the south.
5. There are no sidewalks or designated bicycle lanes along either CR 455 or Ridgewood Avenue.
6. The eastbound and westbound approaches have Stop Ahead warning signs (W3-1) approximately 382' and 363' in advance of the intersection, respectively. The northbound and southbound approaches have Intersection Ahead warning signs (W2-1) with flashing beacons approximately 380' and 465' in advance of the intersection, respectively. The stopping sight distance for a design speed of 45 mph is 360'. Therefore, the warning signs are placed adequately in advance of the intersection to provide timely warning of the upcoming intersection.
7. The quality of the roadway surface and pavement markings at the intersection was observed to be in poor condition. The pavement is cracked and patched within the immediate vicinity of the intersection and rutting was observed on both CR 455 and Ridgewood Avenue. There are no paved shoulders, and the grassed shoulders around the radii exhibit wheel tracking; possibly from larger vehicles turning right and encroaching on the shoulders or from right turning vehicles using the shoulders to get around stopped vehicles in front of them. The pavement markings for the stop bars are worn, but still visible. The center lane pavement markings also worn and cracked, but still visible.

SECTION 3 – ANALYSIS

3.1 SIGNAL WARRANT ANALYSIS

3.1a Methodology

The methodology prepared for performing the signal warrant analysis for the study intersection is described below:

- Collect weekday 24-hour traffic counts on each approach of the study intersection.
- Collect weekday 8-hour vehicle and pedestrian turning movement counts on each approach of the study intersection.
- Collect and analyze 3 years of crash data occurring at or near the vicinity of the study intersection.
- Complete intersection delay studies during the a.m., mid-day and p.m. peak traffic hours which were determined to be 7:00 a.m. to 8:00 a.m., 12:00 p.m. to 1:00 p.m. and 5:00 p.m. to 6:00 p.m., respectively.
- Complete a qualitative assessment based on field observations of traffic operating conditions in the vicinity of the study intersection.
- Using the traffic data and available crash data, complete a traffic signal warrant analysis for the study intersection. Provide a recommendation on whether or not a traffic signal is warranted at the intersection. Provide other operational and safety recommendations as necessary.

3.1b Warrant Analysis

This section describes the signal warrant analysis performed for the intersection using the turning movement counts collected during a typical weekday condition. The analysis was performed in accordance to the Manual on Uniform Traffic Control Devices (MUTCD), 2009 Edition and the Manual on Uniform Traffic Studies (MUTS). CR 455 is considered the major street and Ridgewood Avenue is considered the minor street. Since the intersection is located in an area where the major street posted speed limit is less than 40 mph but is in a community of less than 10,000 people, the 70% volume criteria were used in the analysis.

The results of the signal warrant analysis are summarized as follows:

Warrant #1 – Eight-Hour Vehicular Volume – Not SatisfiedCondition A: Minimum Vehicular Volume – Not Satisfied

This warrant is not satisfied. The major and minor street volumes failed to meet the minimum volume criterion in the required eight hours to satisfy this warrant.

Condition B: Interruption of Continuous Traffic –Not Satisfied

This warrant is not satisfied. The major and minor street volumes failed to meet the minimum volume criterion in the required eight hours to satisfy this warrant.

Combination of Conditions A and B – Not Satisfied

This warrant is not satisfied. Conditions A and B failed to meet the 56% volume criteria.

Warrant #2 – Four-Hour Vehicular Volume – Not Satisfied

This warrant is not satisfied. The major and minor street approach volumes meet the minimum volume criteria in only one of the required four hours.

Warrant #3 – Peak Hour –Satisfied

This warrant is satisfied. The major and minor street volumes met the minimum volume criterion in the required one hour to satisfy this warrant.

Warrant #4 – Pedestrian Volume – Not Applicable

This warrant is not applicable since there were no pedestrians observed at the intersection during the 8-hour turning movement counts.

Warrant #5 – School Crossing – Not Applicable

This warrant was not applicable since there are no schools within the immediate vicinity of the intersection.

Warrant #6 – Coordinated Signal System – Not Applicable

This warrant was not applicable since a traffic signal at the intersection is not being considered to improve progression on CR 455.

Warrant #7 – Crash Experience –Not Satisfied

This warrant is not satisfied. Only two crashes of types susceptible to correction by a traffic signal occurred at the intersection during the latest 12-month reporting period.

Warrant #8 – Roadway Network – Not Applicable

This warrant is not applicable. The side street does not exhibit any of the characteristics of a major route.

Warrant #9 – Intersection Near a Grade Crossing – Not Applicable

This warrant is not applicable. There are no railroad crossings within the immediate vicinity of the intersection.

Based on satisfaction of Warrant #3, a traffic signal is warranted for this intersection.

3.2 RIGHT TURN LANE WARRANT ANALYSIS

This section presents an analysis of whether existing traffic volumes warrant the construction of an eastbound right turn lane on Ridgewood Avenue. The MUTS and the MUTCD do not provide a warrant for right turn lanes on two-lane unsignalized roadways. In lieu of available methodology from these venerable sources, the right turn lane warrant analysis for this report utilizes methodology provided in the report “The Development of Criteria for the Treatment of Right Turn Movements on Rural Roads”, prepared by Mr. B.H. Cottrell, Jr. in March 1981 for the Virginia Highway & Transportation Research Council in conjunction with the Federal Highway Administration. This report analyzed geometric conditions as well as historical data including vehicular volumes, speeds and crashes for a broad range of conditions in order to establish a basis for a right turn lane warrant applicable to two-lane roadways with no traffic control on the mainline.

The information required for this warrant includes the peak hour volume (phv) total and the phv right turns for the approach in question, which are 201 vehicles per hour (vph) and 97 vph, respectively. There is an adjustment for the right turn volume if the posted speed is less than or equal to 45 mph, the phv right turns are greater than 40 and the phv total is less than 300. Both the right turn phv and the approach total phv meet these criteria; thus the adjusted right turn phv becomes 77 vph. These volumes are transposed onto a nomograph to determine if a right turn lane is warranted or not. Based on the results of the analysis, a separate right turn lane is not warranted on the eastbound approach. The nomograph supporting this analysis is provided in the Appendix.

The FDOT Plans Preparation Manual (PPM) supports this finding. The PPM states that “right turn storage lanes should be considered when right turn volumes exceed 300 vph and the adjacent through volume also exceeds 300 vph per lane”. Since the right turn volume during the peak hour was only 97 vph, a separate right turn lane is not warranted on the eastbound approach.

Based on the results of this analysis and the PPM, a separate right turn lane is not warranted on the eastbound approach.

3.3 ALL-WAY STOP WARRANT ANALYSIS

This section presents an all-way stop analysis for the study intersection. Currently the intersection is stop sign controlled on the side street only. An all-way stop would place all approaches of the intersection under stop sign control. The methodology used for an all-way stop analysis is taken from Section 2B.07 All-way Stop Applications of the MUTCD.

- A. *Where traffic control signals are justified, the all-way stop is an interim measure that can be installed quickly to control traffic while arrangements are being made for the installation of the traffic control signal.*

Warrant 3 Peak Hour of the traffic signal warrants was satisfied. A traffic signal can therefore be warranted. This warrant is considered satisfied.

- B. *Five or more reported crashes in a 12-month period that are susceptible to correction by an all-way stop installation. Such crashes include right-turn and left-turn collisions as well as right-angle collisions.*

Of the four crashes that occurred at this intersection in the latest 12-month reporting period, only two could be considered susceptible to correction by an all-way stop installation. One of the crashes was an angle crash caused by a motorist disregarding the stop sign. The other crash was a left turn crash caused by a motorist failing to yield to right of way. This warrant is not met.

- C. Minimum volumes:

1. *The vehicular volume entering the intersection from the major street approach (total of both approaches) averages at least 300 vehicles per hour for any 8 hours of an average day; and*

The major street approach volumes exceeded the required 300 vph threshold in only five of the required eight hours. Therefore this warrant is not met.

2. *The combined vehicular, pedestrian, and bicycle volume entering the intersection from the minor street approaches (total of both approaches) averages at least 200 units per hour for the same 8 hours, with an average delay to minor-street vehicular traffic of at least 30 seconds per vehicle during the highest hour; but*

The minor street approach volumes exceeded the required 200 vph threshold in only one of the required eight hours. Therefore this warrant is not met.

3. *If the 85th percentile approach speed of the major-street traffic exceeds 40 mph, the minimum vehicular volume warrants are 70 percent of the values provided in Items 1 and 2.*

The northbound 85th percentile speed was measured at 38 mph and the southbound 85th percentile speed was measured at 40 mph. Therefore the 70 percent volume threshold is not applicable and the warrant is not met.

- D. *Where no single criterion is satisfied, but where Criteria B, C.1 and C.2 are all satisfied to 80 percent of the minimum values. Criterion C.3 is excluded from this condition.*

Criteria B, C.1 and C.2 are not met with 80 percent of the threshold values shown above. Therefore this warrant is not met.

Other criteria that may be considered in an engineering study include:

- A. *The need to control left turn conflicts;*

The crash analysis did not reveal a pattern of conflicts with left turn crashes. Therefore there is no need to control left turn conflicts.

- B. *The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;*

The turning movement counts recorded only 2 pedestrians and 2 bicyclists during the 8-hour count period. The crash analysis did not reveal any crashes involving pedestrians or bicyclists. Therefore there is no need to control vehicle/pedestrian conflicts.

- C. *Locations where a road user, after stopping, cannot see conflicting traffic and is not able to negotiate the intersection unless conflicting cross traffic is also required to stop; and*
Ridgewood Avenue experiences some sight distance restrictions due to shrubbery, utility poles and vertical geometry; however the sight distance still exceeds the minimum stopping sight distance criteria in the FDOT Plans Preparation Manual. Therefore Ridgewood Avenue road users do not require conflicting cross traffic to stop prior to entering the intersection.

- D. *An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection.*

The intersection is in a rural residential area and, although the geometric design is similar, the operating characteristics of CR 455 are not the same as Ridgewood Avenue. The primary difference is that traffic on CR 455 is significantly higher than traffic on

Ridgewood Avenue. CR 455 is also more of a designated collector road whereas Ridgewood Avenue is more of a residential collector. The installation of an all-way stop would have a significant detrimental impact to the level of service (LOS) currently enjoyed by motorists on CR 455.

Warrant A is the only warrant considered met in this all-way stop analysis. Based on the tenets of Warrant A, since a traffic control signal is justified at this intersection, an all-way stop could be installed as an interim measure; however it should not be used as a permanent measure as its installation would likely have a detrimental impact to traffic on CR 455 since the rate at which vehicles could enter the intersection would be lowered, thus lowering the total intersection capacity. Synchro analysis confirmed this assessment. In a comparison between the existing 2-way stop condition to the all-way stop condition, the analysis for the all-way stop showed a decrease in delay from 35.8 sec. to 14.6 sec. and an increase in the LOS from E to LOS B for the eastbound movement; however the intersection as a whole suffered an increase in delay from 10.1 sec. to 18.5 sec. and a decrease in LOS from LOS B to LOS C. Essentially, an all-way stop would improve capacity of the eastbound movement at the cost of lowering the capacity and LOS on CR 455 and the intersection as a whole.

The analysis reveals that an all-way stop is only warranted in the interim before the installation of a traffic signal. However since there are no critical safety or operational conditions requiring immediate remediation, and Synchro analysis shows a deterioration in the overall operation of the intersection with an all-way stop, an all-way stop is not recommended at this time.

3.4 ROUNDABOUT JUSTIFICATION STUDY

This section presents a roundabout justification study for the intersection of CR 455 and Ridgewood Avenue. Roundabouts can be used as an alternative to conventional forms of traffic control such as traffic signals, two way stops and all-way stops. Each of these forms of traffic control have advantages and disadvantages, and the roundabout justification study provides a procedure and documented support to justify the installation of a roundabout as the most appropriate form of traffic control for a given intersection. The methodology used for this section is provided in the FDOT Florida Roundabout Guide (FRG) and Chapter 16 of the MUTCD entitled Roundabout Justification Study.

The roundabout can be justified by satisfying one or more of the seven roundabout justification categories which include community enhancement, safety improvement, low volume signal alternative, medium volume signal alternative, all-way stop control alternative, traffic calming and special needs. At the intersection of CR 455 and Ridgewood Avenue, a roundabout is being considered for both community enhancement and as a low volume signal alternative. The remaining categories are not applicable since an all-way stop was not justified, and the crash analysis and speed study did not reveal either a crash history or excessive speeds through the intersection, which would necessitate traffic calming measures.

The roundabout justification study is a multipage document that provides a detailed comparison of the alternative forms of traffic control, both quantitatively and qualitatively, but essentially all of the analysis boils down to the answering of three general questions as provided in the MUTCD. If these questions can be answered favorably, then a roundabout should be considered as a candidate for traffic control.

a) *Will a roundabout be expected to perform better than other alternative control modes? In other words, will it reduce delay, improve safety, or solve some other operational problem?*

The results of Synchro analysis show that a roundabout provides lower delay and higher level of service than a traffic signal, a two way stop (existing condition) and an all-way stop.

Table 4: Comparison of Performance				
Performance Measure	Roundabout	Traffic Signal	Two Way Stop Control (Existing Cond.)	All-Way Stop Control
Delay Per Vehicle (sec.)				
Overall	8.7	10.9	10.1	18.5
EB Left	10.1	13.5	35.8	14.6
Level of Service				
Overall	A	B	B	C
EB Left	B	B	E	B

The crash analysis and qualitative assessment did not reveal any safety issues at the intersection.

