

Director's Report

Project Name: 9101 Highland
Description: Rezoning Request
Date on Agenda this packet pertains to: March 7th, 2024

- Public Hearing
- Initial Submittal
- Revised Plans
- Preliminary Approval
- Final Approval
- Special Land Use
- Rezoning
- Other: _____

Contact	Consultants & Departments	Approval	Denial	Approved w/Conditions	Other	Comments
Sean O'Neil	Community Development Director	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Based on comments from the Staff Planner
Justin Quagliata	Staff Planner	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	See letter dated 02/16/2024

WHITE LAKE TOWNSHIP PLANNING COMMISSION

REPORT OF THE COMMUNITY DEVELOPMENT DEPARTMENT

TO: Planning Commission

FROM: Sean O'Neil, AICP, Community Development Director
Justin Quagliata, Staff Planner

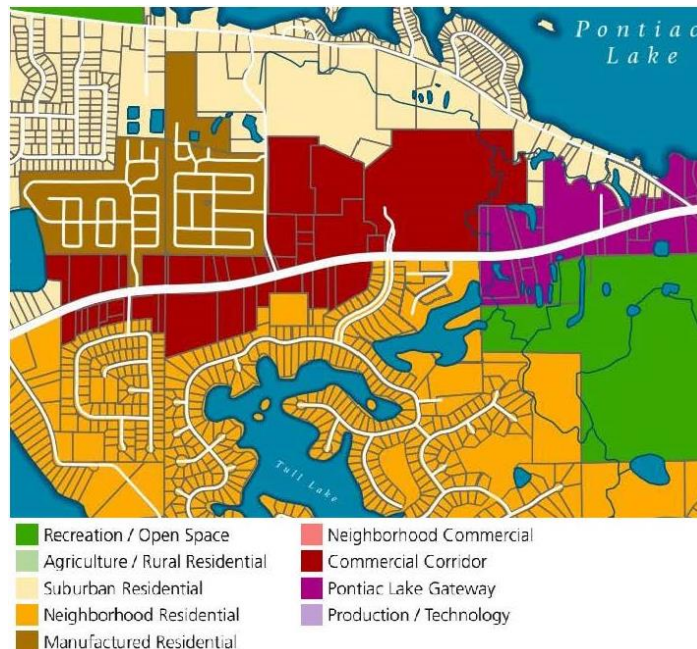
DATE: February 16, 2024

RE: 9101 Highland Road (Parcel Number 12-23-227-003)
Rezoning – Review #1

Affinity 10 Investments, LLC (Tom Hannawa) has requested the rezoning of approximately five acres located at 9101 Highland Road from R1-C (Single-Family Residential) to GB (General Business). The site is located on the south side of Highland Road, west of Sunnybeach Boulevard and contains approximately 458.4 feet of frontage on Highland Road.

The Future Land Use Map from the draft 2024 Master Plan designates the subject site in the Commercial Corridor category, which is intended to provide regional goods and services (such as large box-stores and drive-thrus) to residents and non-residents.

DRAFT 2024 FUTURE LAND USE MAP



Zoning

The subject site is currently zoned R1-C, which requires a minimum of 100 feet of lot width and 16,000 square feet of lot area. The requested GB zoning district requires a minimum of 200 feet of lot width and one (1) acre of lot area. With approximately 458.4 feet of lot width on Highland Road and five acres of lot area, the site meets the minimum standards for both lot area and lot width of the existing and proposed zoning districts. The following table illustrates the lot width and lot area standards for the existing R1-C and proposed GB zoning districts:

ZONING DISTRICT	LOT WIDTH	LOT AREA
R1-C	100 feet	16,000 square feet
GB	200 feet	1 acre

ZONING MAP



Physical Features

The former Calvary Lutheran Church building and its associated parking lot occupy the property, as well as a community garden. Topography of the site is generally level. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) Wetland Map and the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map indicate neither wetlands nor floodplain are present on or near the site.

Access

The site fronts on Highland Road, which along the property is a five-lane road (two lanes in each direction and a center turn lane).

