Clinton County Road Commission
Capital Region International Airport
Traffic Study

Project No. 220424
June 20, 2023

FINAL SUBMITTAL

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Engineers | Architects | Scientists | Constructors

1515 Arboretum Drive, SE
Grand Rapids, Michigan 49546

616.575.3824 | fishbeck.com

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Prepared For:
Clinton County Road Commission
Capital Region Airport Authority

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Table of Contents

List of Figures

List of Tables

List of Appendices

SEE FULL FILE FOR APPENDICES

List of Abbreviations/Acronyms

BR	Business Route
CATA	Capital Area Transportation Authority
CCRC	Clinton County Road Commission
CRAA	Capital Region Airport Authority
CRIA	Capital Region International Airport
EB	eastbound
GHA	Gewalt Hamilton Associates, Inc.
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
MDOT	Michigan Department of Transportation
MOE	measure of effectiveness
MMUTCD	Michigan Manual on Uniform Traffic Control Devices
mph	miles per hour
NB	northbound
SB	southbound
sft	square foot
TCRPC	Tri-County Regional Planning Commission
TDMS	Transportation Data Management System
WB	westbound

Executive Summary

On behalf of the Clinton County Road Commission (CCRC) and Capital Region Airport Authority (CRAA), Fishbeck has conducted a traffic study for key roadways and intersections surrounding the Capital Region International Airport (CRIA). The impetus for this study is two-fold:

- Anticipated future site development on CRIA property requires analysis of adjacent intersections that would process increased traffic volumes in the vicinity of the airport.
- Future CCRC projects on Airport Road from Grand River Avenue to Herbison Road and at the DeWitt Road/Stoll Road intersection require study to understand project needs as well as identify any potential impacts from new CRIA development.

This traffic study was conducted to investigate the above areas of interest and provide CCRC/CRIA with operational and safety insights to inform future roadway infrastructure decisions. The study was conducted according to methodologies published by the Institute of Transportation Engineers (ITE), as well as applicable CCRC/CRAA and Michigan Department of Transportation (MDOT) guidelines and standards. The primary transportation system user in the study area is vehicular traffic. Accordingly, this study focuses on the potential impacts to the vehicle transportation network. Conservatively, in this respect, all users of the study network are assumed to travel to/from CRIA and surrounding land uses by passenger vehicle. Study analyses and findings are organized by sub-area to distinguish operational/safety concerns that may be addressed by future projects. The three sub-areas are defined as:

- Airport Road sub-area including the I-69 interchange and adjacent intersections;
- DeWitt Road sub-area including the I-69 interchange and adjacent intersections; and
- CRIA Development sub-area including intersections providing access to CRAA.

To establish existing traffic operations, intersection turning movement traffic volumes were collected at each of the study intersections on Tuesday, April 5, 2022. Raw traffic count data were examined and compared to historical traffic counts across the study network to estimate the impacts of COVID-19 and MDOT construction on I-69. All study network volumes were adjusted upward by 5% to account for COVID-19 impacts. Traffic volumes on movements impacted by the I-69 construction project were adjusted to establish existing volumes consistent with recent historical peak hour counts.

Synchro (Version 11) traffic analysis software was used to perform operational analyses for this study, consistent with Highway Capacity Manual (HCM) methodology. The primary measure of effectiveness (MOE) for this operational analysis is Level of Service (LOS). Additionally, Synchro is capable to generate simulations of network operations via the SimTraffic module. SimTraffic simulations were observed to identify any adverse queuing at the study intersections. Existing 2022 conditions were compared to Future 2030 conditions that include ambient background traffic growth, as well as traffic volumes expected to be generated by anticipated CRAA development.

In addition to operational analyses, historical crash data for the most recent available 5-year period were examined across the study network. Crashes were evaluated by intersection to identify any pattern of occurrence or severity subject to countermeasure. Crashes were also reviewed along the horizontal curves on Airport Road and DeWitt Road that are routed around the east and west limits of the main airport runway. CCRC conducted a speed study to complement the historical crash data and determine if speeds are related to crash occurrence and identify candidate safety enhancements. Traffic signal warrants were also evaluated at currently stop-controlled intersections along Airport Road that were identified to have operational and/or safety concerns.

The analyses completed for this study provided operational and safety findings for the road network surrounding CRIA that may be improved with future projects. For intersections along Grand River Avenue (I-96 BR) and at the I-69 interchanges, coordination with MDOT will be required. Based on the study findings, the following recommendations were developed to improve existing conditions and accommodate anticipated future traffic demands.

Airport Road sub-area:

1. Evaluate EB/WB sight distance on Clark Road at Airport Road and monitor crash occurrence. Install protected-only, left-turn phasing if sight distance is limited and/or left-turn crash occurrence continues. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
2. Widen Airport Road to three lanes with a center lane for left-turns from south of Stoll Road through the I-69 interchange to match the center left-turn lane at Clark Road. Corridor widening would provide the lane configurations needed for future signalization at the I-69 interchange and at Stoll Road, as well as accommodate left-turns at driveways along Airport Road.
3. Monitor traffic volumes and crash history at the I-69 interchange and Stoll Road with respect to traffic signal warrant criteria. Coordinate potential signal installation at the I-69 interchange with MDOT.
4. Install additional curve delineators and/or chevrons with vertical reflective strips on all warning sign posts to increase the conspicuity of alignment changes on the Airport Road horizontal curves. CCRC may also consider LED speed warning signs on Airport Road that are activated when a vehicle approaches a horizontal curve at a speed higher than the design speed of the curve.

DeWitt Road sub-area:

1. In the short-term, enhance pavement marking and signage at the DeWitt Road and Stoll Road (E and W) intersections. Install vertical reflective strips on all intersection sign posts (including upstream warning signs) and oversized (60" x 30") two-direction large arrow signs (W1-7). Install STOP bar markings on the DeWitt Road approaches. Consider solar-powered LED enhanced signage consistent with other CCRC installations.
2. In the long-term, realign DeWitt Road to a standard all-way intersection with Stoll Road. Install proper traffic control or construct a roundabout. Future design will require further evaluation of traffic volumes, lane configurations, and traffic control warrants based on future alignments and available right-of-way.
3. Install additional curve delineators and/or chevrons with vertical reflective strips on all warning sign posts to increase the conspicuity of alignment changes on the DeWitt Road horizontal curves.

CRIA Development sub-area:

1. CRAA has expressed interest to widen the WB approach of Port Lansing Road at Airport Road to provide separate right and left-turn lanes; however, the operational and safety results of this study do not indicate such widening is necessary, based on the growth information provided by CRAA.
2. Evaluate EB/WB sight distance on Grand River Avenue at Airport Road and monitor crash occurrence. Install EB protected-only left-turn phasing to mitigate left-turn crash occurrence and left-turn queueing. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
3. Evaluate the feasibility of constructing a dedicated EB left-turn lane on Grand River Avenue at Capital City Boulevard, including permissive/protected left-turn protection. This may be accomplished by road widening, or via a road diet to convert Grand River Avenue from 4 to 3 lanes.
4. In the short-term, install "Cross Traffic Does Not Stop" warning placards and vertical reflective strips on STOP sign posts on Port Lansing Road at Capital City Boulevard.
5. In the long-term, reconstruct the intersection of Port Lansing Road and Capital City Boulevard as a roundabout.

The opinions, findings, and conclusions expressed in this study report are those of Fishbeck and not necessarily those of CCRC, CRAA, MDOT, or other governing bodies.

Prepared By: Timothy J. Likens, PE, PTOE **Reviewed By:** Kyle M. Reidsma, PE, PTOE

1.0 Introduction

1.1 Project Overview

On behalf of the Clinton County Road Commission (CCRC) and Capital Region Airport Authority (CRAA), Fishbeck has conducted a traffic study for key roadways and intersections surrounding the Capital Region International Airport (CRIA). The impetus for this study is two-fold:

- Anticipated future site development on CRIA property requires analysis of adjacent intersections that would process increased traffic volumes in the vicinity of the airport.
- Future CCRC projects on Airport Road from Grand River Avenue to Herbison Road and at the DeWitt Road/Stoll Road intersections require study to understand project needs as well as identify any potential impacts from new CRIA development.

The scope of this study was developed in coordination with CCRC and CRAA. The study network includes fourteen intersections, including two divided boulevard locations (for a total of sixteen intersections). For reporting purposes, the study network was broken down into three sub-study areas:

Airport Road sub-area:

1. Airport Road and Clark Road (signalized);
2. Airport Road and I-69 WB ramps (minor STOP);
3. Airport Road and I-69 EB ramps (minor STOP); and
4. Airport Road and Stoll Road (all-way STOP).