- b) *Are there factors present to suggest that a roundabout would be a more appropriate control, even if delays with a roundabout are slightly higher?*

Based on the analysis results above, the delay associated with a roundabout would be less than the delay for the alternative measures. In addition, a traffic signal was only warranted because it met one out of nine traffic signal warrants. The warrant met was Warrant 3 Peak Hour, which means that the majority of the time, the volumes and delay are not sufficient to warrant a traffic signal; except for one hour of the day. As taken from the FRG, the advantages of a roundabout over a traffic signal are that there is no sequential assignment of right-of-way and therefore no wasted time. Left turns are also not subordinated to through traffic. Vehicles enter under yield control instead of stop control and therefore have lower headways and higher capacities and there are no electrical components to malfunction.

- c) *If any contraindicating factors exist, can they be resolved satisfactorily?*

There are several factors regarding roundabouts that may make them less desirable than a traffic signal. Foremost among them is that roundabouts take up a significant amount of real estate, and in areas of limited right-of-way, it may be physically impossible, or cost prohibitive to install a roundabout. Based on the draft roundabout design provided by Lake County Public Works, right-of-way would need to be acquired at the intersection and at least one residential driveway relocated in order to construct the roundabout. In

addition, roundabouts are typically more expensive to construct because of the extensive road work required, whereas a traffic signal can usually be installed with little or no impact to the road save for the addition of stop bar pavement markings. The cost to install the roundabout shown in the Lake County Public Works Plan is approximately \$224,000 and the cost to install a box span wire traffic signal is approximately \$72,000, which makes the traffic signal the more cost effective alternative. These figures do not include right-of-way acquisition, which would significantly increase the cost of the roundabout. A final consideration is that roundabouts are not as familiar to Florida drivers as traffic signals are, therefore safety issues may arise from lack of understanding of their operation. Roundabouts, however, are becoming more common in Lake County. There have already been several roundabouts constructed within the county, most notably the roundabout on Main Street and Sinclair Avenue adjacent to the courthouse in Tavares. There is also an existing roundabout approximately 6 miles to the north of the study intersection on CR 455, and a new roundabout is under design for the intersection of CR 455 and CR 561 which is only 3.5 miles north of the study intersection. The issues of higher cost and right-of-way are somewhat diminished by the desire of the community and the County to provide a gateway feature entering the town. In addition to being aesthetically pleasing a roundabout would also provide a functional purpose by calming traffic while at the same time offering higher operational performance than a traffic signal.

Based on the information provided in this report, the roundabout justification categories for Community Enhancement and Low Volume Signal Alternative have been justified. There were no safety issues noted at the intersection, however a traffic signal was warranted based on peak hour traffic volumes. A roundabout is a viable alternative to a traffic signal and provides better operational performance than a signal. In addition, this intersection serves as a gateway to the scenic town of Montverde, an upscale community which prides its scenic beauty and rural community lifestyle. A roundabout would be more aesthetically pleasing than a traffic signal and the operation provides for a slower moving, but continuous, flow of traffic rather than the stop and go and the delay associated with a traffic signal. Based on the findings of the Town of Montverde CR 455 Master Corridor Plan, residents have expressed an interest in gateway features and traffic calming features entering the town and the Green Mountain Scenic Byway Committee opposes any new signalized intersections along the corridor.

SECTION 4 – RECOMMENDATIONS

This report presents the results of an Intersection Analysis for the intersection of CR 455 and Ridgewood Avenue located in Montverde, Lake County. The intersection is plus-shaped with CR 455 running north-south, and Ridgewood Avenue running east-west. Based upon signal warrant analysis, roundabout analysis, all-way stop analysis, crash analysis, Synchro analysis, field observations and engineering judgment, the following recommendations were developed:

1. **It is recommended that an eastbound right turn lane not be installed at this time.** The right turning volumes were not sufficient to warrant a separate turn lane based on the criteria provided in the report “The Development of Criteria for the Treatment of Right Turn Movements on Rural Roads” and in the FDOT PPM.
2. **It is recommended that an all-way stop not be installed at this time.** The analysis reveals that an all-way stop is only warranted in the interim before the installation of a traffic signal. However there are no critical safety or operational conditions requiring immediate remediation, and Synchro analysis shows a deterioration in the overall operation of the intersection with an all-way stop.
3. **A traffic signal is warranted at the intersection of CR 455 and Ridgewood Avenue.** Of the nine warrants for signalization provided in the Manual on Uniform Traffic Control Devices (MUTCD), Warrant #3 (Peak Hour) was met. This warrant was met due to relatively high volumes on eastbound Ridgewood Avenue. However, there were only three crashes reported at the intersection in the past 3-year reporting period that would be considered susceptible to correction with a traffic signal, and the eastbound left turn delay is minimal at 1.42 vehicle hours, and does not exceed the 4 vehicle-hours required to satisfy the peak hour delay in Condition A of Warrant #3 (Peak Hour). Should a traffic signal be installed at this location, it is recommended that it be placed on flash during the non-peak hour with the signal indications facing Ridgewood Avenue flashing red and the signal indications facing CR 455 flashing yellow. A traffic signal could be installed at an approximate cost of \$72,000 and has a B/C Ratio of 8.03.
4. **A roundabout is justified at the intersection of CR 455 and Ridgewood Avenue.** Based on the information provided in this report, the roundabout justification categories for Community

Enhancement and Low Volume Signal Alternative have been justified. There were no safety issues noted at the intersection, however a traffic signal was warranted based on peak hour traffic volumes. A roundabout is a viable alternative to a traffic signal and provides better operational performance than a signal. In addition, this intersection serves as a gateway to the scenic town of Montverde, an upscale community which prides its scenic beauty and rural community lifestyle. A roundabout would be more aesthetically pleasing than a traffic signal and the operation provides for a slower moving, but continuous, flow of traffic rather than the stop and go and the delay associated with a traffic signal. Based on the findings of the Town of Montverde CR 455 Master Corridor Plan, residents have expressed an interest in gateway features and traffic calming features entering the town and the Green Mountain Scenic Byway Committee opposes any new signalized intersections along the corridor. A roundabout could be installed at an approximate cost of \$225,000 and has a B/C Ratio of 2.96.

APPENDIX

Roadway Count Summary

Start Date : January 14, 2014 Start Time 00:00
 Stop Date : January 14, 2014 Stop Time 24:00
 County : 0 Station Number 0
 Location : #2 - CR 455 (S of Ridgewood) - NB

14-Jan-14 Northbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	3	2	3	0	2	1	1	23	25	20	28	20
30	6	2	1	0	5	6	10	81	21	19	23	20
45	4	4	1	0	3	3	11	117	19	28	22	26
00	2	1	0	4	3	4	15	28	30	32	25	27
Hr Total	15	9	5	4	13	14	37	249	95	99	98	93

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	47	39	30	75	70	70	69	43	22	30	20	5
30	37	31	40	54	70	90	65	42	34	17	12	5
45	35	21	51	55	81	83	60	31	23	14	12	8
00	31	30	61	66	73	86	41	27	22	17	6	5
Hr Total	150	121	182	250	294	329	235	143	101	78	50	23

24 Hour Total : 2,687
 AM Peak Hour begins : 7:15 AM Peak Volume : 251 AM Peak Hour Factor : 0.54
 PM Peak Hour begins : 17:00 PM Peak Volume : 329 PM Peak Hour Factor : 0.91

14-Jan-14 Lane 2

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

24 Hour Total : 0
 AM Peak Hour begins : AM Peak Volume : 0 AM Peak Hour Factor :
 PM Peak Hour begins : PM Peak Volume : 0 PM Peak Hour Factor :

14-Jan-14 Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	3	2	3	0	2	1	1	23	25	20	28	20
30	6	2	1	0	5	6	10	81	21	19	23	20
45	4	4	1	0	3	3	11	117	19	28	22	26
00	2	1	0	4	3	4	15	28	30	32	25	27
Hr Total	15	9	5	4	13	14	37	249	95	99	98	93

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	47	39	30	75	70	70	69	43	22	30	20	5
30	37	31	40	54	70	90	65	42	34	17	12	5
45	35	21	51	55	81	83	60	31	23	14	12	8
00	31	30	61	66	73	86	41	27	22	17	6	5
Hr Total	150	121	182	250	294	329	235	143	101	78	50	23

24 Hour Total : 2,687
 AM Peak Hour begins : 7:15 AM Peak Volume : 251 AM Peak Hour Factor : 0.54
 PM Peak Hour begins : 17:00 PM Peak Volume : 329 PM Peak Hour Factor : 0.91

Roadway Count Summary

Start Date : January 14, 2014 Start Time 00:00
 Stop Date : January 14, 2014 Stop Time 24:00
 County : 0 Station Number 0
 Location : #1 - CR 455 (N of Ridgewood) - SB

14-Jan-14

Lane 1

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

24 Hour Total : 0
 AM Peak Hour begins : AM Peak Volume : 0 AM Peak Hour Factor :
 PM Peak Hour begins : PM Peak Volume : 0 PM Peak Hour Factor :

14-Jan-14

Southbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	4	0	1	2	5	12	40	39	40	36	29	25
30	1	0	1	4	8	13	39	76	46	18	15	25
45	1	1	2	3	6	10	40	134	40	20	24	34
00	0	1	1	6	8	35	32	128	28	22	15	24
Hr Total	6	2	5	15	27	70	151	377	154	96	83	108

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	26	33	22	81	68	46	42	14	6	7	7	4
30	26	41	33	98	54	44	41	22	5	11	3	1
45	29	30	19	44	52	49	32	16	7	15	3	4
00	34	25	34	40	37	43	32	15	5	10	3	1
Hr Total	115	129	108	263	211	182	147	67	23	43	16	10

24 Hour Total : 2,408
 AM Peak Hour begins : 7:15 AM Peak Volume : 378 AM Peak Hour Factor : 0.71
 PM Peak Hour begins : 15:00 PM Peak Volume : 263 PM Peak Hour Factor : 0.67

14-Jan-14

Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	4	0	1	2	5	12	40	39	40	36	29	25
30	1	0	1	4	8	13	39	76	46	18	15	25
45	1	1	2	3	6	10	40	134	40	20	24	34
00	0	1	1	6	8	35	32	128	28	22	15	24
Hr Total	6	2	5	15	27	70	151	377	154	96	83	108

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	26	33	22	81	68	46	42	14	6	7	7	4
30	26	41	33	98	54	44	41	22	5	11	3	1
45	29	30	19	44	52	49	32	16	7	15	3	4
00	34	25	34	40	37	43	32	15	5	10	3	1
Hr Total	115	129	108	263	211	182	147	67	23	43	16	10

24 Hour Total : 2,408
 AM Peak Hour begins : 7:15 AM Peak Volume : 378 AM Peak Hour Factor : 0.71
 PM Peak Hour begins : 15:00 PM Peak Volume : 263 PM Peak Hour Factor : 0.67

Roadway Count Summary

Start Date : January 14, 2014 Start Time 00:00
 Stop Date : January 14, 2014 Stop Time 24:00
 County : 0 Station Number 0
 Location : #4 - Ridgewood (W of 455) - EB

14-Jan-14 Eastbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	2	0	1	2	1	5	8	46	32	22	6	9
30	1	2	0	1	1	13	16	70	20	10	8	13
45	1	0	3	1	1	7	21	54	31	11	16	14
00	1	0	0	0	1	10	28	32	13	11	12	16
Hr Total	5	2	4	4	4	35	73	202	96	54	42	52

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	13	12	22	23	19	24	13	9	3	4	0	3
30	19	9	17	22	27	23	20	6	10	3	2	4
45	10	14	20	21	10	16	16	4	7	4	2	0
00	18	14	16	23	21	18	17	9	10	5	2	1
Hr Total	60	49	75	89	77	81	66	28	30	16	6	8

24 Hour Total : 1,158
 AM Peak Hour begins : 7:00 AM Peak Volume : 202 AM Peak Hour Factor : 0.72
 PM Peak Hour begins : 15:30 PM Peak Volume : 90 PM Peak Hour Factor : 0.83

14-Jan-14 Lane 2

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

24 Hour Total : 0
 AM Peak Hour begins : AM Peak Volume : 0 AM Peak Hour Factor :
 PM Peak Hour begins : PM Peak Volume : 0 PM Peak Hour Factor :

14-Jan-14 Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	2	0	1	2	1	5	8	46	32	22	6	9
30	1	2	0	1	1	13	16	70	20	10	8	13
45	1	0	3	1	1	7	21	54	31	11	16	14
00	1	0	0	0	1	10	28	32	13	11	12	16
Hr Total	5	2	4	4	4	35	73	202	96	54	42	52

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	13	12	22	23	19	24	13	9	3	4	0	3
30	19	9	17	22	27	23	20	6	10	3	2	4
45	10	14	20	21	10	16	16	4	7	4	2	0
00	18	14	16	23	21	18	17	9	10	5	2	1
Hr Total	60	49	75	89	77	81	66	28	30	16	6	8

24 Hour Total : 1,158
 AM Peak Hour begins : 7:00 AM Peak Volume : 202 AM Peak Hour Factor : 0.72
 PM Peak Hour begins : 15:30 PM Peak Volume : 90 PM Peak Hour Factor : 0.83