Utilities

Municipal water and sanitary sewer are available to serve the site. The location and capacity of utilities for any proposed development will be reviewed in detail by the Township Engineering Consultant at the time of a development submittal.

Staff Analysis

In considering any petition for an amendment to the zoning map, the Planning Commission and Township Board must consider the following criteria from Article 7, Section 13 of the Zoning Ordinance in making its findings, recommendations, and decision:

- A. *Consistency with the goals, policies and future land use map of the White Lake Township Master Plan, including any subarea or corridor studies. If conditions have changed since the Master Plan was adopted, the consistency with recent development trends in the area. The Future Land Use Map from the draft 2024 Master Plan designates the subject site in the Commercial Corridor category, which aligns with the proposed GB zoning district.*
- B. *Compatibility of the site's physical, geological, hydrological and other environmental features with the host of uses permitted in the proposed zoning district. If the property is rezoned to GB, it would not directly or indirectly have a substantial adverse impact on the natural resources of the Township.*
- C. *Evidence the Applicant cannot receive a reasonable return on investment through developing the property with one (1) of the uses permitted under the current zoning. While no such evidence has been submitted, the property is five acres in size and located in a commercial corridor on Highland Road (M-59) with access to municipal water and sanitary sewer. It is reasonable to request commercial zoning on this type of property.*
- D. *The compatibility of all the potential uses allowed in the proposed zoning district with surrounding uses and zoning in terms of land suitability, impacts on the environment, density, nature of use, traffic impacts, aesthetics, infrastructure and potential influence on property values. The majority of the permitted and special land uses in the GB district are compatible with the surrounding uses and the nature of the uses anticipated in the Township Master Plan. Only the Township Assessor may provide comment on property values.*
- E. *The capacity of Township utilities and services sufficient to accommodate the uses permitted in the requested district without compromising the "health, safety and welfare" of the Township. The site is in an area intended to be serviced by public water and sanitary sewer. The Community Development Department defers to the Director of Public Services and Township Engineering Consultant on this matter.*

- F. *The capability of the street system to safely and efficiently accommodate the expected traffic generated by uses permitted in the requested zoning district.* A traffic impact study (TIS) has been submitted. For the purpose of this rezoning application, the information provided is sufficient. The TIS describes existing traffic conditions and compares the potential trip generation of the site's use under the existing and proposed zoning classifications. **If the rezoning is approved, prior to submitting a site plan review / special land use application a revised TIS shall be submitted to include Highland Road (M-59) and Sunnybeach Boulevard as a study intersection. Additionally, the site trip generation shall be revised to include potential trip generation based on two drive-thru restaurants, not one (a pick-up window (shown on the submitted concept plan) shall be calculated as a drive-thru restaurant). Also, AM peak hour trips shall be included for one of the two fast-casual restaurants (the TIS states the two potential fast-casual restaurants will not have breakfast service; however, this is an assumption and not indicative of how the proposed restaurants may be used if developed). Note when completing a full evaluation of the TIS during site plan review additional information or revisions may be required.**
- G. *The apparent demand for the types of uses permitted in the requested zoning district in relation to the amount of land in the Township currently zoned and available to accommodate the demand.* Evidence of the demand in the Township for additional retail commercial uses has not been submitted. However, the location is appropriate for property zoned GB, given the traffic, residential units, and general density in the area.
- H. *The boundaries of the requested rezoning district are reasonable in relationship to its surroundings, and construction on the site will be able to meet the dimensional regulations for the zoning district listed in the Schedule of Regulations.* The subject site is located in a commercial corridor on Highland Road (M-59). The Applicant provided a concept plan showing two multi-tenant buildings on the site: the west building is 7,334 square feet in size and the east building is 6,542 square feet in size. The easterly unit in each building contains a drive-thru restaurant and each building has a patio in front; drive-thru restaurants and outdoor dining require special land use approval from the Planning Commission. Parking is shown on all sides of the buildings, with one driveway accessing Highland Road near the center of the site. The Applicant did not volunteer conditions on the rezoning related to the concept plan. Site plan review and approval would be required from the Planning Commission and Township Board to construct the buildings. The concept plan is not under consideration by the Township, and it has not been reviewed for compliance with applicable Zoning Ordinance requirements. Other factors that may impact future development of the site, such as, but not limited to, soils, topography, site layout, landscape and screening, stormwater/drainage, and utilities would be considered at the time of a development proposal.
- I. *The requested zoning district is considered to be more appropriate from the Township's perspective than another zoning district.* The uses allowed in the GB district are appropriate for the site.