DeWitt Road sub-area:

5. DeWitt Road and I-69 WB ramps (minor STOP);
6. DeWitt Road and I-69 EB ramps (minor STOP);
7. DeWitt Road and Clark Road (roundabout);
8. DeWitt Road and Stoll Road (west intersection – minor STOP); and
9. DeWitt Road and Stoll Road (east intersection – minor STOP).

CRIA Development sub-area:

10. Airport Road and Port Lansing Road (minor STOP);
11. Grand River Avenue (I-96 BR) and Airport Road (signalized);
12. Port Lansing Road and Capital City Boulevard NB (minor STOP);
13. Port Lansing Road and Capital City Boulevard SB (minor STOP);
14. Grand River Avenue (I-96 BR) and Capital City Boulevard NB (signalized);
15. Grand River Avenue (I-96 BR) and Capital City Boulevard SB (signalized); and
16. DeWitt Road and Port Lansing Road (minor STOP).

The project location and study intersections are indicated on Figure 1.

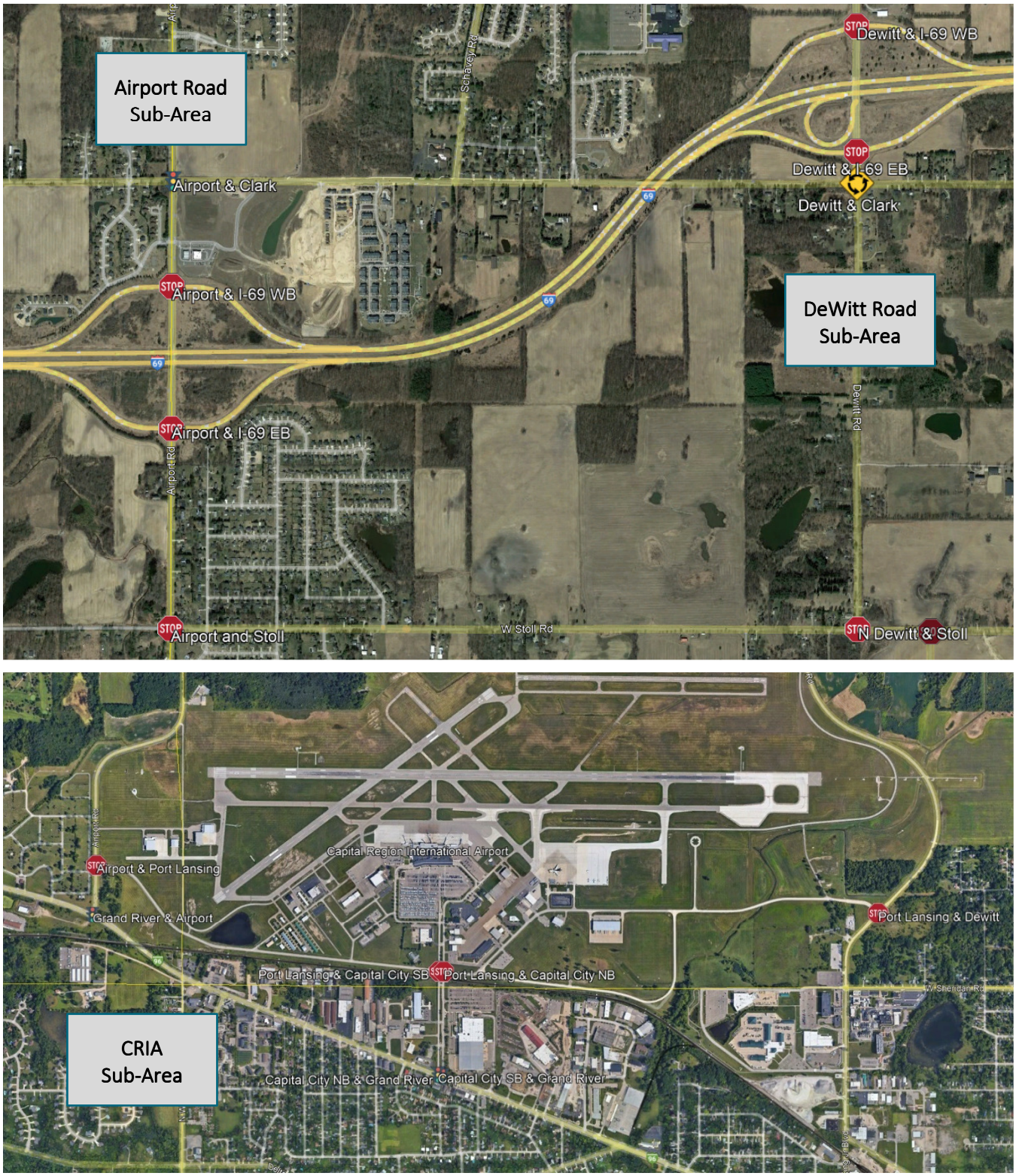

Figure 1 – Project Location and Study Network

1.2 Study Methodology

This traffic study was conducted to investigate the above areas of interest and provide CCRC/CRIA with operational and safety insights to inform future roadway infrastructure decisions. The study was conducted according to methodologies published by the Institute of Transportation Engineers (ITE) as well as applicable CCRC/CRAA and Michigan Department of Transportation (MDOT) guidelines and standards. The assumptions and methodologies described herein were applied across each sub-area in a similar manner.

The following sections of this report include:

- Detailed descriptions of the study area roadways and intersections.
- Existing traffic volumes based on 2022 counts including adjustments for COVID-19 and area construction impacts.
- Operational analysis for Existing 2022 Conditions.
- Evaluation of historical crash data to identify correctable crash occurrences.
- Identification of conceptual improvements for the study network to mitigate any existing operational or safety deficiencies.
- Descriptions of anticipated CRIA development, trip generation forecasts, and distributions onto the study network.
- Future traffic volumes based on Existing 2022 volumes, ambient traffic growth, and new traffic volumes associated with anticipated CRIA development.
- Operational analysis for Future No-Build 2030 Conditions (future volumes on the existing study network).
- Identification of improvements necessary for the study network to mitigate any future operational deficiencies.
- Operational analysis for Future Build 2030 Conditions, including identified improvement measures.
- Conclusions and recommendations for future roadway and intersection improvements within the study area.

2.0 Study Area Characteristics

2.1 Roadway Characteristics

Airport Road is a north-south minor arterial roadway under CCRC jurisdiction. This roadway typically has two lanes (one in each direction) within the study limits. Airport Road is paved, with gravel shoulder, except where intersections are curbed. Auxiliary turn lanes exist at the signalized intersections with Clark Road and Grand River Avenue, as well as at the I-69 EB/WB ramp terminals. The posted speed limit is 40 miles per hour (mph) south of State Road, and 50 mph to the north. Airport Road carries approximately 7,500 vehicles per day between Grand River Avenue and I-69. The bridge over I-69 has a single lane in each direction with 8-foot shoulders. Current MDOT work on I-69 includes maintenance/rehabilitation for this bridge, but not widening.

DeWitt Road is a north-south minor arterial roadway under CCRC jurisdiction. This roadway typically has two lanes (one in each direction) within the study limits. DeWitt Road is paved, with gravel shoulder, except where intersections are curbed. Auxiliary turn lanes exist at the intersections with Port Lansing Road, Stoll Road, and at the I-69 EB/WB ramp terminals. The posted speed limit is 35 mph south of Port Lansing Road, 45 mph in the vicinity of the I-69 interchange, and 55 mph between Port Lansing Road and Clark Road. DeWitt Road carries approximately 5,000 vehicles per day between Grand River Avenue and I-69. The bridge over I-69 formerly carried five travel lanes but was recently reconfigured to provide a separated pedestrian pathway on the existing bridge deck. The resulting lane configuration includes a single lane in each direction, plus an auxiliary lane which develops to service the SB DeWitt Road to I-69 EB loop on-ramp.

Capital City Boulevard is a north-south major collector roadway under CRAA/City of Lansing jurisdiction by a Public Act 425 Agreement with DeWitt Township. This roadway is a curbed, median-divided boulevard with two lanes in each direction and bi-directional crossovers. Capital City Boulevard provides direct access to the CRIA terminal, as well as access to adjacent land uses. The posted speed limit is 40 mph south of the airport terminal area. Capital City Boulevard carries approximately 4,500 vehicles per day.