Roadway Count Summary

Start Date : January 14, 2014 Start Time 00:00
 Stop Date : January 14, 2014 Stop Time 24:00
 County : 0 Station Number 0
 Location : #3 - Ridgewood (E of 455) - WB

14-Jan-14

Lane 1

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0	0	0	0	0
00	0	0	0	0	0	0	0	0	0	0	0	0
Hr Total	0	0	0	0	0	0	0	0	0	0	0	0

24 Hour Total : 0
 AM Peak Hour begins : AM Peak Volume : 0 AM Peak Hour Factor :
 PM Peak Hour begins : PM Peak Volume : 0 PM Peak Hour Factor :

14-Jan-14

Westbound Volume

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	1	1	0	1	2	4	11	18	13	6	10	4
30	3	1	2	0	3	9	14	12	13	14	6	7
45	1	0	0	1	2	5	17	13	30	9	10	7
00	0	0	1	1	7	13	19	19	9	14	11	13
Hr Total	5	2	3	3	14	31	61	62	65	43	37	31

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	12	7	14	7	9	8	14	6	3	1	3	2
30	13	9	11	7	8	10	12	8	6	5	1	1
45	14	10	9	8	7	7	11	3	5	5	2	0
00	13	15	11	7	9	4	8	6	3	4	1	1
Hr Total	52	41	45	29	33	29	45	23	17	15	7	4

24 Hour Total : 697
 AM Peak Hour begins : 7:45 AM Peak Volume : 75 AM Peak Hour Factor : 0.63
 PM Peak Hour begins : 12:00 PM Peak Volume : 52 PM Peak Hour Factor : 0.93

14-Jan-14

Total Volume for All Lanes

End Time	00	01	02	03	04	05	06	07	08	09	10	11
15	1	1	0	1	2	4	11	18	13	6	10	4
30	3	1	2	0	3	9	14	12	13	14	6	7
45	1	0	0	1	2	5	17	13	30	9	10	7
00	0	0	1	1	7	13	19	19	9	14	11	13
Hr Total	5	2	3	3	14	31	61	62	65	43	37	31

End Time	12	13	14	15	16	17	18	19	20	21	22	23
15	12	7	14	7	9	8	14	6	3	1	3	2
30	13	9	11	7	8	10	12	8	6	5	1	1
45	14	10	9	8	7	7	11	3	5	5	2	0
00	13	15	11	7	9	4	8	6	3	4	1	1
Hr Total	52	41	45	29	33	29	45	23	17	15	7	4

24 Hour Total : 697
 AM Peak Hour begins : 7:45 AM Peak Volume : 75 AM Peak Hour Factor : 0.63
 PM Peak Hour begins : 12:00 PM Peak Volume : 52 PM Peak Hour Factor : 0.93

GMB Engineers & Planners, Inc.
2602 E. Livingston St.
Orlando, FL 32803
(407) 898-5424

Site Code: 11-098.04
 Station ID: #1 SB
 CR-455

North of Ridgewood Ave.
 Latitude: 0' 0.000 Undefined

SB

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
01/14/14	0	0	0	0	1	3	0	0	0	0	0	0	0	0	4
00:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
00:30	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	2	3	1	0	0	0	0	0	0	0	6
01:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
02:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:15	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
02:30	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
02:45	1	0	0	0	0	0	1	0	0	0	0	0	0	0	2
03:00	1	0	0	0	0	3	1	1	0	0	0	0	0	0	6
03:15	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
03:30	0	0	0	0	1	1	0	2	0	0	0	0	0	0	4
03:45	0	0	0	0	2	0	1	0	0	0	0	0	0	0	3
04:00	0	0	0	0	3	1	0	0	0	0	0	0	0	0	4
04:15	0	0	0	0	6	4	1	2	0	0	0	0	0	0	13
04:30	0	0	0	0	0	4	1	1	0	0	0	0	0	0	6
04:45	0	0	0	0	1	3	5	0	0	0	0	0	0	0	9
05:00	0	0	0	0	1	4	1	1	0	0	0	0	0	0	6
05:15	0	0	0	0	0	4	3	1	0	0	0	0	0	0	8
05:30	0	0	0	0	1	15	10	3	0	0	0	0	0	0	29
05:45	0	0	0	1	3	3	2	1	0	0	0	0	0	0	10
06:00	0	0	0	0	1	7	6	1	0	0	0	0	0	0	15
06:15	0	0	0	0	0	5	4	0	0	0	0	0	0	0	9
06:30	0	0	0	0	8	15	5	2	1	0	0	0	0	0	31
06:45	0	0	0	1	12	30	17	4	1	0	0	0	0	0	65
07:00	0	0	0	0	5	23	12	0	0	0	0	0	0	0	40
07:15	0	0	0	0	3	28	8	1	0	0	0	0	0	0	40
07:30	0	0	0	1	5	22	8	2	0	0	0	0	0	0	38
07:45	2	0	0	2	11	9	9	1	0	0	0	0	0	0	34
08:00	2	0	0	3	24	82	37	4	0	0	0	0	0	0	152
08:15	0	0	1	4	13	17	4	0	0	0	0	0	0	0	39
08:30	0	0	0	5	30	26	6	0	0	0	0	0	0	0	67
08:45	0	0	3	29	65	28	4	0	0	0	0	0	0	0	129
09:00	0	0	0	8	42	74	5	1	0	0	0	0	0	0	130
09:15	0	0	4	46	150	145	19	1	0	0	0	0	0	0	365
09:30	0	0	1	5	17	16	4	1	0	0	0	0	0	0	44
09:45	0	1	0	6	15	14	2	1	0	0	0	0	0	0	39
10:00	0	0	2	10	13	15	5	1	0	0	0	0	0	0	46
10:15	0	0	0	3	16	8	0	0	0	0	0	0	0	0	27
10:30	0	1	3	24	61	53	11	3	0	0	0	0	0	0	156
10:45	0	0	1	8	9	11	3	2	0	0	0	0	0	0	34
11:00	0	0	2	5	4	4	2	0	0	0	0	0	0	0	17
11:15	0	0	2	2	12	3	1	0	0	0	0	0	0	0	20
11:30	0	0	3	2	7	6	2	0	0	0	0	0	0	0	20
11:45	0	0	8	17	32	24	8	2	0	0	0	0	0	0	91
12:00	0	0	1	2	11	9	0	0	0	0	0	0	0	0	23
12:15	0	1	1	5	4	2	0	0	0	0	0	0	0	0	13
12:30	0	0	0	0	17	7	0	0	0	0	0	0	0	0	24
12:45	0	0	0	3	7	4	0	0	0	0	0	0	0	0	14
13:00	0	1	2	10	39	22	0	0	0	0	0	0	0	0	74
13:15	0	0	0	4	9	5	3	0	0	0	0	0	0	0	21
13:30	1	0	1	3	11	8	0	1	0	0	0	0	0	0	25
13:45	0	0	1	6	12	8	1	0	0	0	0	0	0	0	28
14:00	0	0	0	2	15	9	1	0	0	0	0	0	0	0	27
14:15	1	0	2	15	47	30	5	1	0	0	0	0	0	0	101
Total	4	2	19	116	374	413	110	21	1	0	0	0	0	0	1060

GMB Engineers & Planners, Inc.
2602 E. Livingston St.
Orlando, FL 32803
(407) 898-5424

Site Code: 11-098.04
 Station ID: #1 SB
 CR-455

North of Ridgewood Ave.
 Latitude: 0' 0.000 Undefined

SB

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
12 PM	0	1	1	6	6	3	2	0	0	0	0	0	0	0	19
12:15	0	1	1	2	8	12	2	0	0	0	0	0	0	0	26
12:30	0	0	1	11	10	4	2	0	0	0	0	0	0	0	28
12:45	0	0	2	9	12	7	2	0	0	0	0	0	0	0	32
13:00	1	1	4	5	13	5	1	0	0	0	0	0	0	0	30
13:15	1	0	1	9	10	11	2	0	0	0	0	0	0	0	34
13:30	0	0	1	11	16	5	3	0	0	0	0	0	0	0	36
13:45	0	2	0	6	7	6	0	0	0	0	0	0	0	0	21
14:00	2	3	6	31	46	27	6	0	0	0	0	0	0	0	121
14:15	0	1	1	2	8	8	2	1	0	0	0	0	0	0	23
14:30	0	0	0	8	6	4	3	0	0	0	0	0	0	0	21
14:45	0	0	0	5	13	3	3	1	0	0	0	0	0	0	25
15:00	0	1	1	17	41	24	10	3	0	0	0	0	0	0	97
15:15	0	0	1	15	43	22	2	0	0	0	0	0	0	0	83
15:30	0	0	8	13	42	27	5	0	0	0	0	0	0	0	95
15:45	0	0	2	7	11	16	4	1	1	0	0	0	0	0	42
16:00	0	0	1	7	21	9	2	0	0	0	0	0	0	0	40
16:15	1	0	0	12	42	117	74	13	1	0	0	0	0	0	260
16:30	0	0	0	12	26	19	2	0	0	0	0	0	0	0	60
16:45	0	0	1	7	16	21	7	1	0	0	0	0	0	0	53
17:00	0	0	1	4	21	22	2	0	0	0	0	0	0	0	50
17:15	0	0	1	3	18	13	8	0	0	0	0	0	0	0	43
17:30	1	0	3	26	81	75	19	1	0	0	0	0	0	0	206
17:45	0	1	0	3	11	20	6	0	0	0	0	0	0	0	41
18:00	0	0	0	4	14	20	5	0	0	0	0	0	0	0	43
18:15	0	0	0	10	21	12	5	0	0	0	0	0	0	0	48
18:30	0	0	0	4	14	20	6	1	0	0	1	0	0	0	46
18:45	0	1	0	21	60	72	22	1	0	0	1	0	0	0	178
19:00	0	0	1	2	15	14	6	0	0	0	0	0	0	0	38
19:15	0	0	2	4	12	21	3	0	0	0	0	0	0	0	42
19:30	0	0	0	3	9	13	6	0	0	0	0	0	0	0	31
19:45	0	0	0	2	10	11	6	0	0	0	0	0	0	0	29
20:00	0	0	3	11	46	59	21	0	0	0	0	0	0	0	140
20:15	0	0	0	1	3	6	6	1	0	0	0	0	0	0	17
20:30	0	0	0	1	9	10	3	1	0	0	0	0	0	0	24
20:45	0	0	0	0	5	7	2	0	0	0	0	0	0	0	14
21:00	0	0	0	4	9	9	3	0	0	0	0	0	0	0	16
21:15	0	0	0	2	21	32	14	2	0	0	0	0	0	0	71
21:30	0	0	0	0	0	3	3	0	0	0	0	0	0	0	6
21:45	0	0	0	2	2	0	1	0	0	0	0	0	0	0	5
22:00	0	0	1	2	5	7	7	1	0	0	0	0	0	0	23
22:15	0	0	0	1	2	0	2	0	0	0	0	0	0	0	5
22:30	0	0	0	0	4	6	2	1	0	0	0	0	0	0	13
22:45	0	0	0	0	5	4	3	2	0	0	0	0	0	0	14
23:00	0	0	0	1	3	2	4	1	0	0	0	0	0	0	11
23:15	0	0	0	2	14	12	11	4	0	0	0	0	0	0	43
23:30	0	0	0	0	2	0	1	2	0	0	0	0	0	0	5
23:45	0	0	0	0	1	1	1	1	0	0	0	0	0	0	4
Total	3	7	31	182	477	412	136	19	1	1	1	0	0	0	1270
Grand Total	7	9	50	298	851	825	246	40	2	1	1	0	0	0	2330

15th Percentile : 30 MPH
 50th Percentile : 35 MPH
 85th Percentile : 40 MPH
 95th Percentile : 44 MPH

Stats
 Mean Speed(Average) : 35 MPH
 10 MPH Pace Speed : 31-40 MPH
 Number in Pace : 1676
 Percent in Pace : 71.9%
 Number of Vehicles > 35 MPH : 1115
 Percent of Vehicles > 35 MPH : 47.9%

Roadway Count Summary

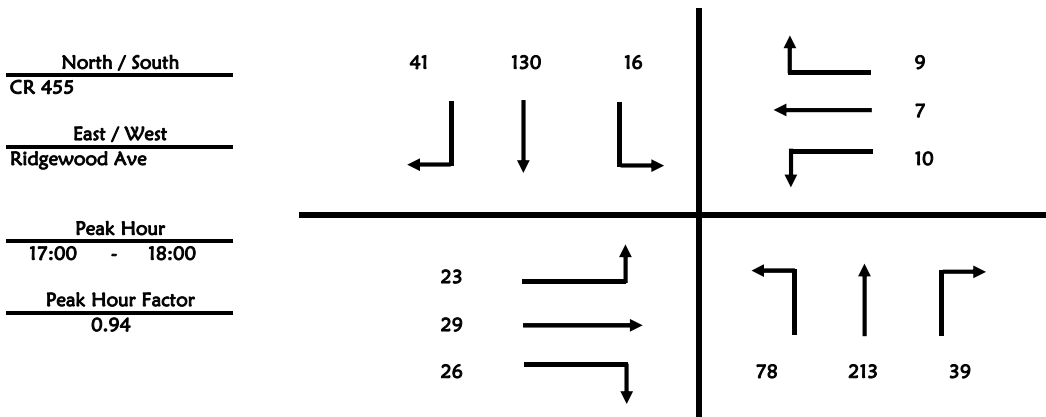
GMB Engineers & Planners, Inc.