- J. If the request is for a specific use, is rezoning the land more appropriate than amending the list of permitted or special land uses in the current zoning district to allow the use? Rezoning would be the most appropriate way to allow for the proposed use. Amending the R1-C zoning district to allow retail commercial uses and drive-thru restaurants would not be advised.*
- K. The requested rezoning will not create an isolated and unplanned spot zone. The site is surrounded by R1-C (Single-Family Residential) zoning to the east and south, LB (Local Business) zoning to the west, and PB (Planned Business) zoning to the north.*
- L. The request has not previously been submitted within the past one (1) year, unless conditions have changed or new information has been provided. This request is a new application.*
- M. An offer of conditions submitted as part of a conditional rezoning request shall bear a reasonable and rational relationship to the property for which rezoning is requested. This standard is not applicable.*
- N. Other factors deemed appropriate by the Planning Commission and Township Board. The Planning Commission and Township Board could also consider other factors which may be relevant to the rezoning request.*

Planning Commission Options

The Planning Commission may recommend approval or denial of the rezoning request, or it may recommend a different zoning designation than proposed by the Applicant to the Township Board. **The proposed rezoning is compatible with the draft 2024 Master Plan and surrounding land uses. Staff recommends approval of the rezoning from R1-C to GB.**

CHARTER TOWNSHIP OF WHITE LAKE
COMMUNITY DEVELOPMENT DEPARTMENT
7525 Highland Road, White Lake, Michigan 48383-2900
248-698-3300, Ext. 163

APPLICATION TO REZONE PROPERTY

Date: 01/17/2024

Applicant: Affinity 10 Investment LLC

Address: 4512 South Shore Street, Waterford MI 48328

Phone No.: 248-361-1666 Fax No.: _____

E-mail: Thomashannawa@gmail.com

Applicant's Interest in Property: LOI to purchase

Property Owner: Calvary Evangelical Lutheran Church of Clarkston

Owner's Address: 6805 Bluegrass Dr, Clarkston MI 48346

Phone No.: _____ Fax No.: _____

Location of Property: 9101 Highland Road

Sidwell No(s): 12-23-227-003

Total area of change: 5.02 acres

I, the undersigned (owner, attorney, or option holder) hereby request that this property now classified as R1-C (Single Family Residential) District, be reclassified as GB (General Business) District.