Port Lansing Road is an east-west local roadway under CRAA/City of Lansing jurisdiction by a Public Act 425 Agreement with DeWitt Township. This roadway is paved with gravel shoulder, except where intersections are curbed. Auxiliary turn lanes exist at the intersection with DeWitt Road. The posted speed limit is 40 to 45 mph between Airport Road and DeWitt Road, except in the vicinity of Capital City Boulevard which is posted at 25 mph. Port Lansing Road carries an estimated 1,500 vehicles per day west of Capital City Boulevard and an estimated 3,000 vehicles per day east of Capital City Boulevard.

Stoll Road is an east-west major collector roadway between Airport Road and DeWitt Road, under CCRC jurisdiction. This roadway typically has two lanes (one in each direction) and is paved with gravel shoulder, except for a curbed section approximately 1/2 mile east of Airport Road adjacent to residential developments, and where intersections are curbed. Auxiliary turn lanes exist at the intersections with Airport Road and DeWitt Road. The posted speed limit is 45 mph in the vicinity of the study intersections. Stoll Road carries approximately 2,500 vehicles per day between Airport Road and DeWitt Road.

Clark Road is an east-west minor arterial roadway between Airport Road and DeWitt Road, under CCRC jurisdiction. This roadway typically has two lanes (one in each direction) and is paved with gravel shoulder, except where intersections are curbed and on the bridge over I-69. Auxiliary turn lanes exist at the intersection with Airport Road, and a single lane roundabout was recently constructed at the intersection with DeWitt Road. The posted speed limit is 55 mph, and Clark Road carries approximately 3,500 vehicles per day between Airport Road and DeWitt Road.

Grand River Avenue (I-96 BR) is an east-west principal arterial under MDOT jurisdiction within the study area. This roadway typically has two lanes in each direction and is paved and curbed. Auxiliary turn lanes exist at the

intersections with Airport Road and Capital City Boulevard; however, a center lane for left turns does not exist at the intersection with Capital City Boulevard. The posted speed limit is 45 mph in the vicinity of Capital City Boulevard and 55 mph in the vicinity of Airport Road. Grand River Avenue carries approximately 14,000 vehicles per day in the vicinity of CRIA.

2.2 Intersection Characteristics

The study area includes a mix of minor STOP, all-way STOP, signalized, and roundabout intersection traffic controls. The specific traffic control measures at each of the study intersections are identified above in Section 1.1 and summarized below. In addition, the following lane configurations and intersection characteristics were identified through field observations, initial operational analyses, and conversations with CCRC/CRAA.

Table 1 – Airport Road Sub-area Intersections

#	*Intersection*	*Traffic Control*	*Lane Configurations*
1	Airport & Clark	Signalized	Dedicated left-turn lanes on all approaches; left-turns operate as permissive movements (i.e., without a protected green arrow)
2	Airport & I-69 WB	Minor STOP	Dedicated right-turn and left-turn bypass lanes approaching the I-69 entrance ramps; I-69 exit ramps have separate left/right-turn lanes
3	Airport & I-69 EB		
4	Airport & Stoll	All-way STOP	Dedicated left-turn lanes on Stoll Road, but not on Airport Road

Table 2 – DeWitt Road Sub-area Intersections

#	*Intersection*	*Traffic Control*	*Lane Configurations*
5	DeWitt & I-69 WB	Minor STOP	Dedicated right and left-turn lanes approaching the I-69 WB entrance ramp; I-69 exit ramp has separate left/right-turn lanes
6	DeWitt & I-69 EB	Minor STOP	Dedicated right-turn lanes for both I-69 EB entrance ramps; I-69 exit ramp has separate left/right-turn lanes
7	DeWitt & Clark	Yield	Intersection was recently reconstructed as a single-lane roundabout
8	DeWitt & Stoll (W)	Minor STOP	Offset T-intersections; dedicated right-turn lanes on Stoll Road and on the NB approach of DeWitt Road
9	DeWitt & Stoll (E)		

Table 3 – CRIA Development Sub-area Intersections

#	*Intersection*	*Traffic Control*	*Lane Configurations*
10	Airport & Port Lansing	Minor STOP	No dedicated turn lanes
11	Grand River & Airport	Signalized	Dedicated right and left-turn lanes for all turning movements; WB right-turn has an overlap (green arrow) with the SB left-turn; EB left-turn operates as permissive movement (i.e., without a protected green arrow)
12	Port Lansing & Capital City NB	Minor STOP	Crossing Capital City Boulevard on Port Lansing Road requires a two-stage stop, with limited storage in the narrow bi-directional median crossover; no dedicated turn lanes
13	Port Lansing & Capital City SB		
14	Grand River & Capital City NB	Signalized	Dedicated WB right-turn lane; EB left-turns are not provided a dedicated turn lane and must proceed from the inside thru travel lane; two apartment complex driveways on the south side of Grand River Avenue are not controlled by the traffic signal
15	Grand River & Capital City SB		
16	DeWitt & Port Lansing	Minor STOP	Dedicated right and left-turn lanes for all turning movements

2.3 Multimodal Characteristics

The primary transportation system user in the study area is vehicular traffic. Accordingly, this study focuses on the potential impacts to the vehicle transportation network. Conservatively in this respect, all users of the study network are assumed to travel to/from CRIA and surrounding land uses by passenger vehicle; however, there are multimodal facilities in the vicinity of the project.

The Capital Area Transportation Authority (CATA) operates bus service to and in the vicinity of CRIA. According to the CATA website, Route #14 has two stops along Capital City Boulevard (one NB and one SB) and three stops along the CRIA terminal loop. Route #14 also provides service along EB Grand River Avenue (south side), including two stops within 750 feet of Capital City Boulevard. CRAA has indicated concern with the lack of pedestrian infrastructure on Capital City Boulevard connecting these bus stops between Grand River Avenue and the CRIA terminal.

Sidewalk currently exists along Grand River Avenue in the vicinity of CRIA; however, the non-motorized network ends to the west at Waverly Road and is gapped on the north side of Grand River Avenue west of Capital City Boulevard. Non-motorized pathway was recently installed on DeWitt Road from Clark Road, across I-69, and north towards the City of DeWitt. Non-motorized pathway/sidewalk does not exist along other segments of the study network.

The *DeWitt Township Non-Motorized Transportation Plan (2019)* indicates that Airport Road and DeWitt Road are both planned for future wide shoulders, with connections to other existing/future non-motorized components.

3.0 Existing Conditions Analysis

3.1 Existing Traffic Volumes

To establish existing traffic operations, intersection turning movement traffic volumes were collected at each of the study intersections. Data were collected by Fishbeck subconsultant Gewalt Hamilton Associates, Inc. (GHA) on Tuesday, April 5, 2022. GHA utilized MioVision camera systems to record and process the raw data. Traffic counts were conducted during a typical weekday morning peak period (7 a.m. to 9 a.m.), and afternoon peak period (4 p.m. to 6 p.m.). Traffic volume data are included in Appendix 1, which include heavy vehicle and pedestrian crossing data (where non-motorized crossings exist).

Raw traffic count data were examined and compared to historical traffic counts across the study network obtained from the MDOT Transportation Data Management System (TDMS). Differences in historical and existing counts were specifically calculated to estimate the impacts of:

1. COVID-19 and changes in commuting patterns and therefore peak hour traffic volumes; and
2. MDOT construction on I-69 which closed the ramp from I-69 EB to Airport Road and detoured traffic destined for I-69 EB onto EB Grand River Avenue to NB Airport Road.

Based on the results of this evaluation, all study network volumes were adjusted upward by 5% to account for COVID-19 impacts. Traffic volumes on movements impacted by the I-69 construction project were adjusted to establish existing volumes consistent with recent historical peak hour counts. Detailed adjustments are included in the traffic count data included in Appendix 1.

3.2 Traffic Operations Analysis Methodology

Synchro (Version 11) traffic analysis software was used to perform operational analyses for this study. Synchro uses methodologies described in the Highway Capacity Manual (HCM) to provide several measures of effectiveness for a transportation network based on geometric configurations and operational conditions. Additionally, Synchro is capable to generate simulations of network operations via the SimTraffic module. SimTraffic simulations were observed to identify any adverse queuing at the study intersections.

The primary measure of effectiveness (MOE) for this operational analysis is Level of Service (LOS). LOS is a letter grade that describes traffic operations based on the amount of delay experienced by vehicles at an intersection, along an intersection approach (e.g., eastbound (EB), westbound (WB)), or in a specific lane group (e.g., EB right turn, EB thru-left). LOS is measured using letter grades ranging from A to F, with LOS A representing negligible delay and LOS F representing demands which exceed capacity. LOS D is generally considered acceptable for most areas and is referenced as a threshold in this study to identify the need for roadway/intersection improvements. Table 4 presents the HCM criteria for various LOS for unsignalized and signalized intersections. The color coding in the table is used in the capacity analysis summary tables later in this report.