County Lake **City** Montverde
Intersection CR 455 **&** Ridgewood Ave
Date January 14, 2014
Time Period 2:00 PM to 6:00 PM **All Vehicles**

GMB Project #: 11-098.04

Time Period	Northbound				Southbound			
	Left	Through	Right	Total	Left	Through	Right	Total
14:00 - 14:15	7	20	5	32	3	18	1	22
14:15 - 14:30	8	30	3	41	2	24	7	33
14:30 - 14:45	8	37	8	53	1	11	4	16
14:45 - 15:00	8	48	5	61	1	28	5	34
15:00 - 15:15	14	50	6	70	1	55	22	78
15:15 - 15:30	7	39	2	48	1	64	20	85
15:30 - 15:45	7	39	6	52	7	23	10	40
15:45 - 16:00	11	47	13	71	3	23	15	41
16:00 - 16:15	17	36	7	60	0	53	17	70
16:15 - 16:30	12	45	11	68	3	30	13	46
16:30 - 16:45	17	49	12	78	6	34	13	53
16:45 - 17:00	22	38	10	70	2	26	7	35
17:00 - 17:15	18	48	7	73	3	29	13	45
17:15 - 17:30	11	64	12	87	2	33	11	46
17:30 - 17:45	22	59	6	87	5	37	10	52
17:45 - 18:00	27	42	14	83	6	31	7	44
TOTAL	216	691	127	1,034	46	519	175	740

Time Period	Eastbound				Westbound			
	Left	Through	Right	Total	Left	Through	Right	Total
14:00 - 14:15	4	6	12	22	6	8	1	15
14:15 - 14:30	3	4	7	14	3	8	1	12
14:30 - 14:45	10	1	8	19	3	3	2	8
14:45 - 15:00	11	3	3	17	4	4	3	11
15:00 - 15:15	16	5	3	24	4	3	0	7
15:15 - 15:30	11	5	5	21	4	1	2	7
15:30 - 15:45	7	6	7	20	2	3	3	8
15:45 - 16:00	17	3	4	24	3	4	1	8
16:00 - 16:15	10	2	6	18	3	3	3	9
16:15 - 16:30	10	5	10	25	2	3	3	8
16:30 - 16:45	5	3	4	12	2	4	1	7
16:45 - 17:00	1	7	12	20	3	5	1	9
17:00 - 17:15	8	8	8	24	3	2	1	6
17:15 - 17:30	3	8	6	17	1	3	5	9
17:30 - 17:45	7	8	4	19	3	2	2	7
17:45 - 18:00	5	5	8	18	3	0	1	4
TOTAL	128	79	107	314	49	56	30	135



Pedestrian & Bicycle Summary

Project #: 11-098.04

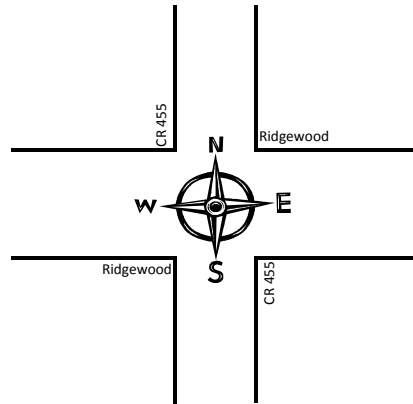
NB/SB: CR 455

Date: 1/14/2014

EB/WB: Ridgewood

		Hour								
		14:00	15:00	16:00	17:00					
		1	2	3	4	5	6	7	8	
Eastbound	Bike									0
	Ped									0
Westbound	Bike									0
	Ped									0

Hour	Southbound		Northbound	
	Ped	Bike	Ped	Bike
1 14:00				
2 15:00				
3 16:00		1		
4 17:00				
5				
6				
7				
8				
	0	1	0	0



Hour	Southbound		Northbound	
	Ped	Bike	Ped	Bike
1 14:00			2	
2 15:00		1		
3 16:00				
4 17:00				
5				
6				
7				
8				
	0	1	2	0

Eastbound	Bike									0
	Ped									0
Westbound	Bike									0
	Ped									0

		14:00	15:00	16:00	17:00				
		1	2	3	4	5	6	7	8
Hour									

File Name : #1 - CR 455 @ Ridgewood Ave - (0700 - 0800)

Site Code : 00000000

Start Date : 2/27/2014

Page No : 1

7:00:00 AM - 8:00:00 AM	Lane 1
Total Vehicle Count:	215
Delayed Vehicle Count:	215
Through Vehicle Count:	0
Average Stopped Time:	23.80
Maximum Stopped Time:	99
Min. Secs. for Delay:	0
Average Queue:	1.44
Queue Density:	2.73
Maximum Queue:	11

SR 46A @ Business Center

File Name : #1 - CR 455 @ Ridgewood Ave - (1200 - 1300)

Site Code : 00000000

Start Date : 2/27/2014

Page No : 1

12:00:00 PM - 12:59:00 PM	Lane 1
Total Vehicle Count:	70
Delayed Vehicle Count:	70
Through Vehicle Count:	0
Average Stopped Time:	8.84
Maximum Stopped Time:	37
Min. Secs. for Delay:	0
Average Queue:	0.18
Queue Density:	1.17
Maximum Queue:	5

SR 46A @ Business Center

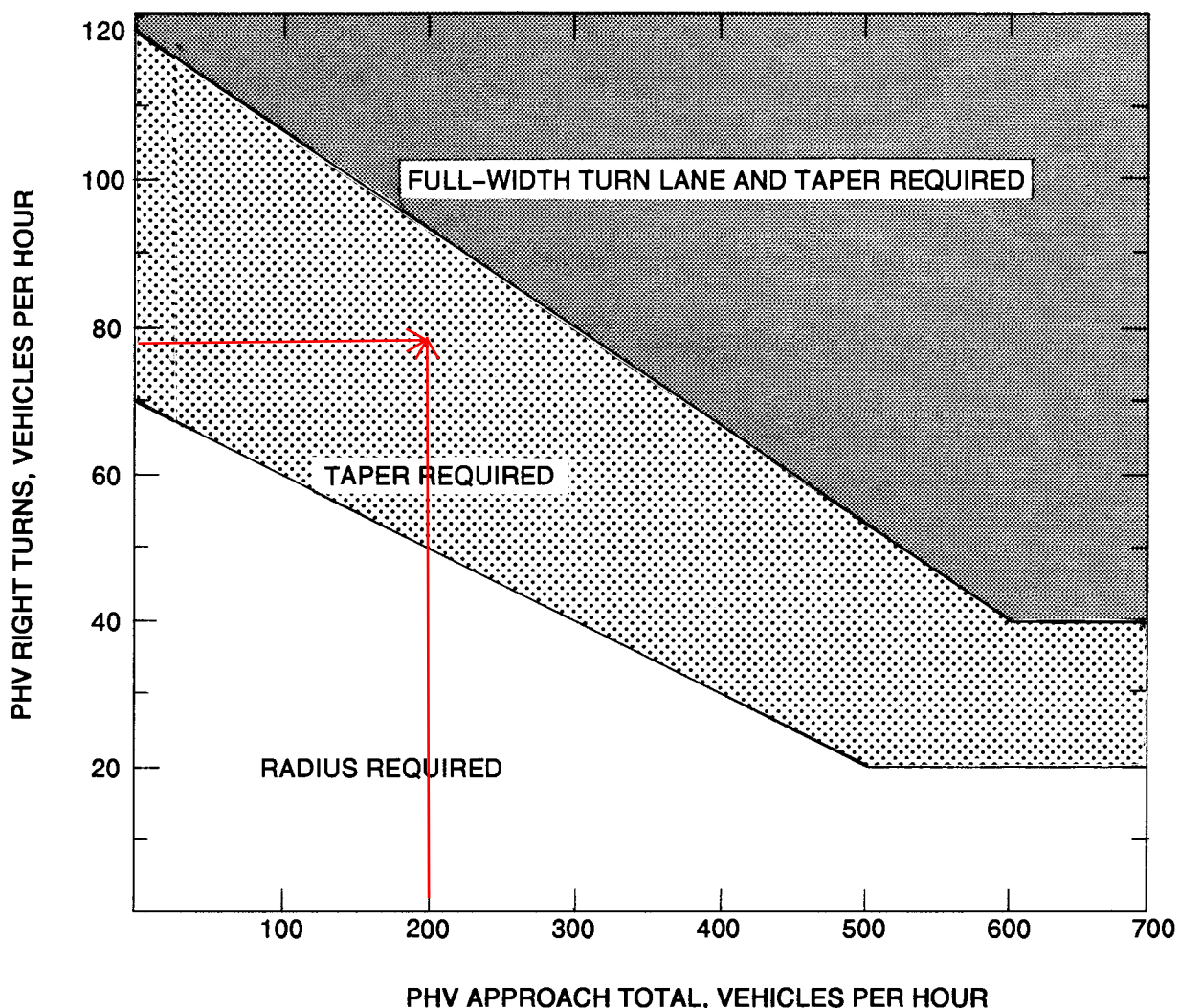
File Name : #1 - CR 455 @ Ridgewood Ave - (1700 - 1800)

Site Code : 00000000

Start Date : 2/27/2014

Page No : 1

4:58:00 PM - 6:00:00 PM	Lane 1
Total Vehicle Count:	66
Delayed Vehicle Count:	66
Through Vehicle Count:	0
Average Stopped Time:	14.55
Maximum Stopped Time:	61
Min. Secs. for Delay:	0
Average Queue:	0.26
Queue Density:	1.32
Maximum Queue:	4



LEGEND

PHV - Peak Hour Volume (also Design Hourly Volume equivalent)

Adjustment for Right Turns

For posted speeds at or under 70 km/h (45 mph), PHV right turns > 40, and PHV total < 300.

Adjusted right turns - PHV Right Turns - 20

If PHV is not known use formula: $PHV = ADT \times K \times D$

K = the percent of AADT occurring in the peak hour
 D = the percent of traffic in the peak direction of flow

Note: An average of 11% for K x D will suffice.

**GUIDELINES FOR RIGHT TURN TREATMENT (2-LANE HIGHWAY)
 FIGURE C-1-8**

TRAFFIC SIGNAL WARRANT SUMMARY

City: MONTVERDE
 County: LAKE

Engineer: KLL
 Date: February 12, 2014

Major Street: CR 455
 Minor Street: RIDGEWOOD AVENUE

Lanes: 1 Critical Approach Speed: 35
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
 2. Is the intersection in a built-up area of isolated community of <10,000 population? Yes No
- If Question 1 or 2 above is answered "Yes", then use "70%" volume level 70% 100%

WARRANT 1 - EIGHT-HOUR VEHICULAR VOLUME

Applicable: Yes No
 Satisfied: Yes No

Warrant 1 is satisfied if Condition A or Condition B is "100%" satisfied.

Warrant is also satisfied if both Condition A and Condition B are "80%" satisfied for major streets 40 mph or less, or "56%" satisfied for major streets greater than 40 mph.

Condition A - Minimum Vehicular Volume

70% or 100% Satisfied: Yes No
 56% or 80% Satisfied: Yes No

(volumes in veh/hr)	Minimum Requirements (80% Shown in Parenthesis)				Eight Highest Hours							
	1		2 or more		6:30 AM -	7:30 AM -	11:00 AM -	12:00 PM -	2:00 PM -	3:00 PM -	4:00 PM -	5:00 PM -
	100%	70%	100%	70%								
Both Approaches on Major Street	500 (400) [280]	350	600 (480) [336]	420	326	509	197	245	292	485	480	517
Highest Approach on Minor Street	150 (120) [84]	105	200 (160) [112]	140	161	141	48	56	72	89	75	78

Record 8 highest hours and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours. Condition is 80% satisfied if (parenthetical) volumes are met for eight hours. Condition is 56% satisfied if [bracketed] volumes are met for eight hours.

Condition B - Interruption of Continuous Traffic

Condition B is intended for application where the traffic volume is so heavy that traffic on the minor street suffers excessive delay.

Applicable: Yes No
 Excessive Delay: Yes No
 70% or 100% Satisfied: Yes No
 56% or 80% Satisfied: Yes No

(volumes in veh/hr)	Minimum Requirements (80% Shown in Parenthesis)				Eight Highest Hours							
	1		2 or more		6:30 AM -	7:30 AM -	11:00 AM -	12:00 PM -	2:00 PM -	3:00 PM -	4:00 PM -	5:00 PM -
	100%	70%	100%	70%								
Both Approaches on Major Street	750 (600) [420]	525	900 (720) [504]	630	326	509	197	245	292	485	480	517
Highest Approach on Minor Street	75 (60) [42]	53	100 (80) [56]	70	161	141	48	56	72	89	75	78

Record 8 highest hours and the corresponding volumes in boxes provided. Condition is 100% satisfied if the minimum volumes are met for eight hours. Condition is 80% satisfied if (parenthetical) volumes are met for eight hours. Condition is 56% satisfied if [bracketed] volumes are met for eight hours.