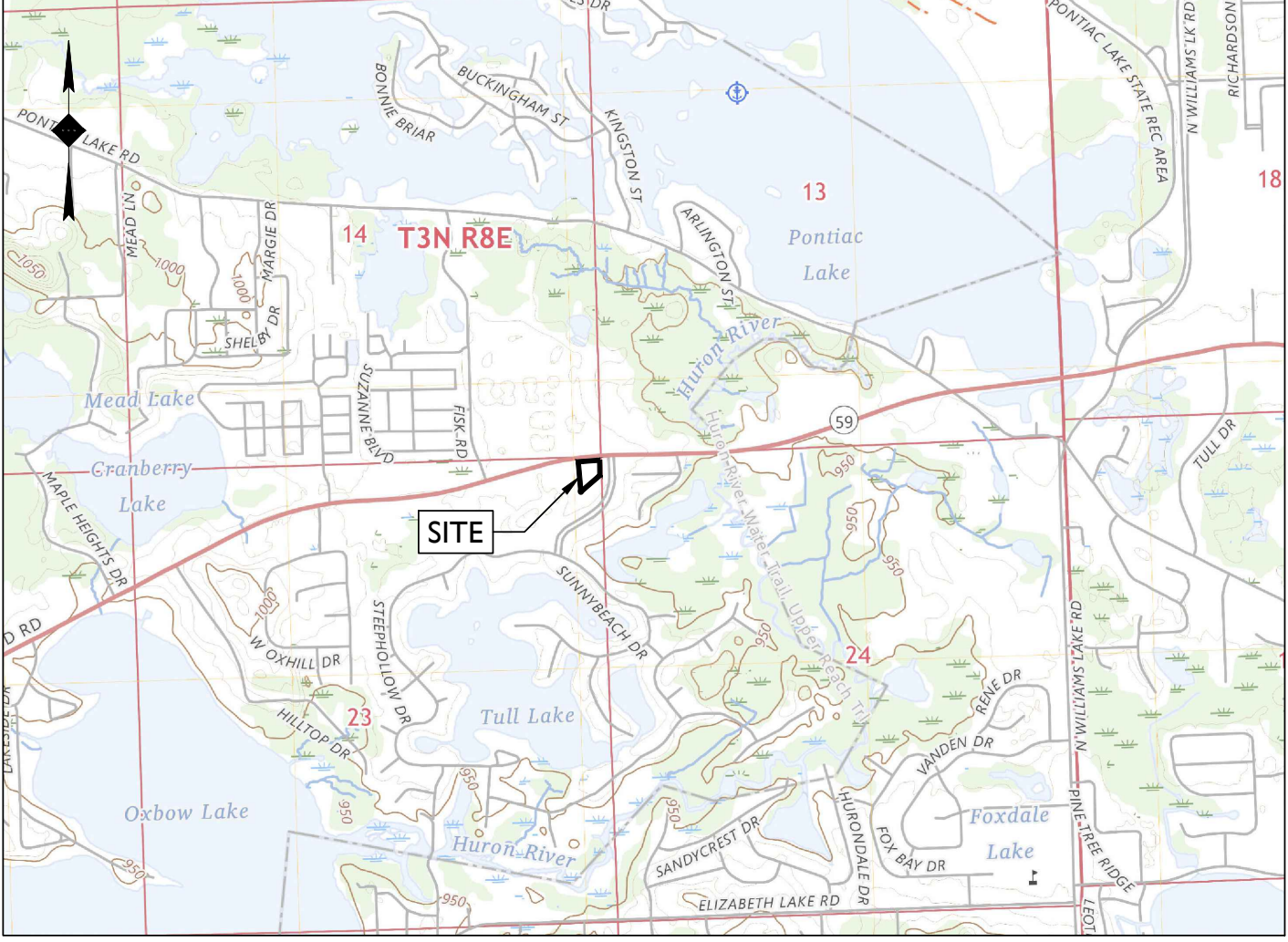