Table 4 – LOS Criteria

LOS	Average Stopped Vehicle Delay (seconds)	
	Unsignalized	Signalized
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

3.3 Existing Conditions Traffic Analysis

Synchro models for the study network were created based on existing roadway conditions and volumes. Existing intersection and roadway lane configurations, geometry, and traffic controls were determined based on field reviews, aerial imagery including Google Earth street view, and plans provided by CCRC. Traffic signal timing permits for the signalized study intersections were provided by CCRC for reference in the models.

Existing (2022) peak hour intersection volumes were analyzed for the a.m. and p.m. peak hours, and intersection capacity reports were generated based on the most recent HCM (6th Edition) methodology. The configuration and (clustered) signal phasing for the Grand River Avenue and Capital City Boulevard intersection cannot be evaluated using HCM 6th edition methods; therefore, HCM 2000 calculations were utilized for this location. This application has been reviewed previously with the MDOT Lansing Signals unit and determined acceptable for study analyses. STOP controlled intersections are reported using HCM 6th edition calculations.

The resulting Existing LOS and delay by approach and overall intersection are indicated in Tables 5 thru 7 for all of the study intersections, grouped by sub-area. See Appendix 2 for the Existing Conditions intersection capacity reports.

Table 5 – Airport Road Sub-Area
Existing Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)	
	a.m. Peak Hour	p.m. Peak Hour
Airport Road and Clark Road (Signalized)		
EB Clark Road	*B (16.3)*	*B (15.6)*
WB Clark Road	*C (22.2)*	*B (17.5)*
NB Airport Road	*B (10.4)*	*B (15.9)*
SB Airport Road	*B (11.8)*	*B (11.2)*
Overall	***B (14.0)***	***B (14.9)***
Airport Road & I-69 WB Ramp Terminal (minor STOP)		
WB I-69 Exit Ramp	*F (55.7)*	*D (25.3)*
NB Airport Road Left	*B (10.3)*	*A (8.4)*
SB Airport Road	*Free*	
Airport Road & I-69 EB Ramp Terminal (minor STOP)		
EB I-69 Exit Ramp	*F (76.2)*	*F (121.6)*
NB Airport Road	*Free*	
SB Airport Road Left	*A (9.4)*	*A (9.6)*
Airport Road & Stoll (All-way STOP)		
EB Stoll Road	*B (11.0)*	*B (13.3)*
WB Stoll Road	*B (11.4)*	*B (13.0)*
NB Airport Road	*B (14.9)*	*F (53.3)*
SB Airport Road	*C (19.8)*	*D (27.5)*
Overall	***C (15.9)***	***E (35.3)***

Table 6 – DeWitt Road Sub-Area
Existing Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)	
	a.m. Peak Hour	p.m. Peak Hour
DeWitt Road & I-69 WB Ramp Terminal (minor STOP)		
WB I-69 Exit Ramp	*C (16.9)*	*B (12.6)*
NB DeWitt Road Left	*A (9.2)*	*A (8.0)*
SB DeWitt Road	*Free*	
DeWitt Road & I-69 EB Ramp Terminal (minor STOP)		
EB I-69 Exit Ramp	*B (13.8)*	*B (12.6)*
NB/SB DeWitt Road	*Free*	
DeWitt Road and Clark Road (Single-Lane Roundabout)		
EB Clark Road	*A (6.9)*	*A (4.9)*
WB Clark Road	*A (5.7)*	*A (6.7)*
NB DeWitt Road	*A (5.4)*	*A (5.9)*
SB DeWitt Road	*A (9.4)*	*A (6.6)*
Overall	***A (7.6)***	***A (6.1)***
DeWitt Road & Stoll Road (west) (minor STOP)		
EB Stoll Road Left	*A (7.6)*	*A (8.3)*
WB Stoll Road	*Free*	
SB DeWitt Road	*B (14.9)*	*B (11.4)*
DeWitt Road & Stoll Road (east) (minor STOP)		
EB Stoll Road	*Free*	
WB Stoll Road Left	*A (8.4)*	*A (7.6)*
NB DeWitt Road	*B (12.0)*	*B (13.0)*

Table 7 – CRIA Development Sub-Area Existing Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)	
	a.m. Peak Hour	p.m. Peak Hour
Airport Road & Port Lansing Road (minor STOP)		
WB Port Lansing Road	*C (16.8)*	*C (20.5)*
NB Airport Road	*Free*	
SB Airport Road Left	*A (8.1)*	*A (8.8)*
Airport Road & Grand River Avenue (Signalized)		
EB Grand River Avenue	*A (6.2)*	*A (8.5)*
WB Grand River Avenue	*A (4.0)*	*A (3.9)*
SB Airport Road	*C (26.4)*	*C (27.2)*
Overall	***B (10.5)***	***A (9.6)***
Capital City Boulevard and Port Lansing Road (minor STOP)		
EB Port Lansing Road	*A (9.7)*	*B (10.2)*
WB Port Lansing Road	*B (11.2)*	*B (12.6)*
NB Capital City Boulevard	*Free*	
SB Capital City Boulevard	*Free*	

Table 7 – CRIA Development Sub-Area Existing Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)	
	a.m. Peak Hour	p.m. Peak Hour
Capital City Boulevard and Grand River Avenue (Signalized)		
EB Grand River Avenue	*A (5.2)*	*A (9.7)*
WB Grand River Avenue	*A (4.5)*	*A (9.0)*
SB Capital City Boulevard	*C (25.5)*	*C (22.8)*
Overall	***A (6.9)***	***B (11.3)***
DeWitt Road and Port Lansing Road (minor STOP)		
EB Port Lansing Road	*B (11.6)*	*B (16.3)*
NB DeWitt Road Left	*A (8.2)*	*A (7.7)*
SB DeWitt Road	*Free*	

As shown in Table 5, several of the STOP controlled movements along the Airport Road corridor currently experience delays corresponding to a LOS F. The all-way STOP controlled intersection of Airport Road and Stoll Road operates at an overall LOS E during the p.m. peak hour. Candidate improvements for these conditions will be examined in subsequent sections of this report.

All approaches and overall intersections within the DeWitt Road and CRIA sub-areas are calculated to operate at a LOS C or better, as shown in Tables 6 and 7. These results are deemed to be acceptable, and no improvements are required based on this analysis. Furthermore, results which are predominantly LOS A and B in these sub-areas indicate that excess capacity is available to accommodate future traffic growth.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. Overall, adverse queuing was not identified in the simulations and existing storage lane lengths are adequate where provided. The exception occurs during the p.m. peak hour, when the EB left-turn queue on Grand River Avenue at Airport Road extends beyond 500 feet in length. Although there is a continuous center lane for left-turns on this approach, this queue length extends beyond the dedicated EB left-turn storage into the two-way left-turn lane section, blocking movements for adjacent access points. This queue is not cleared during the most intense 15-minute period of the peak hour, which may cause aggressive driver behavior including red-light running.

3.4 Crash History

Crash data for the most recent available 5-year period (2016-2020) were examined across the study network. Crash data were obtained from the Michigan Traffic Crash Facts website, which references the Michigan State Police database. Crashes were evaluated by intersection to identify any pattern of occurrence or severity subject to countermeasure. Safety-related findings are outlined in Tables 8 thru 10 below, including the crash type/severity of primary concern, key observations from review of data and UD-10 crash reports, and potential countermeasures to address safety concerns.

For crash severity, A-level indicates incapacitating injury, B-level indicates non-incapacitating injury, C-level indicates minor injury, and PDO represents property damage only. Crash data and a more detailed summary of findings are included in Appendix 3.

Table 8 – Airport Road Sub-area Crash History

#	*Intersection*	*Most Frequent & Severe (#)*	*Observation/Pattern*	*Improvement Option*
1	Airport & Clark	Head-on Left-turn (5) B-level injury (2)	WB to SB left-turn crash pattern with EB thru	Evaluate EB/WB sight distance and protected left-turn phasing

Table 8 – Airport Road Sub-area Crash History

#	Intersection	Most Frequent & Severe (#)	Observation/Pattern	Improvement Option
2	Airport & I-69 WB	Angle (2) PDO (3)	No pattern/severity subject to improvement	None identified
3	Airport & I-69 EB	Angle (3) A-level Injury (1)	A-level severe injury driver disregarded STOP sign	None identified
4	Airport & Stoll	Angle (8) A-level injury (1)	Most angle crashes involved WB vehicle and failure to yield	All-way STOP installed in 2016[1]; continue to monitor crash occurrence and severity

1. UD-10 reports indicate that 4 of 8 angle crashes occurred in 2016 prior to the installation of all-way STOP control. Data indicates a positive impact on crash occurrence as a result of the installation.