TRAFFIC SIGNAL WARRANT SUMMARY

City: MONTVERDE
 County: LAKE

Engineer: KLL
 Date: February 12, 2014

Major Street: CR 455
 Minor Street: RIDGEWOOD AVENUE

Lanes: 1 Critical Approach Speed: 35
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
 2. Is the intersection in a built-up area of isolated community of <10,000 population? Yes No
- If Question 1 or 2 above is answered "Yes", then use "70%" volume level 70% 100%

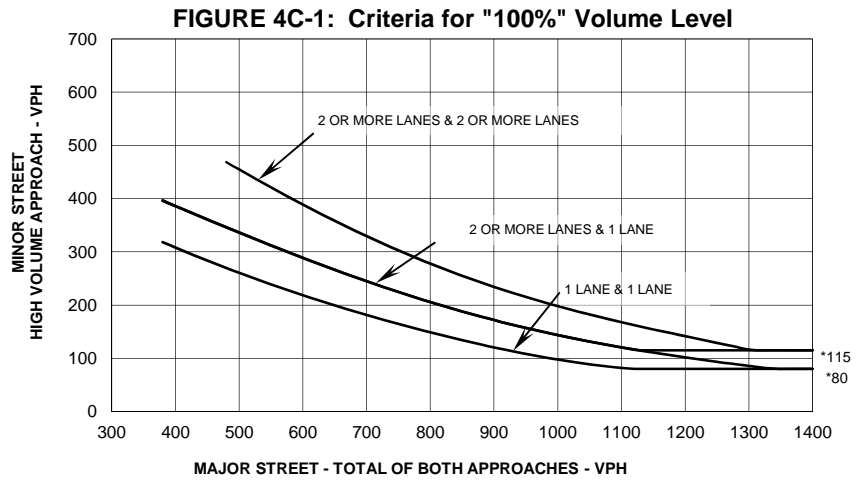
WARRANT 2 - FOUR-HOUR VEHICULAR VOLUME

If all four points lie above the appropriate line, then the warrant is satisfied.

Applicable: Yes No
 Satisfied: Yes No

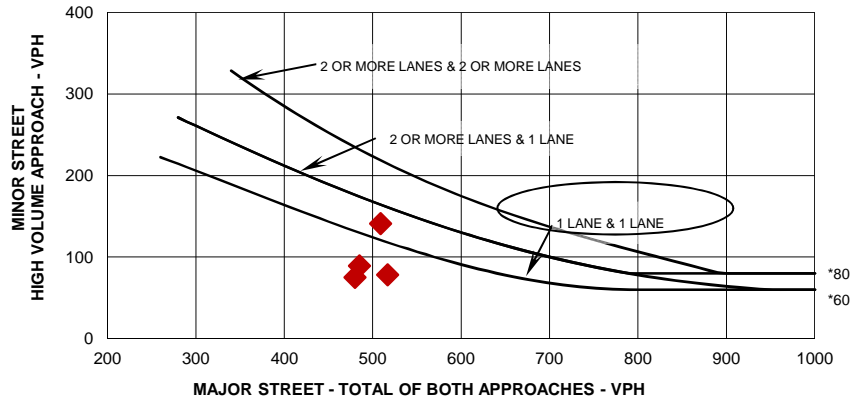
Plot four volume combinations on the applicable figure below.

Four Highest Hours	Volumes	
	Major Street	Minor Street
11:00 AM	509	141
2:00 PM	485	89
3:00 PM	480	75
4:00 PM	517	78



* Note: 115 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 80 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

FIGURE 4C-2: Criteria for "70%" Volume Level
 (Community Less than 10,000 population or above 70 km/hr (40 mph) on Major Street)



* Note: 80 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 60 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

TRAFFIC SIGNAL WARRANT SUMMARY

City: MONTVERDE
 County: LAKE

Engineer: KLL
 Date: February 12, 2014

Major Street: CR 455
 Minor Street: RIDGEWOOD AVENUE

Lanes: 1 Critical Approach Speed: 35
 Lanes: 1

Volume Level Criteria

1. Is the critical speed of major street traffic > 70 km/h (40 mph) ? Yes No
 2. Is the intersection in a built-up area of isolated community of <10,000 population? Yes No

If Question 1 or 2 above is answered "Yes", then use "70%" volume level 70% 100%

WARRANT 3 - PEAK HOUR

If all three criteria are fulfilled or the plotted point lies above the appropriate line, then the warrant is satisfied.

Applicable: Yes No
 Satisfied: Yes No

Unusual condition justifying use of warrant:

School within vicinity

Record hour when criteria are fulfilled and the corresponding delay or volume in boxes provided.

Peak Hour		
7:00 a.m.	617	201

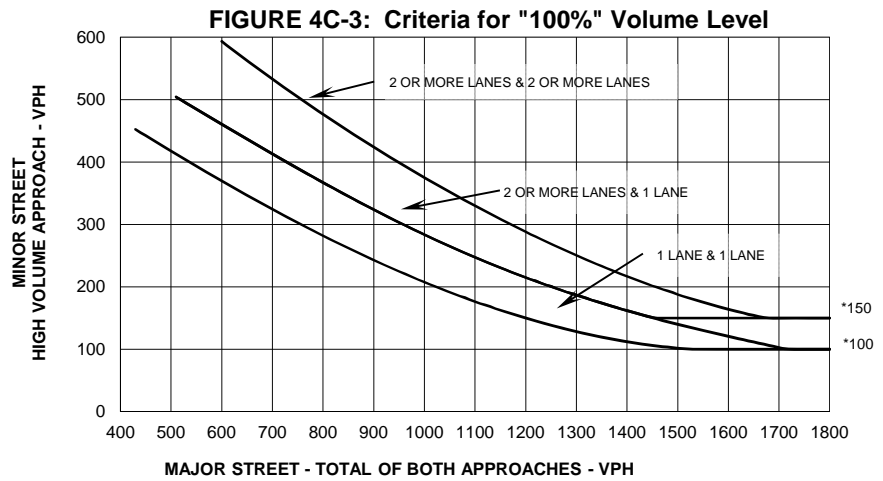
Criteria

1. Delay on Minor Approach *(vehicle-hours)		
Approach Lanes	1	2
Delay Criteria*	4.0	5.0
Delay*	1.4	
Fulfilled?:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

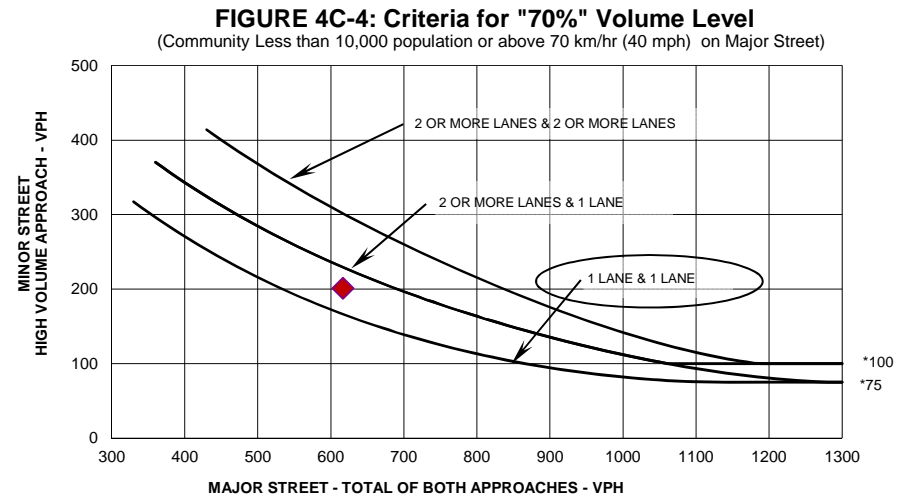
2. Volume on Minor Approach *(vehicles per hour)		
Approach Lanes	1	2
Volume Criteria*	100	150
Volume*	201	
Fulfilled?:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

3. Total Entering Volume *(vehicles per hour)		
No. of Approaches	3	4
Volume Criteria*	650	800
Volume*		878
Fulfilled?:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

Plot volume combination on the applicable figure below.



* Note: 150 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 100 vph applies as the lower threshold volume threshold for a minor street approach with one lane.



* Note: 100 vph applies as the lower threshold volume for a minor street approach with two or more lanes and 75 vph applies as the lower threshold volume threshold for a minor street approach with one lane.

TRAFFIC SIGNAL WARRANT SUMMARY

City: MONTVERDE
 County: LAKE

Engineer: KLL
 Date: February 12, 2014

Major Street: CR 455
 Minor Street: RIDGEWOOD AVENUE

Lanes: 1 Critical Approach Speed: 35
 Lanes: 1

WARRANT 4 - PEDESTRIAN VOLUME

Record hours where criteria are fulfilled and the corresponding volume or gap frequency in the boxes provided. The warrant is satisfied if condition 1 or 2 is fulfilled and condition 3 is fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Hour	Pedestrian Volume	Pedestrian Gaps	Fulfilled?	
				Yes	No
1. Pedestrian volume crossing the major street is 100 ped/hr or more for each of any four hours <u>and</u> there are less than 60 gaps per hour in the major street traffic stream of adequate length.					
2. Pedestrian volume crossing the major street is 190 ped/hr or more for any one hour <u>and</u> there are less than 60 gaps per hour in the major street traffic stream of adequate length.					
3. The nearest traffic signal along the major street is located more than 90 m (300 ft) away, or the nearest signal is within 90 m (300 ft) but the proposed traffic signal will not restrict the progressive movement of traffic.					

WARRANT 5 - SCHOOL CROSSING

Record hours where criteria are fulfilled and the corresponding volume or gap frequency in the boxes provided. The warrant is satisfied if all three of the criteria are fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Fulfilled?	
	Yes	No
1. There are a minimum of 20 students crossing the major street during the highest crossing hour.	Students:	Hour:
2. There are fewer adequate gaps in the major street traffic stream during the period when the children are using the crossing than the number of minutes in the same period.	Minutes:	Gaps:
3. The nearest traffic signal along the major street is located more than 90 m (300 ft) away, or the nearest signal is within 90 m (300 ft) but the proposed traffic signal will not restrict the progressive movement of traffic.		

WARRANT 6 - COORDINATED SIGNAL SYSTEM

Indicate if the criteria are fulfilled in the boxes provided. The warrant is satisfied if either criterion is fulfilled. This warrant should not be applied when the resulting signal spacing would be less than 300 m (1,000 ft).

Applicable: Yes No
 Satisfied: Yes No

Criteria	Fulfilled?	
	Yes	No
1. On a one-way street or a street that has traffic predominately in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.		
2. On a two-way street, adjacent signals do not provide the necessary degree of platooning, and the proposed and adjacent signals will collectively provide a progressive operation.		

TRAFFIC SIGNAL WARRANT SUMMARY

City: MONTVERDE
 County: LAKE

Engineer: KLL
 Date: February 12, 2014

Major Street: CR 455
 Minor Street: RIDGEWOOD AVENUE

Lanes: 1 Critical Approach Speed: 35
 Lanes: 1

WARRANT 7 - CRASH EXPERIENCE

Record hours where criteria are fulfilled, the corresponding volume, and other information in the boxes provided. The warrant is satisfied if all three of the criteria are fulfilled.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Hour	Volume	Met?		Fulfilled?		
			Yes	No	Yes	No	
1. One of the warrants to the right is met.	Warrant 1, Condition A (80% satisfied)			<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
	Warrant 1, Condition B (80% satisfied)			<input checked="" type="checkbox"/>			
	Warrant 4, Pedestrian Volume at 80% of volume requirements: 80 ped/hr for four (4) hours or 152 ped/hr for one (1) hour				<input checked="" type="checkbox"/>		
2. Adequate trial of other remedial measure has failed to reduce crash frequency.	Measure tried:	N/A					
3. Five or more reported crashes, of types susceptible to correction by signal, have occurred within a 12-mo. period.		Number of crashes per 12 months: 4				<input checked="" type="checkbox"/>	

WARRANT 8 - ROADWAY NETWORK

Record hours where criteria are fulfilled, and the corresponding volume or other information in the boxes provided. The warrant is satisfied if at least one of the criteria is fulfilled and if all intersecting routes have one or more of the characteristics listed.