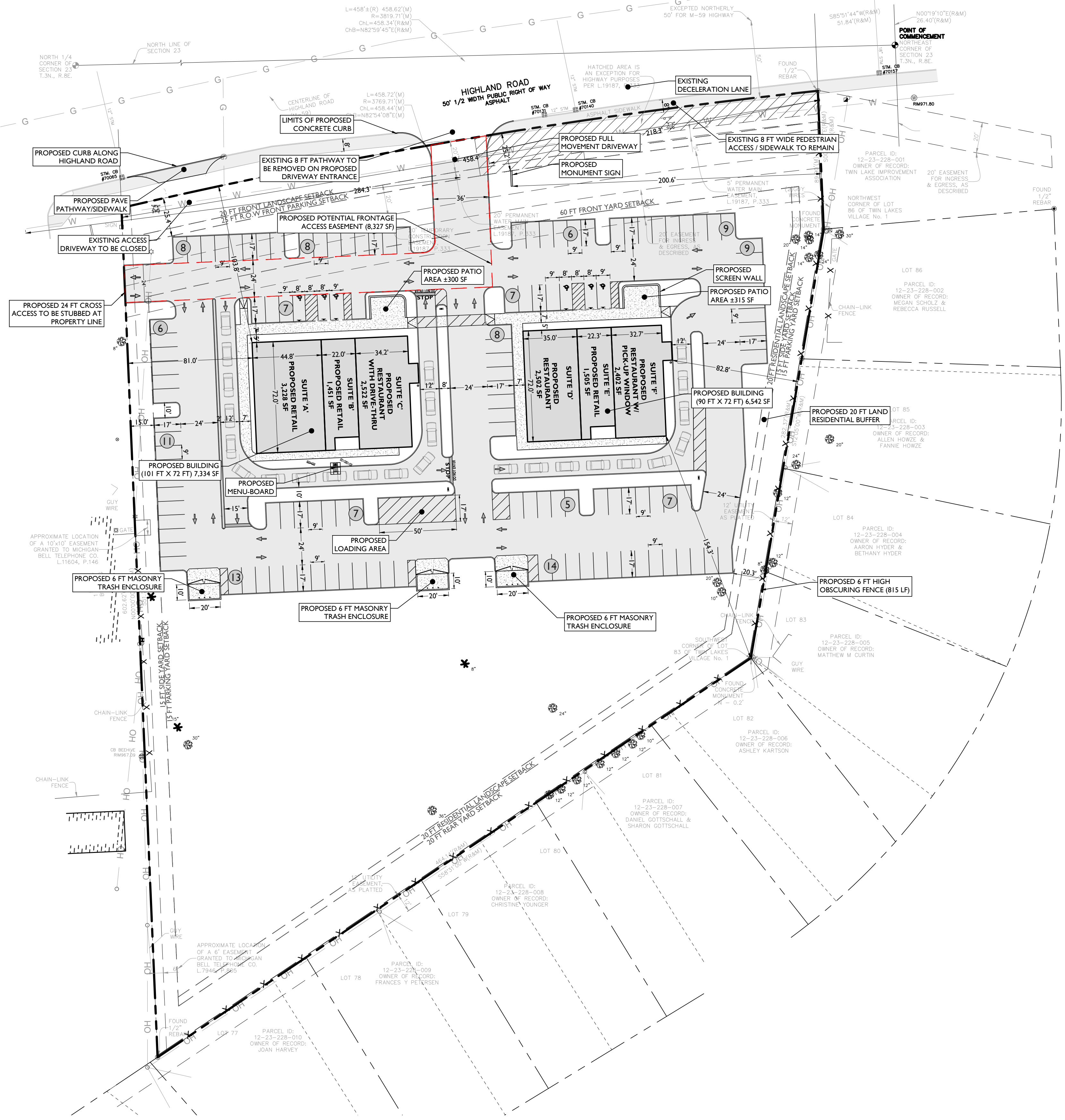
Applicant's Signature: 