Table 9 – DeWitt Road Sub-area Crash History

#	Intersection	Most Frequent/Severe (#)	Observation/Pattern	Improvement Option
5	DeWitt & I-69 WB	Angle (1) PDO (1)	No pattern/severity subject to improvement	None identified
6	DeWitt & I-69 EB	No crash history	No pattern/severity subject to improvement	None identified
7	DeWitt & Clark	Angle (3) B-level injury	Angle crashes related to all-way stop operation	Roundabout installed in 2021
8	DeWitt & Stoll (W)	Single Vehicle (3) PDO (5)	Icy conditions, alcohol, deer contributing factors	Enhance pavement markings and signage; realign offset-T intersections
9	DeWitt & Stoll (E)	Angle (4) B-level injury (1)	Snowy/icy conditions and distracted/careless driving contributing factors	Enhance pavement markings and signage; realign offset-T intersections

Table 10 – CRIA Development Sub-area Crash History

#	Intersection	Most Frequent/Severe (#)	Observation/Pattern	Improvement Option
10	Airport & Port Lansing	Single Vehicle (1) C-level injury (1)	No pattern/severity subject to improvement	None identified
11	Grand River & Airport	Head-on Left-turn (4) Fatal (1)	Fatal/injury crashes involved EB left-turn and WB motorcycle.	Evaluate EB/WB sight distance and protected left-turn phasing
12 13	Port Lansing & Capital City	Angle (5) B-level injury (1)	EB/WB vehicles not yielding to NB/SB traffic, especially 2nd stage median STOP	Install “cross traffic does not stop” warning placards on STOP signs; evaluate roundabout feasibility
14 15	Grand River & Capital City	Rear-end Left-turn (7) A-level injury (1)	EB left-turns from the inside thru lane result in rear-ends and sideswipes	Reconfigure Grand River Ave. to provide a center lane for left-turns; evaluate protected left-turn phasing
16	DeWitt & Port Lansing	Single Vehicle (2) B-level injury (1)	Injury crash was a motorcycle too fast for wet conditions	None identified

3.5 Speed Study

In addition to the safety concerns outlined above, CCRC/CRAA expressed interest in examining crash history and vehicle speeds relative to the horizontal curves on Airport Road and DeWitt Road adjacent to CRIA. Both roadways have combination horizontal curves as the alignments are routed around the east and west limits of the main airport runway. The horizontal curves on Airport Road are tighter (smaller radius) and transition over a shorter distance than the longer, larger radius curves on DeWitt Road. The posted speed limit on Airport is 40 mph south of State Road, with a posted curve advisory speed of 35 mph. The posted speed limit on DeWitt Road is 55 mph between Port Lansing Road and Clark Road (no posted advisory speed).

CCRC conducted a speed study on both roadways in the vicinity of the horizontal curves during the week of July 11, 2022. The results of this study indicate that vehicle speeds on DeWitt Road are below 45 mph; whereas speeds on Airport Road frequently exceed 45 mph. Speed data are included in Appendix 4.

Crash data for the most recent available 5-year period were examined along the horizontal curves on both Airport Road and DeWitt Road, excluding animal crashes. Crash data were obtained from the Michigan Traffic Crash Facts website, which references the Michigan State Police database. During this period, four crashes occurred on Airport Road and five crashes occurred on DeWitt Road. Summaries of crash occurrence are outlined in Table 11.

Table 11 – Horizontal Curve Crash History

Roadway	*Crash Type*	*Crash Severity*	*UD-10 Report Summary*
Airport Road	Single Vehicle	A-level injury	Intoxicated driver crossed centerline, departed roadway, and struck guardrail
		B-level injury	Motorcycle driver attempted to negotiate a curve at too high of speed
		C-level injury	Intoxicated driver departed roadway, struck a sign, and rolled over
		PDO	Intoxicated driver departed roadway and became stuck in the adjacent farm field
DeWitt Road	Single Vehicle	B-level injury	Motorcycle lost control on wet pavement attempting to avoid conflict with a vehicle turning from Port Lansing Road
		PDO	Driver was distracted by a plane flying overhead
	Head-on	A-level injury	Driver crossed centerline on icy road, cited for driving too fast for conditions
		C-level injury	Driver crossed centerline on snowy road, cited for driving too fast for conditions
	Sideswipe (opposite dir.)	PDO	Driver crossed centerline on icy road

The frequency of crashes on both roadways (average one crash per year or less) does not indicate a correctable crash pattern exists; however, each roadway has a unique pattern of occurrence. On Airport Road, 3 of 4 crashes involved intoxicated drivers (drugs and alcohol) that were unable to safely negotiate the horizontal curves. Although the drivers were intoxicated, this indicates that drivers are unable to perceive the abrupt changes in horizontal alignment. On DeWitt Road, 4 of 5 crashes involved drivers crossing the centerline or departing the roadway in poor weather conditions. This indicates that the roadway geometry is appropriate to normal conditions.

Both roadways currently have advanced curve warning signs, with an advisory speed of 35 mph posted on Airport Road. To enhance safety on these curves, CCRC should consider additional curve delineators and/or chevrons

with vertical reflective strips on all warning sign posts to increase the conspicuity of alignment changes. Additionally, CCRC may consider LED speed warning signs on Airport Road that are activated when a vehicle approaches a horizontal curve at a speed higher than the design speed of the curve.

3.6 Traffic Signal Warrants

On Airport Road, intersections with the I-69 interchange ramp terminals and with Stoll Road have approaches that operate at a LOS F during the peak hours. The I-69 interchange ramp terminals do not experience significant crash frequency/severity, and the installation of all-way STOP control may have mitigated historical crash occurrence at Stoll Road. However, given the poor operational conditions, traffic signal warrants were evaluated for these three intersections.

Hourly traffic volumes on Airport Road, the I-69 exit ramps, and Stoll Road were calculated based on MDOT TDMS data and the peak hour traffic volumes identified for this study. The peak hour volumes (adjusted for COVID-19 and area construction impacts) were proportioned over a 24-hour period based on hourly variations in the TDMS data. The traffic signal volumes were used in the evaluation of traffic signal warrants based on the criteria in the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). For these intersections, Warrant 1 (8-hour vehicular volume) and Warrant 2 (4-hour vehicular volume) are most applicable. Based on these volumes, each of these intersections would satisfy the Warrant 2 criteria. Only the I-69 EB ramp terminal would satisfy the Warrant 1 criteria; however, this is based on historical volumes and adjustments for I-69 construction impacts.

Based on the results of this analysis, these intersections should be monitored to determine if/when a traffic signal is warranted and necessary. In addition to vehicular volumes, crash occurrence at these locations should be monitored. When Airport Road is reconstructed, CCRC should consider installing center left-turn lanes or a continuous center lane for left-turns on Airport Road through this area. Aligned center left-turn lane configuration (as opposed to bypass lanes or no left-turn lane) would be required if signalization is installed. Additional coordination will be required with MDOT for improvements at the I-69 ramp terminals. Traffic signal warrant volumes and summaries are provided in Appendix 5.

3.7 Conceptual Improvements

On June 10, 2022, Fishbeck met virtually with representatives of CCRC and CRAA. Conceptual improvements were discussed, based on the results of the Existing Conditions operational analysis and review of historical crash data. The conceptual improvements identified by the project team are outlined below and will be evaluated under Future Conditions in order to develop study recommendations. The agenda and minutes from this meeting are included in Appendix 6.

Airport Road sub-area:

1. Evaluate EB/WB sight distance on Clark Road at Airport Road and monitor crash occurrence. Consider protected-only left-turn phasing if sight distance is limited and/or left-turn crash occurrence continues. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
2. Widen Airport Road to three lanes, with a center lane for left-turns from south of Stoll Road through the I-69 interchange to match the center left-turn lane at Clark Road. Corridor widening would provide the lane configurations needed for future signalization at the I-69 interchange and at Stoll Road, as well as accommodate left-turns at driveways along Airport Road.
3. Monitor traffic volumes and crash history at the I-69 interchange and Stoll Road with respect to traffic signal warrant criteria. Coordinate potential signal installation at the I-69 interchange with MDOT.