Applicable: Yes No
 Satisfied: Yes No

Criteria	Met?			Fulfilled?	
	Yes	No	Yes	No	No
1. Both of the criteria to the right are met.	a. Total entering volume of at least 1,000 veh/hr during a typical weekday peak hour.		Entering Volume:		
	b. Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		Warrant:	1	2
2. Total entering volume at least 1,000 veh/hr for each of any 5 hrs of a non-normal business day (Sat. or Sun.)					
				Hour	
				Volume	

Characteristics of Major Routes	Met?		Fulfilled?	
	Yes	No	Yes	No
1. Part of the street or highway system that serves as the principal roadway network for through traffic flow.	Major Street:			
	Minor Street:			
2. Rural or suburban highway outside of, entering, or traversing a city.	Major Street:			
	Minor Street:			
3. Appears as a major route on an official plan.	Major Street:			
	Minor Street:			

CONCLUSIONS

Warrants Satisfied: 3

Remarks: Warrant 3 has been satisfied. A traffic signal can be warranted

Intersection

Int Delay, s/veh 10.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR
Vol, veh/h	97	7	97	33	20	7	12	227	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	75	75	75	75	75	75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2
Mvmt Flow	129	9	129	44	27	9	16	303	12

Major/Minor

	Minor2	Minor1			Major1				
Conflicting Flow All	808	796	439	860	838	309	487	0	0
Stage 1	449	449	-	341	341	-	-	-	-
Stage 2	359	347	-	519	497	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	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	-	-
Pot Cap-1 Maneuver	299	320	618	276	302	731	1076	-	-
Stage 1	589	572	-	674	639	-	-	-	-
Stage 2	659	635	-	540	545	-	-	-	-
Platoon blocked, %									
Mov Cap-1 Maneuver	270	312	618	209	295	731	1076	-	-
Mov Cap-2 Maneuver	270	312	-	209	295	-	-	-	-
Stage 1	578	569	-	662	627	-	-	-	-
Stage 2	612	624	-	417	542	-	-	-	-

Approach

	EB	WB	NB
HCM Control Delay, s	35.8	25.4	0.4
HCM LOS	E	D	

Minor Lane/Major Mvmt

	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1076	-	-	373	255	1245	-	-
HCM Lane V/C Ratio	0.015	-	-	0.718	0.314	0.004	-	-
HCM Control Delay (s)	8.4	0	-	35.8	25.4	7.9	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0	-	-	5.4	1.3	0	-	-

Intersection

Int Delay, s/veh

Movement	SBL	SBT	SBR
Vol, veh/h	4	293	72
Conflicting Peds, #/hr	0	0	0
Sign Control	Free	Free	Free
RT Channelized	-	-	None
Storage Length	-	-	-
Veh in Median Storage, #	-	0	-
Grade, %	-	0	-
Peak Hour Factor	75	75	75
Heavy Vehicles, %	2	2	2
Mvmt Flow	5	391	96

Major/Minor Major2

Conflicting Flow All	315	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1245	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	1245	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach SB

HCM Control Delay, s 0.1

HCM LOS

Minor Lane/Major Mvmt

Intersection												
Int Delay, s/veh	3.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	23	29	26	10	7	9	78	213	39	16	130	41
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	31	28	11	7	10	83	227	41	17	138	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	616	628	160	636	629	247	182	0	0	268	0	0
Stage 1	194	194	-	413	413	-	-	-	-	-	-	-
Stage 2	422	434	-	223	216	-	-	-	-	-	-	-
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	403	400	885	391	399	792	1393	-	-	1296	-	-
Stage 1	808	740	-	616	594	-	-	-	-	-	-	-
Stage 2	609	581	-	780	724	-	-	-	-	-	-	-
Platoon blocked, %												
Mov Cap-1 Maneuver	367	366	885	332	366	792	1393	-	-	1296	-	-
Mov Cap-2 Maneuver	367	366	-	332	366	-	-	-	-	-	-	-
Stage 1	751	729	-	573	552	-	-	-	-	-	-	-
Stage 2	552	540	-	713	713	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	14	1.8	0.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1393	-	-	455	429	1296	-	-
HCM Lane V/C Ratio	0.06	-	-	0.182	0.064	0.013	-	-
HCM Control Delay (s)	7.7	0	-	14.7	14	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.7	0.2	0	-	-

Intersection												
Intersection Delay, s/veh	18.5											
Intersection LOS	C											
Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	97	7	97	0	33	20	7	0	12	227	9
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	129	9	129	0	44	27	9	0	16	303	12
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	14.6	11.4	15.7
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	48%	55%	1%
Vol Thru, %	92%	3%	33%	79%
Vol Right, %	4%	48%	12%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	248	201	60	369
LT Vol	227	7	20	293
Through Vol	9	97	7	72
RT Vol	12	97	33	4
Lane Flow Rate	331	268	80	492
Geometry Grp	1	1	1	1
Degree of Util (X)	0.537	0.466	0.156	0.753
Departure Headway (Hd)	5.975	6.259	7.042	5.617
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	608	579	511	649
Service Time	3.975	4.265	5.056	3.617
HCM Lane V/C Ratio	0.544	0.463	0.157	0.758
HCM Control Delay	15.7	14.6	11.4	23.7
HCM Lane LOS	C	B	B	C
HCM 95th-tile Q	3.2	2.5	0.5	6.8

Intersection

Intersection Delay, s/veh
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	4	293	72
Peak Hour Factor	0.75	0.75	0.75	0.75
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	5	391	96
Number of Lanes	0	0	1	0

Approach SB

Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	23.7
HCM LOS	C

Lane

Intersection

Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	23	29	26	0	10	7	9	0	78	213	39
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	24	31	28	0	11	7	10	0	83	227	41
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	8.8	8.4	10.7
HCM LOS	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	24%	29%	38%	9%
Vol Thru, %	65%	37%	27%	70%
Vol Right, %	12%	33%	35%	22%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	330	78	26	187
LT Vol	213	29	7	130
Through Vol	39	26	9	41
RT Vol	78	23	10	16
Lane Flow Rate	351	83	28	199
Geometry Grp	1	1	1	1
Degree of Util (X)	0.43	0.116	0.04	0.247
Departure Headway (Hd)	4.407	5.047	5.144	4.476
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	818	708	693	802
Service Time	2.436	3.094	3.198	2.511
HCM Lane V/C Ratio	0.429	0.117	0.04	0.248
HCM Control Delay	10.7	8.8	8.4	9
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2.2	0.4	0.1	1

Intersection

Intersection Delay, s/veh
 Intersection LOS

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	16	130	41
Peak Hour Factor	0.94	0.94	0.94	0.94
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	17	138	44
Number of Lanes	0	0	1	0

Approach SB

















Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	9
HCM LOS	A

Lane

HCM 2010 Signalized Intersection Summary
3: CR 455 & Ridgewood Avenue

Traffic Signal- AM Peak Hour

















02/13/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	7	97	33	20	7	12	227	9	4	293	72
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	190.0	186.3	190.0	190.0	186.3	190.0	190.0	186.3	190.0	190.0	186.3	190.0
Adj Flow Rate, veh/h	129	9	129	44	27	9	16	303	12	5	391	96
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	295	39	177	308	166	41	115	648	25	101	544	132
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.38	0.38	0.38	0.38	0.38	0.38
Sat Flow, veh/h	619	163	731	645	685	169	33	1718	66	5	1442	351
Grp Volume(v), veh/h	267	0	0	80	0	0	331	0	0	492	0	0
Grp Sat Flow(s),veh/h/ln	1513	0	0	1499	0	0	1817	0	0	1797	0	0
Q Serve(g_s), s	4.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.9	0.0	0.0	1.3	0.0	0.0	5.0	0.0	0.0	8.6	0.0	0.0
Prop In Lane	0.48		0.48	0.55		0.11	0.05		0.04	0.01		0.20
Lane Grp Cap(c), veh/h	512	0	0	515	0	0	788	0	0	777	0	0
V/C Ratio(X)	0.52	0.00	0.00	0.16	0.00	0.00	0.42	0.00	0.00	0.63	0.00	0.00
Avail Cap(c_a), veh/h	1721	0	0	1694	0	0	2854	0	0	2873	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.7	0.0	0.0	11.0	0.0	0.0	8.7	0.0	0.0	9.8	0.0	0.0
Incr Delay (d2), s/veh	0.8	0.0	0.0	0.1	0.0	0.0	0.4	0.0	0.0	0.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.0	0.7	0.0	0.0	2.6	0.0	0.0	4.4	0.0	0.0
LnGrp Delay(d),s/veh	13.5	0.0	0.0	11.2	0.0	0.0	9.0	0.0	0.0	10.7	0.0	0.0
LnGrp LOS	B			B			A			B		
Approach Vol, veh/h		267			80			331			492	
Approach Delay, s/veh		13.5			11.2			9.0			10.7	
Approach LOS		B			B			A			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.9		15.9		20.9		15.9				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		57.0		39.0		57.0		39.0				
Max Q Clear Time (g_c+I1), s		7.0		7.9		10.6		3.3				
Green Ext Time (p_c), s		3.3		1.3		3.3		1.3				
Intersection Summary												
HCM 2010 Ctrl Delay				10.9								
HCM 2010 LOS				B								

HCM 2010 Signalized Intersection Summary
3: CR 455 & Ridgewood Avenue

Traffic Signal- PM Peak Hour





















02/13/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	29	26	10	7	9	78	213	39	16	130	41
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	190.0	186.3	190.0	190.0	186.3	190.0	190.0	186.3	190.0	190.0	186.3	190.0
Adj Flow Rate, veh/h	24	31	28	11	7	10	83	227	41	17	138	44
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	183	120	85	199	107	88	240	544	86	138	576	170
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	312	786	559	343	702	581	251	1240	197	54	1315	389
Grp Volume(v), veh/h	83	0	0	28	0	0	351	0	0	199	0	0
Grp Sat Flow(s),veh/h/ln	1658	0	0	1626	0	0	1688	0	0	1757	0	0
Q Serve(g_s), 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
Cycle Q Clear(g_c), s	1.4	0.0	0.0	0.5	0.0	0.0	4.6	0.0	0.0	2.4	0.0	0.0
Prop In Lane	0.29		0.34	0.39		0.36	0.24		0.12	0.09		0.22
Lane Grp Cap(c), veh/h	388	0	0	394	0	0	870	0	0	885	0	0
V/C Ratio(X)	0.21	0.00	0.00	0.07	0.00	0.00	0.40	0.00	0.00	0.22	0.00	0.00
Avail Cap(c_a), veh/h	1413	0	0	1369	0	0	3422	0	0	3564	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	12.9	0.0	0.0	12.5	0.0	0.0	6.7	0.0	0.0	6.1	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.0	0.1	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	0.2	0.0	0.0	2.3	0.0	0.0	1.2	0.0	0.0
LnGrp Delay(d),s/veh	13.2	0.0	0.0	12.6	0.0	0.0	7.0	0.0	0.0	6.2	0.0	0.0
LnGrp LOS	B			B			A			A		
Approach Vol, veh/h		83			28			351			199	
Approach Delay, s/veh		13.2			12.6			7.0			6.2	
Approach LOS		B			B			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.0		12.2		22.0		12.2				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		69.0		27.0		69.0		27.0				
Max Q Clear Time (g_c+I1), s		6.6		3.4		4.4		2.5				
Green Ext Time (p_c), s		2.1		0.3		2.1		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				7.8								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary
3: CR 455 & Ridgewood Avenue






















Traffic Signal W Turn Lanes- AM Peak Hour

02/13/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	97	7	97	33	20	7	12	227	9	4	293	72
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0
Adj Flow Rate, veh/h	129	9	129	44	27	9	16	303	12	5	391	96
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	453	20	288	358	258	86	366	701	28	498	569	140
Arrive On Green	0.19	0.19	0.19	0.19	0.19	0.19	0.39	0.39	0.39	0.39	0.39	0.39
Sat Flow, veh/h	1367	104	1495	1246	1338	446	905	1780	70	1060	1445	355
Grp Volume(v), veh/h	129	0	138	44	0	36	16	0	315	5	0	487
Grp Sat Flow(s),veh/h/ln	1367	0	1599	1246	0	1784	905	0	1850	1060	0	1800
Q Serve(g_s), s	2.9	0.0	2.6	1.1	0.0	0.6	0.5	0.0	4.2	0.1	0.0	7.6
Cycle Q Clear(g_c), s	3.5	0.0	2.6	3.7	0.0	0.6	8.1	0.0	4.2	4.3	0.0	7.6
Prop In Lane	1.00		0.93	1.00		0.25	1.00		0.04	1.00		0.20
Lane Grp Cap(c), veh/h	453	0	308	358	0	344	366	0	729	498	0	709
V/C Ratio(X)	0.28	0.00	0.45	0.12	0.00	0.10	0.04	0.00	0.43	0.01	0.00	0.69
Avail Cap(c_a), veh/h	1764	0	1842	1553	0	2055	1533	0	3115	1866	0	3031
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.7	0.0	12.1	13.7	0.0	11.3	11.9	0.0	7.5	9.1	0.0	8.5
Incr Delay (d2), s/veh	0.3	0.0	1.0	0.2	0.0	0.1	0.0	0.0	0.4	0.0	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	1.2	0.4	0.0	0.3	0.1	0.0	2.2	0.0	0.0	3.9
LnGrp Delay(d),s/veh	13.0	0.0	13.1	13.9	0.0	11.4	11.9	0.0	7.9	9.1	0.0	9.7
LnGrp LOS	B		B	B		B	B		A	A		A
Approach Vol, veh/h		267			80			331			492	
Approach Delay, s/veh		13.1			12.7			8.1			9.7	
Approach LOS		B			B			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		20.3		13.5		20.3		13.5				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		57.0		39.0		57.0		39.0				
Max Q Clear Time (g_c+I1), s		10.1		5.5		9.6		5.7				
Green Ext Time (p_c), s		3.2		1.1		3.2		1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			10.2									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary
3: CR 455 & Ridgewood Avenue