(If owner does not sign application, attach letter signed by owner, requesting zoning change.)

Please Print Name: Tom Hannawa

Required Attachments:

- 1. Legal description of the property proposed to be rezoned.
- 2. Location map
- 3. Rezoning sign location map
- 4. Statement indicating why change is requested
- 5. Review fee (check payable to the Charter Township of White Lake)



LOCATION MAP
SCALE: 1" = 2,000'±

SYMBOL	DESCRIPTION
---	PROPERTY LINE
---	SETBACK LINE
---	PROPOSED CURB
○	PROPOSED SIGNS / BOLLARDS
■	PROPOSED BUILDING
□	PROPOSED CONCRETE
▬	PROPOSED RETAINING WALL
—x—x—	PROPOSED OBSCURING FENCE

LAND USE AND ZONING		
PID:12-23-227-003		
EXISTING ZONE: R1-C SINGLE FAMILY RESIDENTIAL		
REZONED TO GENERAL BUSINESS DISTRICT (GB)		
PROPOSED USE	RESTAURANT OR FAST FOOD	PERMITTED USE
	DRIVE-THRU WINDOW	SPECIAL LAND USE
	RETAIL STORE	PERMITTED USE
ZONING REQUIREMENT	REQUIRED	PROPOSED
MINIMUM LOT AREA	1 AC	195,568 SF (4.5 AC)
MINIMUM LOT WIDTH	200 FT	458.4 FT
MAXIMUM BUILDING HEIGHT	35 FT (2 STORIES)	<35 FT (1 STORY)
MINIMUM FRONT YARD SETBACK	60 FT ⁽¹⁾	103.8 FT
MINIMUM SIDE YARD SETBACK (ONE)	15 FT	81.0 FT
MINIMUM SIDE YARD SETBACK (BOTH)	20 FT	163.8 FT
MINIMUM REAR YARD SETBACK	20 FT	154.3 FT
MINIMUM DRIVEWAY FROM RESIDENTIAL	200 FT ⁽¹⁾	218.3 FT
MINIMUM FRONT LANDSCAPE SETBACK	20 FT	25.4 FT
MINIMUM R.O.W PARKING SETBACK	25 FT ⁽²⁾	25.4 FT
INTERIOR LANDSCAPING AREA	15% (29,335 SF)	>15%
MINIMUM DRIVEWAY SPACING (HIGHLAND ROAD)	455 FT	±284.3 FT TO WEST (V)
TRASH ENCLOSURE SETBACK	FRONT LOT LINE ⁽³⁾	REAR YARD
MINIMUM SIDE PARKING SETBACK	15 FT	15.0 FT

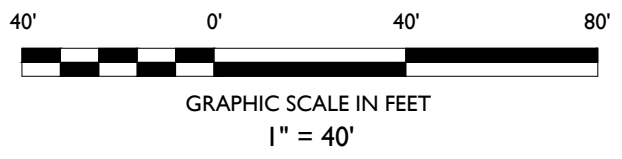
SIGNAGE REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§5.9.1.B	MULTI-TENANT SIGN HEIGHT: 15 FT ⁽¹⁾	<15 FT
§5.9.1	SIGN AREA: 6 SF PER 1 FT OF SETBACK	<150 SF
§5.9.1	MAXIMUM SIGN AREA: 150 SF ⁽¹⁾	<150 SF
§5.9.1.A	SIGN SETBACK: 10 FT	25.2 FT
§5.9.1.A	RESIDENTIAL SETBACK: 100 FT	200.6 FT

- MAXIMUM SIGN AREA SHALL NOT INCLUDE DECORATIVE ELEMENTS SUCH AS BASES, COLUMNS OR CAPS
- MINIMUM HEIGHT OF A SIGN BASE SHALL BE 2 FT IN HEIGHT
- EACH INDIVIDUAL TENANT SIGN SHALL NOT EXCEED 4 FT IN HEIGHT

OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 5.11.M	FAST FOOD PARKING: 1 SPACE PER 75 OF GFA (2,522 SF + 2,402 SF) = 4,924 SF (4,924 SF) / (75 SF) = 66 SPACES	125 SPACES
	RESTAURANT PARKING: 1 SPACE PER 100 SF OF GFA (2,502 SF) / (100 SF) = 25 SPACES	
	RETAIL PARKING: 1 SPACE PER 200 SF OF GFA (3,228 SF + 1,451 SF + 1,505 SF) = 6,184 SF (6,184 SF) / (200 SF) = 31 SPACES	
	TOTAL: 66 + 25 + 31 = 122 SPACES	
§ 5.11.M	STACKING SPACES (WEST FAST FOOD): 8 STACKING CARS (9 FT X 18 FT)	15 SPACES
§ 5.11.M	STACKING SPACES (EAST FAST FOOD): 8 STACKING CARS (9 FT X 18 FT)	10 SPACES
§ 5.11.Q	90° PARKING: 9 FT X 18 FT WITH 24 FT AISLE ⁽¹⁾	9 FT X 17 FT W/ 24 FT AISLE
§ 5.19	LANDSCAPE REQUIREMENT: 20 FT WIDTH ALONG RESIDENTIAL 3 FT HIGH BERM WITH A 2 FT CROWN	PROVIDED
§ 5.11.P.I	LOADING AREA: 10 FT X 50 FT WITH 15 FT CLEARANCE	17 FT X 50 FT

(1) PARKING SPACE LENGTH MAY BE REDUCED TO 17 FT WHERE 7 FT SIDEWALK OR LANDSCAPE IS PROVIDED

- GENERAL NOTES**
- THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 - THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 - ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 - THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 - THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
 - THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
 - THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTOR'S EXPENSE.
 - CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW BY STONEFIELD ENGINEERING & DESIGN, LLC. WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
 - THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 - THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 - THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
 - SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.