DeWitt Road sub-area:

1. In the short-term, enhance pavement marking and signage at the DeWitt Road and Stoll Road (E and W) intersections. Install vertical reflective strips on all intersection sign posts (including upstream warning signs) and oversized (60" x 30") two-direction large arrow signs (W1-7). Install STOP bar markings on the DeWitt Road approaches. Consider solar-powered LED enhanced signage consistent with other CCRC installations.
2. In the long-term, realign DeWitt Road to a standard all-way intersection with Stoll Road. Evaluate traffic control requirements (i.e., stop-controlled or signalized) and/or roundabout construction.

CRIA Development sub-area:

1. CRAA has expressed interest to widen the WB approach of Port Lansing Road at Airport Road to provide separate right and left-turn lanes; however, the operational and safety results of this study do not indicate such widening is necessary.
2. Coordinate with MDOT to evaluate EB/WB sight distance on Grand River Avenue at Airport Road and monitor crash occurrence. Consider EB protected-only left-turn phasing to mitigate left-turn crash occurrence and left-turn queueing. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
3. Coordinate with MDOT to evaluate the feasibility of a dedicated EB left-turn lane on Grand River Avenue at Capital City Boulevard, including potential left-turn protection. This may be accomplished by road widening, or possibly via a road diet to convert Grand River Avenue from 4 to 3 lanes.
4. In the short-term, install "Cross Traffic Does Not Stop" warning placards and vertical reflective strips on STOP sign posts on Port Lansing Road at Capital City Boulevard.
5. In the long-term, consider reconstructing the intersection of Port Lansing Road and Capital City Boulevard as a roundabout.

4.0 Future Conditions Analysis

This section presents information regarding future operational conditions considering ambient traffic growth as well as new volumes generated by development on CRIA property. A narrative description of expected development, trip generation forecasts, the directional distribution of the project traffic, and an assignment of peak hour traffic volumes to the adjacent roadways are presented in this section. Operational results are calculated assuming existing lane configurations and traffic control. Conceptual improvements outlined in the previous section are also analyzed under future traffic volumes to develop study recommendations.

4.1 Future Traffic Volumes

In order to account for unknown development projects and ambient growth in neighboring communities, background traffic growth was applied. The Tri-County Regional Planning Commission provided an ambient growth rate of 1% per year for the study area. This growth rate was compounded annually to a horizon year of 2030 and added to the existing traffic volumes.

CRAA has indicated the intent to develop currently vacant lands along Port Lansing Road, east of Capital Center Boulevard. CRAA specifically provided information relative to a 14,500 square foot (sft) manufacturing expansion. DeWitt Township records also indicate application for a 180,000 sft light industrial expansion. In order to forecast for these specific developments, *Trip Generation, 11th Edition* published by ITE was referenced to estimate the number of a.m. and p.m. peak hour trips that would be added to the adjacent road network.

Although the operational details of potential development projects are unknown, the proposed land use types often facilitate multiple employee shifts for the production of materials. The ITE data reflect a very directional traffic pattern; whereby the majority of traffic enters in the morning and departs in the afternoon. With multiple shifts, overnight shift traffic is exiting while morning shift is entering. Similarly, morning shift traffic is exiting while evening shift traffic is entering. Conservatively, the ITE trip generation forecasts were adjusted to account for a more balanced ingress/egress pattern during both the morning and afternoon peak hours. This adjustment is equal to 60% of the opposing (higher) volume. The resultant trip generation forecast is outlined in Table 12.

Table 12 – Future CRIA Trip Generation

ITE Land Use	Land Use Description	Unit	Amount	a.m. Peak Hour			p.m. Peak Hour		
				In	Out	Total	In	Out	Total
110	Light Industrial	Sq. Ft.	180,000	143	21	164	26	118	144
140	Manufacturing	Sq. Ft.	14,500	27	10	37	13	18	31
			Total New Trips	170	31	201	39	136	175
			Shift Change Adjustment	0	102	102	82	0	82
			Adjusted New Trips	170	133	303	121	136	257

4.2 Trip Distribution

The directions that development traffic will travel to and from CRIA were based upon existing traffic patterns during the a.m. and p.m. peak hours. Existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the new trips would be coming from and going to. According to ITE methodology, new trips are assumed to return to their direction of origin and were assigned accordingly. The trip distribution model developed for this study based on existing traffic patterns is summarized in Table 13.

Table 13 – Traffic Distribution Model

Direction (to/from)	Roadway	Percent
North	Airport Road	10%
	DeWitt Road	15%
South	DeWitt Road	8%
East	I-69	9%
	Clark Road	5%
	Stoll Road	5%
	Grand River Avenue	19%
West	I-69	6%
	Clark Road	2%
	Stoll Road	2%
	Grand River Avenue	19%
Total		100%

4.3 Trip Assignment

There are three main access points to CRIA to/from the surrounding road network:

1. Port Lansing Road at Airport Road;
2. Port Lansing Road at DeWitt Road; and
3. Capital City Boulevard at Grand River Avenue.

Trips in and out of developed parcels on CRIA property are expected to utilize each of these three access points via Port Lansing Road. Development traffic volumes were assigned to these access points and the adjacent road network according to the trip distribution model shown above. Trips were assigned to the shortest travel route, with a 50/50% split where similar route choices are available (i.e., entering from the west via Port Lansing Road or Grand River Avenue). Trip generation data, traffic assignments, and future traffic volumes are provided in Appendix 7.

4.4 Future Conditions Traffic Analysis

The objective of this traffic study is to evaluate the study area intersections and provide CCRC/CRAA with operational and safety insights to inform future roadway infrastructure decisions. To determine the need for future roadway/intersection improvements, traffic operations under Existing 2022 Conditions were compared to operations under Future 2030 Conditions with no changes to intersection lane configurations or traffic control (no-build). The results provided in this section do not include the conceptual improvements outlined in Section 3.

Where traffic operations under the Existing 2022 or Future 2030 no-build conditions remain acceptable (LOS D or better), the existing infrastructure is deemed to provide adequate capacity and no improvements are required. Where traffic operations under the Future no-build conditions are considerably worse than those of the Existing conditions, or if operations degrade from acceptable operations (LOS D or better) to unacceptable levels (LOS E or F), future traffic growth is determined to have an adverse impact on the current roadway network and improvements are required.

Tables 14 thru 16 outline the intersection capacity analysis results for the Existing 2022 Conditions in comparison to the 2030 Future (no-build) operations during the a.m. and p.m. peak hours. Capacity analysis reports for the future no-build conditions are in Appendix 8.

Table 14 – Airport Road Sub-Area
Future Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)		Future (2030)	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
Airport Road and Clark Road (Signalized)				
EB Clark Road	*B (16.3)*	*B (15.6)*	*B (16.5)*	*B (15.8)*
WB Clark Road	*C (22.2)*	*B (17.5)*	*C (23.5)*	*B (17.8)*
NB Airport Road	*B (10.4)*	*B (15.9)*	*B (11.0)*	*B (18.6)*
SB Airport Road	*B (11.8)*	*B (11.2)*	*B (12.8)*	*B (11.9)*
Overall	***B (14.0)***	***B (14.9)***	***B (14.8)***	***B (16.5)***
Airport Road & I-69 WB Ramp Terminal (minor STOP)				
WB I-69 Exit Ramp	*F (55.7)*	*D (25.3)*	*F (122.1)*	*E (38.2)*
NB Airport Road Left	*B (10.3)*	*A (8.4)*	*B (10.9)*	*A (8.7)*
SB Airport Road	*Free*		*Free*	
Airport Road & I-69 EB Ramp Terminal (minor STOP)				
EB I-69 Exit Ramp	*F (76.2)*	*F (121.6)*	*F (136.4)*	*F (212.4)*
NB Airport Road	*Free*		*Free*	
SB Airport Road Left	*A (9.4)*	*A (9.6)*	*A (9.9)*	*B (10.1)*
Airport Road & Stoll (all-way STOP)				
EB Stoll Road	*B (11.0)*	*B (13.3)*	*B (11.9)*	*B (14.4)*
WB Stoll Road	*B (11.4)*	*B (13.0)*	*B (12.8)*	*B (14.2)*
NB Airport Road	*B (14.9)*	*F (53.3)*	*C (21.0)*	*F (117.2)*
SB Airport Road	*C (19.8)*	*D (27.5)*	*E (35.6)*	*E (44.8)*
Overall	***C (15.9)***	***E (35.3)***	***C (24.8)***	***F (69.6)***