Traffic Signal W Turn Lanes- PM Peak Hour
02/13/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	29	26	10	7	9	78	213	39	16	130	41
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0
Adj Flow Rate, veh/h	24	31	28	11	7	10	83	227	41	17	138	44
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	138	124	374	106	151	659	674	122	588	594	189
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	1390	903	816	1338	695	993	1197	1536	277	1107	1355	432
Grp Volume(v), veh/h	24	0	59	11	0	17	83	0	268	17	0	182
Grp Sat Flow(s),veh/h/ln	1390	0	1719	1338	0	1688	1197	0	1814	1107	0	1787
Q Serve(g_s), s	0.5	0.0	1.0	0.2	0.0	0.3	1.6	0.0	3.3	0.4	0.0	2.2
Cycle Q Clear(g_c), s	0.8	0.0	1.0	1.3	0.0	0.3	3.8	0.0	3.3	3.7	0.0	2.2
Prop In Lane	1.00		0.47	1.00		0.59	1.00		0.15	1.00		0.24
Lane Grp Cap(c), veh/h	410	0	262	374	0	257	659	0	795	588	0	783
V/C Ratio(X)	0.06	0.00	0.23	0.03	0.00	0.07	0.13	0.00	0.34	0.03	0.00	0.23
Avail Cap(c_a), veh/h	1296	0	1356	1226	0	1332	2548	0	3658	2335	0	3603
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.8	0.0	12.7	13.3	0.0	12.4	7.2	0.0	6.3	7.5	0.0	6.0
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.5	0.1	0.0	0.1	0.5	0.0	1.7	0.1	0.0	1.1
LnGrp Delay(d),s/veh	12.8	0.0	13.2	13.3	0.0	12.5	7.3	0.0	6.6	7.6	0.0	6.2
LnGrp LOS	B		B	B		B	A		A	A		A
Approach Vol, veh/h		83			28			351			199	
Approach Delay, s/veh		13.1			12.8			6.7			6.3	
Approach LOS		B			B			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.0		12.2		22.0		12.2				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		69.0		27.0		69.0		27.0				
Max Q Clear Time (g_c+I1), s		5.8		3.0		5.7		3.3				
Green Ext Time (p_c), s		1.9		0.3		1.9		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				7.7								
HCM 2010 LOS				A								






















Intersection				
Intersection Delay, s/veh	8.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	267	80	331	492
Demand Flow Rate, veh/h	273	82	337	502
Vehicles Circulating, veh/h	449	457	146	89
Vehicles Exiting, veh/h	142	26	576	450
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.1	6.4	7.4	9.3
Approach LOS	B	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	273	82	337	502
Cap Entry Lane, veh/h	721	715	976	1034
Entry HV Adj Factor	0.977	0.981	0.982	0.980
Flow Entry, veh/h	267	80	331	492
Cap Entry, veh/h	705	702	959	1013
V/C Ratio	0.379	0.115	0.345	0.486
Control Delay, s/veh	10.1	6.4	7.4	9.3
LOS	B	A	A	A
95th %tile Queue, veh	2	0	2	3

Intersection				
Intersection Delay, s/veh	6.2			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	83	28	351	199
Demand Flow Rate, veh/h	85	28	359	203
Vehicles Circulating, veh/h	169	341	73	103
Vehicles Exiting, veh/h	137	91	181	266
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.7	4.8	7.0	5.5
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	85	28	359	203
Cap Entry Lane, veh/h	954	803	1050	1019
Entry HV Adj Factor	0.981	0.995	0.979	0.981
Flow Entry, veh/h	83	28	351	199
Cap Entry, veh/h	936	800	1028	1000
V/C Ratio	0.089	0.035	0.342	0.199
Control Delay, s/veh	4.7	4.8	7.0	5.5
LOS	A	A	A	A
95th %tile Queue, veh	0	0	2	1

HCM 2010 Signalized Intersection Summary
3: CR 455 & Ridgewood Avenue

Traffic Signal W Turn Lanes- PM Peak Hour

02/13/2014

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	23	29	26	10	7	9	78	213	39	16	130	41
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0	186.3	186.3	190.0
Adj Flow Rate, veh/h	24	31	28	11	7	10	83	227	41	17	138	44
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	1	1	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	410	138	124	374	106	151	659	674	122	588	594	189
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	1390	903	816	1338	695	993	1197	1536	277	1107	1355	432
Grp Volume(v), veh/h	24	0	59	11	0	17	83	0	268	17	0	182
Grp Sat Flow(s),veh/h/ln	1390	0	1719	1338	0	1688	1197	0	1814	1107	0	1787
Q Serve(g_s), s	0.5	0.0	1.0	0.2	0.0	0.3	1.6	0.0	3.3	0.4	0.0	2.2
Cycle Q Clear(g_c), s	0.8	0.0	1.0	1.3	0.0	0.3	3.8	0.0	3.3	3.7	0.0	2.2
Prop In Lane	1.00		0.47	1.00		0.59	1.00		0.15	1.00		0.24
Lane Grp Cap(c), veh/h	410	0	262	374	0	257	659	0	795	588	0	783
V/C Ratio(X)	0.06	0.00	0.23	0.03	0.00	0.07	0.13	0.00	0.34	0.03	0.00	0.23
Avail Cap(c_a), veh/h	1296	0	1356	1226	0	1332	2548	0	3658	2335	0	3603
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	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.8	0.0	12.7	13.3	0.0	12.4	7.2	0.0	6.3	7.5	0.0	6.0
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.5	0.1	0.0	0.1	0.5	0.0	1.7	0.1	0.0	1.1
LnGrp Delay(d),s/veh	12.8	0.0	13.2	13.3	0.0	12.5	7.3	0.0	6.6	7.6	0.0	6.2
LnGrp LOS	B		B	B		B	A		A	A		A
Approach Vol, veh/h		83			28			351			199	
Approach Delay, s/veh		13.1			12.8			6.7			6.3	
Approach LOS		B			B			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		22.0		12.2		22.0		12.2				
Change Period (Y+Rc), s		7.0		7.0		7.0		7.0				
Max Green Setting (Gmax), s		69.0		27.0		69.0		27.0				
Max Q Clear Time (g_c+I1), s		5.8		3.0		5.7		3.3				
Green Ext Time (p_c), s		1.9		0.3		1.9		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			7.7									
HCM 2010 LOS			A									

ROUNDBABOUT JUSTIFICATION STUDY

District _____ City Montverde

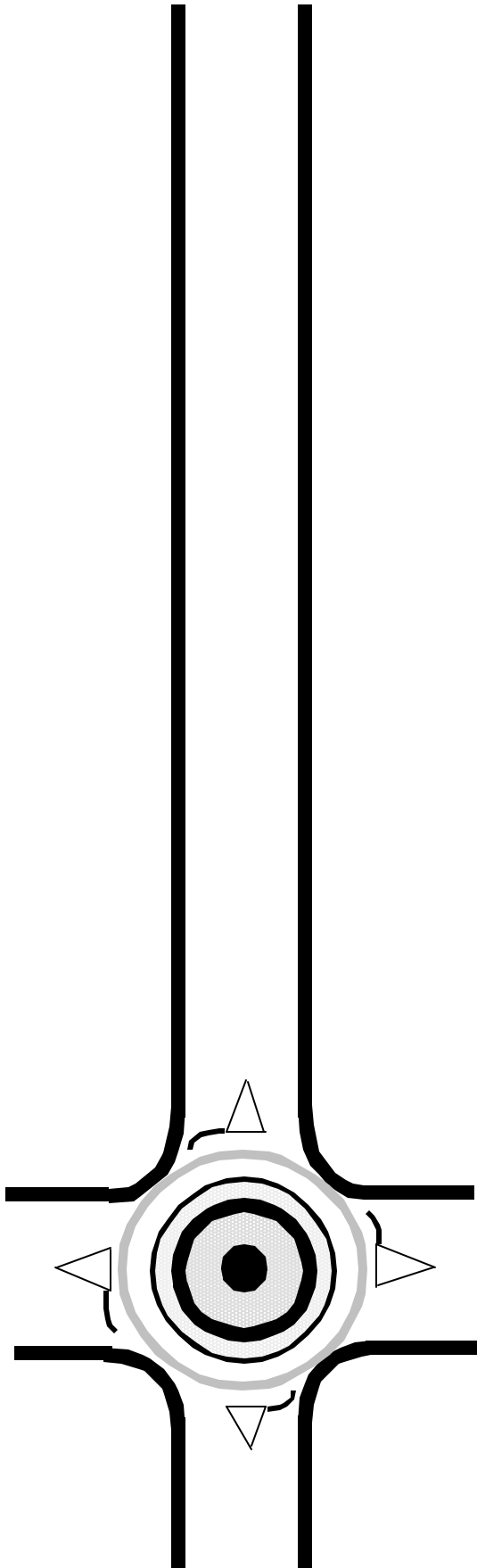
Intersection CR 455

at Ridgewood Avenue

Agency _____

Prepared by GMB Engineers & Planners, Inc.

Date February 2014



**Florida Department
of Transportation**

ROUNABOUT JUSTIFICATION STUDY SUMMARY			
Location Description: Study intersection is located just south of Montverde. Both roadways are 2-lane undivided rural roadways with posted speed limits of 35 mph. CR 455 (major street) is free-flow and Ridgewood Avenue (minor street) is stop sign controlled.		Area Population: <u>1,498</u> Growth Rate: <u>1.92%</u>	
Existing Control: <input checked="" type="radio"/> TWSC <input type="radio"/> AWSC <input type="radio"/> Signal Other: _____		Total Approaches: <input type="radio"/> 3 <input checked="" type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8 ADT (all approaches): <u>6,950</u> Total crashes: <u>7</u> in <u>3</u> years Preventable: <u>3</u>	

APPROACH CHARACTERISTICS							
Direction	Street Name	State or Local	Number of Lanes	ADT	Posted Speed (mph)	Traffic Control	Length* (feet)
1. NB	CR 455	L	2	2,687	35	N/A	N/A
2. SB	CR 455	L	2	2,408	35	N/A	N/A
3. EB	Ridgewood Avenue	L	2	1,158	35	Stop Sign	N/A
4. WB	Ridgewood Avenue	L	2	697	35	Stop Sign	N/A
5.							
6.							
7.							
8.							

* from upstream signal.

JUSTIFICATION CATEGORY	
<input checked="" type="checkbox"/> Community enhancement	<input type="checkbox"/> AWSC alternative
<input type="checkbox"/> Safety improvement	<input type="checkbox"/> Traffic calming
<input checked="" type="checkbox"/> Low volume signal alternative	<input type="checkbox"/> Special
<input type="checkbox"/> Medium volume signal alternative	
<hr/>	
Warrants Met?	<input checked="" type="checkbox"/> Signal volume warrants
<input type="checkbox"/> AWSC	<input type="checkbox"/> Signal crash warrants
<hr/>	
Level of Service	<u> A </u> Roundabout
<u> B </u> Signal	<u> C </u> AWSC <u> B </u> TWSC
<hr/>	
Traffic Volume Projection Basis:	<input checked="" type="checkbox"/> Actual Volumes
<input type="checkbox"/> Projected To _____ by _____	

ATTACHMENTS	
<input checked="" type="checkbox"/> 24-hour approach counts	
<input checked="" type="checkbox"/> Peak hour turning movement counts	
<input checked="" type="checkbox"/> Pedestrian/bicycle counts	
<input checked="" type="checkbox"/> Existing geometrics	
<input checked="" type="checkbox"/> Collision diagram/crash summary	
<input checked="" type="checkbox"/> Condition diagram	
<input checked="" type="checkbox"/> Preliminary roundabout design	
<input type="checkbox"/> _____	
<input type="checkbox"/> _____	
<input type="checkbox"/> _____	
<input type="checkbox"/> _____	

ANALYSIS OF CONTRAINDICATIONS

Describe all contraindications that apply at this location and indicate what mitigation measures will be used to eliminate the problems that could arise.

1. Physical or geometric features that could make the construction or operation of a roundabout more difficult.

Limited right-of-way

2. Land use or traffic generators that could interfere with construction or cause operational problems.

N/A - None known or observed

3. Other traffic control devices along any intersecting roadway which would require preemption.

N/A - Isolated intersection

4. Bottlenecks on any of the intersecting roadways that could back up traffic into the roundabout.

N/A - No close intersections that would be likely to back up traffic into the roundabout

5. Sight distance obstructions.

Roundabout will be on top of a hill, but sight distance is sufficient as to be unimpeded

6. Platooned arterial traffic flow on one or more approaches.

N/A - No platooning since there are no nearby signalized intersections

7. Heavy use by persons with special needs that could suggest a requirement for more positive control.

N/A - No one with special needs was observed or reported at the intersection

8. Recent safety projects in the area to benefit older drivers.

Intersection ahead warning signs with flashing beacons have been installed on CR 455 and stop sign ahead warning signs have been installed on Ridgewood Avenue

9. Emergency vehicle operations coordination requirements.

N/A - There is no preemption currently at the intersection. Intersection must be kept open and passable at all times for emergency vehicles

10. Emergency evacuation route coordination requirements.

N/A - CR 455 and Ridgewood Ave. are not evacuation routes

11. Other problems that have been identified.

N/A

MISCELLANEOUS OBSERVATIONS

The following observations are relevant to the justification and/or operation of a roundabout:

1. Physical and right-of-way features.

Limited right-of-way. Right-of-way would need to be acquired on all four corners for construction of roundabout

2. Current and planned site development features such as adjoining businesses, driveways, etc.

Currently there are single family residences in the NE and NW quadrants and vacant lots in the SE and SW quadrants. The driveway for the property in the NE will require closure/relocation to move it outside the roundabout

3. Community considerations such as a need for parking, landscaping character, etc.

Based on excerpts taken from the Town of Montverde CR 455 Corridor Master Plan, the residents of Montverde have expressed an interest in gateway features and traffic calming devices entering the town.

4. Traffic management strategies that are being (or will be) used in the area.

N/A

5. Projected public transit usage (routes, stops, etc.).

N/A - No public bus routes

6. Intersection treatments used at adjacent intersections.

N/A - No adjacent intersections

7. History of public complaints that suggest a need for traffic calming.

Based on excerpts taken from the Town of Montverde CR 455 Corridor Master Plan, the residents of Montverde have expressed an interest in traffic calming devices entering the town.