Table 15 – DeWitt Road Sub-Area
Future Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)		Future (2030)	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
DeWitt Road & I-69 WB Ramp Terminal (minor STOP)				
WB I-69 Exit Ramp	*C (16.9)*	*B (12.6)*	*C (21.5)*	*B (13.8)*
NB DeWitt Road Left	*A (9.2)*	*A (8.0)*	*A (9.5)*	*A (8.2)*
SB DeWitt Road	*Free*		*Free*	
DeWitt Road & I-69 EB Ramp Terminal (minor STOP)				
EB I-69 Exit Ramp	*B (13.8)*	*B (12.6)*	*C (16.8)*	*B (14.2)*
NB/SB DeWitt Road	*Free*		*Free*	
DeWitt Road and Clark Road (Single-Lane Roundabout)				
EB Clark Road	*A (6.9)*	*A (4.9)*	*A (8.3)*	*A (5.4)*
WB Clark Road	*A (5.7)*	*A (6.7)*	*A (6.4)*	*A (7.8)*
NB DeWitt Road	*A (5.4)*	*A (5.9)*	*A (6.2)*	*A (6.9)*
SB DeWitt Road	*A (9.4)*	*A (6.6)*	*B (11.8)*	*A (7.7)*
Overall	***A (7.6)***	***A (6.1)***	***A (9.3)***	***A (7.0)***
DeWitt Road & Stoll Road (west) (minor STOP)				
EB Stoll Road Left	*A (7.6)*	*A (8.3)*	*A (7.8)*	*A (8.5)*
WB Stoll Road	*Free*		*Free*	
SB DeWitt Road	*B (14.9)*	*B (11.4)*	*C (19.1)*	*B (12.7)*

Table 15 – DeWitt Road Sub-Area
Future Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)		Future (2030)	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
DeWitt Road & Stoll Road (east) (minor STOP)				
EB Stoll Road	*Free*		*Free*	
WB Stoll Road Left	*A (8.4)*	*A (7.6)*	*A (8.8)*	*A (7.8)*
NB DeWitt Road	*B (12.0)*	*B (13.0)*	*B (13.7)*	*C (15.9)*

Table 16 – Capital Region International Airport Sub-Area
Future Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Existing (2022)		Future (2030)	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
Airport Road & Port Lansing Road (minor STOP)				
WB Port Lansing Road	*C (16.8)*	*C (20.5)*	*C (20.7)*	*D (32.3)*
NB Airport Road	*Free*		*Free*	
SB Airport Road Left	*A (8.1)*	*A (8.8)*	*A (8.4)*	*A (9.2)*
Airport Road & Grand River Avenue (Signalized)				
EB Grand River Avenue	*A (6.2)*	*A (8.5)*	*A (7.1)*	*B (11.9)*
WB Grand River Avenue	*A (4.0)*	*A (3.9)*	*A (4.4)*	*A (4.2)*
SB Airport Road	*C (26.4)*	*C (27.2)*	*C (25.9)*	*C (26.7)*
Overall	***B (10.5)***	***A (9.6)***	***B (10.9)***	***B (11.4)***
Capital City Boulevard and Port Lansing Road (minor STOP)				
EB Port Lansing Road	*A (9.7)*	*B (10.2)*	*B (10.2)*	*B (10.9)*
WB Port Lansing Road	*B (11.2)*	*B (12.6)*	*B (12.7)*	*B (14.8)*
NB Capital City Boulevard	*Free*		*Free*	
SB Capital City Boulevard	*Free*		*Free*	
Capital City Boulevard and Grand River Avenue (Signalized)				
EB Grand River Avenue	*A (5.2)*	*A (9.7)*	*A (5.6)*	*B (10.4)*
WB Grand River Avenue	*A (4.5)*	*A (9.0)*	*A (4.9)*	*A (9.5)*
SB Capital City Boulevard	*C (25.5)*	*C (22.8)*	*C (25.2)*	*C (23.8)*
Overall	***A (6.9)***	***B (11.3)***	***A (7.6)***	***B (12.1)***
DeWitt Road and Port Lansing Road (minor STOP)				
EB Port Lansing Road	*B (11.6)*	*B (16.3)*	*B (13.6)*	*D (25.0)*
NB DeWitt Road Left	*A (8.2)*	*A (7.7)*	*A (8.7)*	*A (7.9)*
SB DeWitt Road	*Free*		*Free*	

As shown in Table 14, several of the STOP controlled movements along the Airport Road corridor currently experience delays corresponding to a LOS F. These delays are exacerbated by future traffic growth, and new LOS E operations are introduced on some approaches. The all-way STOP controlled intersection of Airport Road and Stoll Road is expected to degrade to an overall LOS F during the p.m. peak hour.

All approaches and overall intersections within the DeWitt Road and CRIA sub-areas are calculated to operate at a LOS C or better, as shown in Tables 15 and 16. These results are deemed to be acceptable, and no improvements are required based on this analysis. Furthermore, results which are predominantly LOS C or better in these sub-areas indicate that existing excess capacity is available to accommodate future traffic growth.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. Overall, adverse queuing was not identified, and existing storage lane lengths are adequate where provided, consistent with existing conditions. The exceptions occur on the EB left turn from EB Grand River Avenue to NB Airport Road and on the NB approach of Airport Road at Stoll Road. Queues on these movements exceed 500 feet during the p.m. peak hour.

4.5 Operations with Improvements

In order to develop study recommendations, improvement concepts outlined in Section 3 to address existing operational and safety concerns are analyzed under Future conditions. Additional improvement measures are considered where future traffic volumes are determined to have an adverse impact on operations that are currently acceptable. Improvement outcomes are considered acceptable where intersection operations would be improved to LOS D or better on all approaches, and/or where correctable safety concerns are expected to be mitigated. Improvements that would benefit intersection operations and/or safety are specified below. Resultant operations are shown in Tables 17 thru 19, comparing future conditions without and with improvements. Capacity analysis reports for the future improved conditions are in Appendix 9.

Airport Road sub-area:

1. Install protected-only left-turn phasing on the EB/WB approaches of Clark Road at Airport Road.
2. Widen Airport Road to three lanes with a center lane for left-turns from south of Stoll Road through the I-69 interchange to match the center left-turn lane at Clark Road. Install traffic signals at the three currently unsignalized intersections as warranted.

As shown in Table 17, these improvements would result in acceptable operations at each of the intersections in the Airport Road sub-area. At Clark Road, EB/WB protected left-turn phasing can be installed without significant degradation of existing signalized operations. At the I-69 interchange and at Stoll Road, traffic signals would mitigate stop-controlled delays and improve overall operations along the Airport Road corridor.

Table 17 – Airport Road Sub-Area Improved Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Future No-build		Future w/ Improvements	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
Airport Road and Clark Road (Signalized) – Install EB/WB left-turn protection				
EB Clark Road	*B (16.5)*	*B (15.8)*	*D (43.3)*	*D (38.1)*
WB Clark Road	*C (23.5)*	*B (17.8)*	*D (39.7)*	*D (40.7)*
NB Airport Road	*B (11.0)*	*B (18.6)*	*A (3.7)*	*A (2.8)*
SB Airport Road	*B (12.8)*	*B (11.9)*	*B (13.7)*	*A (8.9)*
Overall	***B (14.8)***	***B (16.5)***	***B (18.6)***	***B (11.8)***
Airport Road & I-69 WB Ramp Terminal (minor STOP) – Install traffic signal				
WB I-69 Exit Ramp	*F (122.1)*	*E (38.2)*	*D (38.0)*	*D (40.3)*
NB Airport Road Left	*B (10.9)*	*A (8.7)*	*A (0.5)*	*A (1.2)*
SB Airport Road	*Free*		*A (1.2)*	*A (0.6)*
Overall	***N/A***		***A (6.4)***	***B (10.5)***
Airport Road & I-69 EB Ramp Terminal (minor STOP) – Install traffic signal				
EB I-69 Exit Ramp	*F (136.4)*	*F (212.4)*	*D (40.3)*	*D (36.1)*
NB Airport Road	*Free*		*A (0.3)*	*B (16.3)*
SB Airport Road Left	*A (9.9)*	*B (10.1)*	*A (0.9)*	*A (2.2)*
Overall	***N/A***		***A (4.9)***	***B (16.4)***

Table 17 – Airport Road Sub-Area Improved Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Future No-build		Future w/ Improvements	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
Airport Road & Stoll (all-way STOP) – Install traffic signal				
EB Stoll Road	*B (11.9)*	*B (14.4)*	*C (33.9)*	*C (33.6)*
WB Stoll Road	*B (12.8)*	*B (14.2)*	*C (32.3)*	*C (29.3)*
NB Airport Road	*C (21.0)*	*F (117.2)*	*A (6.2)*	*A (9.2)*
SB Airport Road	*E (35.6)*	*E (44.8)*	*B (17.3)*	*A (1.7)*
Overall	***C (24.8)***	***F (69.6)***	***B (17.9)***	***B (11.6)***

DeWitt Road sub-area:

1. Realign DeWitt Road to a standard all-way intersection with Stoll Road. Install proper traffic control (i.e., all-way stop-control) or construct a new roundabout.

As shown in Table 18, realignment of DeWitt Road would result in acceptable operations a single intersection with Stoll Road. The analysis assumed a single lane on each approach and stop-control (yield for roundabout) on all four approaches. Two-way (minor) stop-control was considered; however, some movements would operate at a LOS E. Volumes are slightly higher on DeWitt Road than on Stoll Road; however, DeWitt Road is currently the stop-controlled approach. If/when DeWitt Road is realigned, traffic volumes, lane configurations, traffic control warrants, and resultant operations should be evaluated in further detail.

Table 18 – DeWitt Road Sub-Area
Improved Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Future No-build		Future w/ Improvements	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
DeWitt Road & Stoll Road (minor STOP) – Realign DeWitt (Install all-way STOP)				
EB Stoll Road	*A (7.8)*	*A (8.5)*	*B (12.0)*	*B (10.9)*
WB Stoll Road	*A (8.8)*	*A (7.8)*	*B (11.2)*	*B (11.5)*
NB DeWitt Road	*B (13.7)*	*C (15.9)*	*B (11.5)*	*C (17.3)*
SB DeWitt Road	*C (19.1)*	*B (12.7)*	*C (15.7)*	*B (10.7)*
Overall	***N/A***		***B (13.2)***	***B (13.9)***
DeWitt Road & Stoll Road (minor STOP) – Realign DeWitt (Construct roundabout)				
EB Stoll Road	*A (7.8)*	*A (8.5)*	*A (7.3)*	*A (4.4)*
WB Stoll Road	*A (8.8)*	*A (7.8)*	*A (4.8)*	*A (6.5)*
NB DeWitt Road	*B (13.7)*	*C (15.9)*	*A (5.1)*	*A (6.9)*
SB DeWitt Road	*C (19.1)*	*B (12.7)*	*A (6.4)*	*A (4.9)*
Overall	***N/A***		***A (6.1)***	***A (6.1)***

CRIA Development sub-area:

1. Install protected-only left-turn phasing on EB Grand River Avenue at Airport Road.
2. Construct a dedicated EB left-turn lane on Grand River Avenue at Capital City Boulevard, including permissive/protected left-turn protection.
3. Reconstruct the intersection of Port Lansing Road and Capital City Boulevard as a roundabout.

As shown in Table 19, these improvements would result in acceptable operations where previous operational and safety concerns were identified. On Grand River Avenue at Airport Road, EB protected left-turn phasing can be installed without significant degradation of existing signalized operations. On Grand River Avenue at Capital City Boulevard, a center lane for left turns with permissive/protected left-turn phasing can also be installed without significant degradation of existing signalized operations. These improvements would improve queuing on Grand

River Avenue as well as address identified safety concerns. At Capital City Boulevard and Port Lansing Road, a single lane roundabout would also provide acceptable operations and mitigate historical crash occurrence.

Table 19 – Capital Region International Airport Sub-Area
Improved Level of Service (LOS) and Delay (sec/veh)

Approach / Lane Group	Future No-build		Future w/ Improvements	
	a.m. Peak Hour	p.m. Peak Hour	a.m. Peak Hour	p.m. Peak Hour
Airport Road & Grand River Avenue (Signalized) – Install EB left-turn protection				
EB Grand River Avenue	*A (7.1)*	*B (11.9)*	*B (15.5)*	*B (17.5)*
WB Grand River Avenue	*A (4.4)*	*A (4.2)*	*B (13.8)*	*B (18.1)*
SB Airport Road	*C (25.9)*	*C (26.7)*	*C (30.3)*	*C (31.5)*
Overall	***B (10.9)***	***B (11.4)***	***B (18.6)***	***B (19.8)***
Capital City Boulevard and Port Lansing Road (minor STOP) – (Construct roundabout)				
EB Port Lansing Road	*B (10.2)*	*B (10.9)*	*A (4.8)*	*A (4.9)*
WB Port Lansing Road	*B (12.7)*	*B (14.8)*	*A (5.2)*	*A (5.4)*
NB Capital City Boulevard	*Free*		*A (5.0)*	*A (6.4)*
SB Capital City Boulevard	*Free*		*A (3.9)*	*A (5.6)*
Overall	***N/A***		***A (5.0)***	***A (5.7)***
Capital City Boulevard and Grand River Avenue (Signalized) – Install EB left-turn lane (perm./prot.)				
EB Grand River Avenue	*A (5.6)*	*B (10.4)*	*A (4.8)*	*A (9.5)*
WB Grand River Avenue	*A (4.9)*	*A (9.5)*	*B (10.9)*	*B (19.5)*
SB Capital City Boulevard	*C (25.2)*	*C (23.8)*	*C (25.8)*	*C (22.5)*
Overall	***A (7.6)***	***B (12.1)***	***A (7.2)***	***B (12.0)***

5.0 Findings and Recommendations

The analyses completed for this study provided the operational and safety findings for the road network surrounding CRIA that may be improved with future projects. For intersections along Grand River Avenue (I-96 BR) and at the I-69 interchanges, coordination with MDOT will be required. The following recommendations were developed to improve existing conditions and accommodate anticipated future traffic demands.

Airport Road sub-area:

1. Evaluate EB/WB sight distance on Clark Road at Airport Road and monitor crash occurrence. Install protected-only left-turn phasing if sight distance is limited and/or left-turn crash occurrence continues. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
2. Widen Airport Road to three lanes with a center lane for left-turns from south of Stoll Road through the I-69 interchange to match the center left-turn lane at Clark Road. Corridor widening would provide the lane configurations needed for future signalization at the I-69 interchange and at Stoll Road, as well as accommodate left-turns at driveways along Airport Road.
3. Monitor traffic volumes and crash history at the I-69 interchange and Stoll Road with respect to traffic signal warrant criteria. Coordinate potential signal installation at the I-69 interchange with MDOT.
4. Install additional curve delineators and/or chevrons with vertical reflective strips on all warning sign posts to increase the conspicuity of alignment changes on the Airport Road horizontal curves. CCRC may also consider LED speed warning signs on Airport Road that are activated when a vehicle approaches a horizontal curve at a speed higher than the design speed of the curve.

DeWitt Road sub-area:

1. In the short-term, enhance pavement marking and signage at the DeWitt Road and Stoll Road (E and W) intersections. Install vertical reflective strips on all intersection sign posts (including upstream warning signs) and oversized (60” x 30”) two-direction large arrow signs (W1-7). Install STOP bar markings on the DeWitt Road approaches. Consider solar-powered LED enhanced signage consistent with other CCRC installations.
2. In the long-term, realign DeWitt Road to a standard all-way intersection with Stoll Road. Install proper traffic control or construct a roundabout. Future design will require further evaluation of traffic volumes, lane configurations, and traffic control warrants based on future alignments and available right-of-way.
3. Install additional curve delineators and/or chevrons with vertical reflective strips on all warning sign posts to increase the conspicuity of alignment changes on the DeWitt Road horizontal curves.

CRIA Development sub-area:

1. CRAA has expressed interest to widen the WB approach of Port Lansing Road at Airport Road to provide separate right and left-turn lanes; however, the operational and safety results of this study do not indicate such widening is necessary.
2. Evaluate EB/WB sight distance on Grand River Avenue at Airport Road and monitor crash occurrence. Install EB protected-only left-turn phasing to mitigate left-turn crash occurrence and left-turn queueing. Traffic signal modernization would also improve signal head visibility and mitigate left-turn crash occurrence during yellow/red clearance intervals.
3. Evaluate the feasibility of constructing a dedicated EB left-turn lane on Grand River Avenue at Capital City Boulevard, including permissive/protected left-turn protection. This may be accomplished by road widening, or via a road diet to convert Grand River Avenue from 4 to 3 lanes.
4. In the short-term, install “Cross Traffic Does Not Stop” warning placards and vertical reflective strips on STOP sign posts on Port Lansing Road at Capital City Boulevard.
5. In the long-term, reconstruct the intersection of Port Lansing Road and Capital City Boulevard as a roundabout.