8. Number of other roundabouts in the jurisdiction that would make drivers more familiar with this type of control.

Lake County has several roundabouts within the County. The closest one to the study intersection is at CR 455 and Mountain Club Drive which is approximately 6.2 miles away. There is also a design under way for a roundabout at CR 455 and CR 561A, which is approximately 3.5 miles away

Other observations:

N/A

OPERATIONAL ANALYSIS

If a roundabout is being considered as an alternative to a traffic signal, describe the signal operating plan(s) used in the comparison, including number of lanes and lane use, left turn protection, signal phasing and timing plan, etc.

Plan 1: Signalize existing conditions with no turn lanes

Plan 2: Signalize intersection with left turn lanes on all approaches

Plan 3: N/A

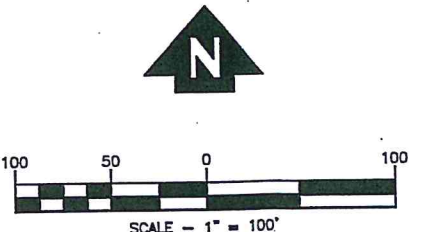
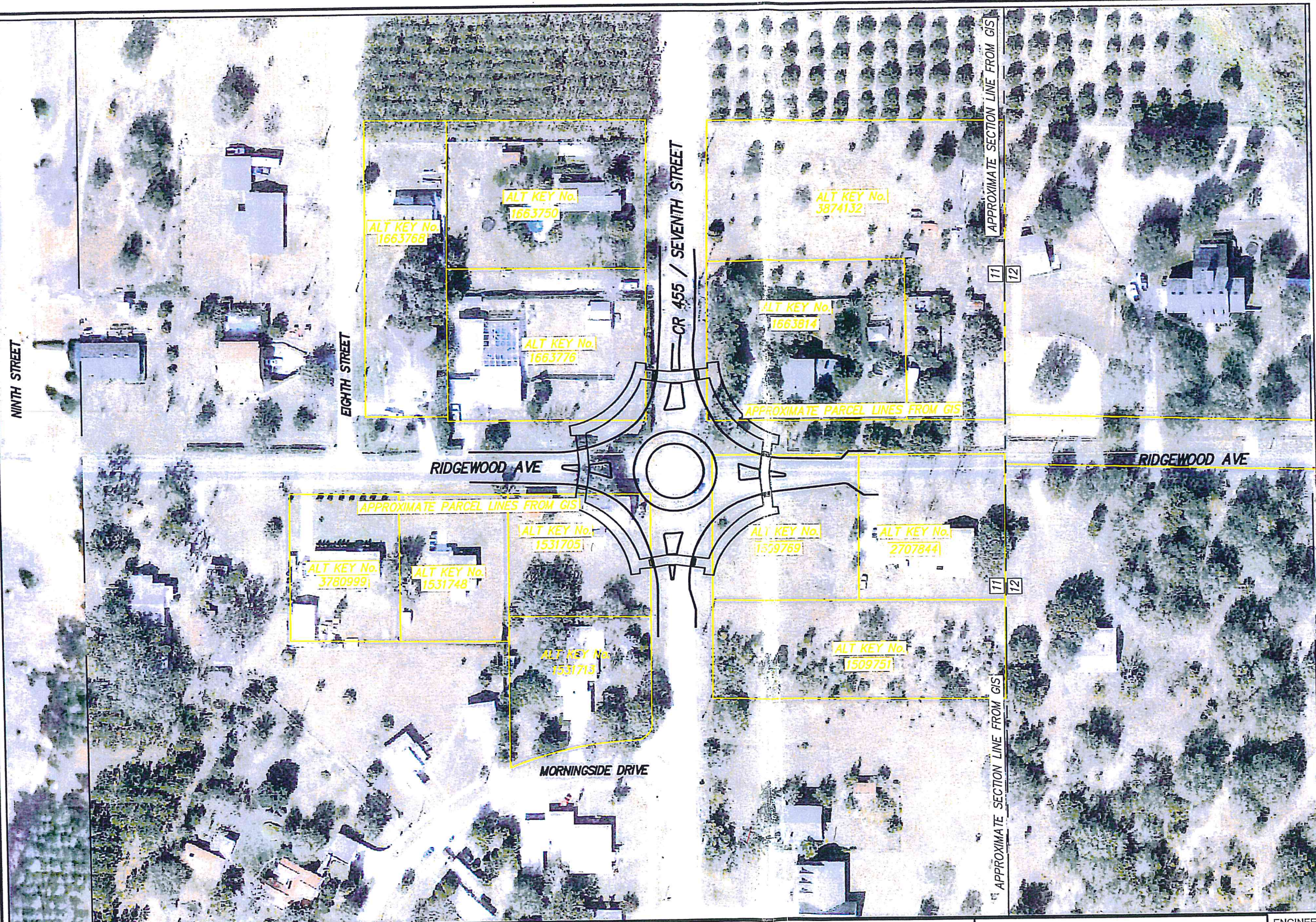
COMPARISON OF PERFORMANCE						
Performance Measure	Roundabout (HCM)	Signal Plan 1 (HCM)	Signal Plan 2 (HCM)	Signal Plan 3 (HCM)	TWSC (HCM)	AWSC (HCM)
Critical v/c Ratio EB LT	.379	.520	.280	N/A	.718	.463
Delay per Vehicle						
Overall	8.7	10.9	10.2	N/A	10.1	18.5
Critical Mov't	10.1	13.5	13.1	N/A	35.8	14.6
Level of Service						
Overall	A	B	B	N/A	B	C
Critical Mov't	B	B	B	N/A	E	B

Note: X indicates that delay was not computed because one or more movements was oversaturated.

Final Recommendation:

Based on the analysis and observations provided above, a roundabout can be justified for this location. There were no safety issues noted at the intersection, however a traffic signal was warranted based on peak hour traffic volumes. A roundabout is a viable alternative to a traffic signal and provides better operational performance than a signal. In addition, this intersection serves as a gateway to the scenic town of Montverde, an upscale community which prides its scenic beauty and rural community lifestyle. A roundabout would be more aesthetically pleasing than a traffic signal and the operation provides for a slower moving, but continuous, flow of traffic rather than the stop and go and the delay associated with a traffic signal.

PROJECTS\11025_CR455-RIDGEWOOD ROUNDABOUT\CR455-RIDGEWOOD.dwg, 12/16/2013 2:38:49 PM, pproctor



DB 191/263
 ORB 626/323
 ORB 733/116Z
 PB 5/21
 PB 6/34
 PB 28/19

 RMB 2/69
 RMB 3/127
 RMB 3/135

Copy of above
 documents &
 tax map to
 Sean 12-18-13

DETERMINE RIGHT OF WAY
 600 LINEAL FEET FROM
 CENTER OF INTERSECTION
 FOR EACH ROAD LEG

REVISION:	DATE	SECTION	TOWNSHIP	RANGE
		11	22 S	26 E
DESIGNED:	PM	DATE:	JULY 19, 2013	
DRAWN:		DATE:		
APPROVED:		DATE:		



DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION
 437 ARDICE AVE.
 EUSTIS, FLORIDA 32726

CR 455 RIDGEWOOD AVE.
 ROUNDABOUT
 AERIAL MAP
 DRAFT FOR REVIEW ONLY

ENGINEER OF RECORD:
 PATERNO M. MAGNO, JR
 STATE OF FLORIDA
 PROFESSIONAL ENGINEER
 LICENSE NO. 53074
 DATE

CAD FILE
 11025CA
 SHEET #
 2

CR 455 TRAFFIC CONTROL ALTERNATIVES COST ESTIMATE

5-Mar-14

PAY ITEM	DESCRIPTION	UNIT	*COST/ QUANTITY	ALL-WAY STOP		TRAFFIC SIGNAL		ROUNDBOUT	
				QUANTITY	TOTAL COST	QUANTITY	TOTAL COST	QUANTITY	TOTAL COST
110-1-1	CLEARING AND GRUBBING	AC	\$7,723.00		\$ -		\$ -	1	\$ 7,723.00
285-709	OPTIONAL BASE, BASE GROUP 09	SY	\$11.94		\$ -		\$ -	3636	\$ 43,413.84
334-1-13	SUPERPAVE ASPHALTIC CONC, 2"	TN	\$83.00		\$ -		\$ -	400	\$ 33,200.00
337-7-40	ASPHALT CONC FRICTION COURSE FC 9.5 1.5"	TN	\$117.00		\$ -		\$ -	200	\$ 23,400.00
520-70	CONCRETE TRAFFIC SEPARATOR, VARIABLE WIDTH	SY	\$47.95		\$ -		\$ -	290	\$ 13,905.50
522-1	CONCRETE SIDEWALK 4" THICK	SY	\$28.00		\$ -		\$ -	550	\$ 15,400.00
630-2-11	CONDUIT, F&I, OPEN TRENCH	LF	\$4.40		\$ -	390	\$ 1,716.00		\$ -
630-2-12	CONDUIT, F&I, DIRECTIONAL BORE	LF	\$11.92		\$ -	200	\$ 2,384.00		\$ -
632-7-1	SIGNALS-CABLE (F&I)	PI	\$3,582.00		\$ -	1	\$ 3,582.00		\$ -
634-4-153	SPAN WIRE ASSEMBLY, F&I, TWO POINT, BOX	PI	\$3,417.80		\$ -	1	\$ 3,417.80		\$ -
635-2-11	PULL & SPLICE BOX, F&I, 13"x24" COVER SIZE	EA	\$384.35		\$ -	11	\$ 4,227.85		\$ -
639-1-22	SIGNALS-ELECTRICAL POWER SURVIVE (UG)(BY CONTRACTOR)	AS	\$1,384.00		\$ -	1	\$ 1,384.00		\$ -
639-2-1	SIGNALS-ELECTRICAL SERVICE WIRE	LF	\$1.95		\$ -	150	\$ 292.50		\$ -
641-2-12	PRESTRESSED CONC POLE, F&I, TYPE P-II SERVICE POLE	EA	\$842.84		\$ -	1	\$ 842.84		\$ -
641-2-16	PRESTRESSED CONC POLE, F&I, TYPE P-VI	EA	\$5,752.91		\$ -	4	\$ 23,011.64		\$ -
650-1-311	TRAFFIC SIGNAL (F&I)(3-SEC)(1 DIRECTION)(LED)	AS	\$843.74		\$ -	8	\$ 6,749.92		\$ -
660-1-101	LOOP DETECTOR INDUCTIVE	EA	\$108.00		\$ -	4	\$ 432.00		\$ -
660-2-102	LOOP ASSEMBLY, F&I, TYPE B	AS	\$532.00		\$ -	2	\$ 1,064.00		\$ -
660-2-106	LOOP ASSEMBLY, F&I, TYPE F	AS	\$687.00		\$ -	2	\$ 1,374.00		\$ -
670-5-111	TRAFFIC CONTROLLER ASSEMBLY, FURNISH & INSTALL	AS	\$20,930.00		\$ -	1	\$ 20,930.00		\$ -
700-1-11	SINGAL POST SIGN, F&I, GROUND MOUNT, < 12 SF	AS	\$252.00	2	\$ 504.00		\$ -	16	\$ 4,032.00
700-1-60	SIGNAL POST SIGN, REMOVE	AS	\$15.00		\$ -	2	\$ 30.00	4	\$ 60.00
700-3-601	SIGN PANEL, REMOVE, < 12 SF	EA	\$69.00	2	\$ 138.00	2	\$ 138.00		\$ -
700-3-101	SIGN PANEL, GROUND MOUNT, < 12 SF	EA	\$334.93	2	\$ 669.86	2	\$ 669.86		\$ -
711-11-XXX	THERMOPLASTIC, MARKINGS	LF	\$200.00	1	\$ 200.00	1	\$ 200.00	1	\$ 200.00
				TOTAL	\$ 1,511.86	TOTAL	\$ 72,446.41	TOTAL	\$ 141,334.34

* Most unit costs are based on FDOT Item Average Unit Cost from 2012/01/01 to 2012/12/31.

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION SAFETY OFFICE ANNUAL BENEFIT COST ANALYSIS

SUBMITTED BY	<u>GMB ENGINEERS & PLANNERS, INC.</u>	WPA NO.		SAFETY PRIORITY																																																																
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TYPE	COST	LIFE	CRF	AN'L COST																																																								
A. R-O-W	<u>\$0</u>	50	0.0725	\$0																																																								
B. PECEI	<u>\$33,750</u>	20	0.0944	\$3,186																																																								
C. STRUC	<u>\$0</u>	50	0.0725	\$0																																																								
D. RDWY	<u>\$225,000</u>	20	0.0944	\$21,240																																																								
E. PVTMT	<u>\$0</u>	8	0.1675	\$0																																																								
F. SIGNALS	<u>\$0</u>	15	0.1098	\$0																																																								
G. SUBTOTAL	<u>\$258,750</u>		0	\$24,426																																																								
H. CHANGE IN MAINT				\$2,000																																																								
I. CRASH CLEANUP				(\$100)																																																								
J. TOTAL				\$26,326																																																								
				16. BENEFIT <u>\$78,000</u>																																																								
				17. BENEFIT / COST <u>2.96</u>																																																								
PREPARED BY:			APPROVED BY:		DATE:																																																							
<u>KLL</u>																																																												
COMMENTS/CRASH REDUCTION METHOD:																																																												
HIGH CRASH LISTINGS:																																																												