ISSUE	DATE	BY	DESCRIPTION
1	11/29/2023	JRC/JJP	SUBMISSION FOR REZONING

NOT APPROVED FOR CONSTRUCTION

STONEFIELD
engineering & design

Detroit, MI · Rutherford, NJ · New York, NY
Boston, MA · Princeton, NJ · Tampa, FL
www.stonefielddg.com

607 Shelby Suite 200, Detroit, MI 48226
Phone 248.247.1115

SITE DEVELOPMENT PLANS

9101 HIGHLAND ROAD

PROPOSED MULTI-TENANT BUILDING

PARCEL ID: 12-23-227-003
9101 HIGHLAND ROAD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY, MICHIGAN

J. REID COOKSEY, P.E.
MICHIGAN LICENSE No. 6201069428
LICENSED PROFESSIONAL ENGINEER

STONEFIELD
engineering & design

SCALE: 1" = 40' PROJECT ID: DET-230229

TITLE: **SITE PLAN**

DRAWING: **C-3**

NOTICE: DET-230229-003-001-18 INVESTIGATION OF HIGHLAND ROAD, WHITE LAKE, MICHIGAN, FOR SUBMITTING

MEMO

VIA EMAIL: ewilliams@stonefieldeng.com

To: **Stonefield Engineering**

From: **Jacob Swanson, PE
Paul Bonner, EIT
Fleis & VandenBrink**

Date: **January 11, 2024**

Re: **9101 Highland Road (M-59) – Commercial Development
White Lake Township, Michigan
Traffic Impact Study**

1 INTRODUCTION

This memorandum presents the results of the Traffic Impact Study (TIS) for the proposed commercial development in White Lake Township, Michigan. The project site is generally located on the south side of Highland Road (M-59), approximately 1,000-feet east of Fisk Road, as shown on the attached **Figure 1**. The proposed commercial development includes construction of commercial development that includes retail and restaurant land uses. The project site is currently vacant and was previously occupied by the Calvary Lutheran Church, which will be razed with the construction of the proposed development. Site access is proposed via one (1) full access driveway on Highland Road (M-59). The study section of Highland Road (M-59) is under the jurisdiction of the Michigan Department of Transportation (MDOT). The purpose of this TIS is to evaluate the impact of the proposed development on the adjacent roadway network, as part of the site plan approval and driveway permitting processes.

Scope of work for this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practices, and information published by the Institute of Transportation Engineers (ITE). Study analyses were completed using Synchro/SimTraffic (Version 11) traffic analysis software. Sources of data for this study include F&V subconsultant Quality Counts (QC), MDOT, the Road Commission for Oakland County (RCOC), White Lake Township, the Southeast Michigan Council of Governments (SEMCOG), and ITE.

2 BACKGROUND

2.1 EXISTING ROAD NETWORK

Lane uses and traffic control at the study intersections are shown on the attached **Figure 2** and study roadways are further described below. For purposes of this study, all minor street and driveways were assumed to have an operating speed of 25 miles per hour (mph), unless otherwise noted.

Highland Road (M-59) generally runs in the east / west directions, adjacent to the north side of the project site. The study section of roadway is classified as an *Other Principal Arterial*, is under the jurisdiction of MDOT, has a posted speed limit of 50-mph, and has an Average Annual Daily Traffic (AADT) volume of approximately 33,400 (MDOT 2022) vehicles per day (vpd). The study section of roadway provides a typical five-lane cross-section, with two (2) lanes of travel in each direction and a center two-way left-turn lane (TWLTL). At the signalized intersection with Fisk Road, Highland Road (M-59) widens to provide an exclusive eastbound right-turn lane. Additionally, Highland Road (M-59) widens to provide an exclusive westbound right-turn lane at the intersection with the JOANN Fabric driveway.

Fisk Road generally runs in the north / south directions, west of the project site, terminating at Highland Road (M-59). The study section of roadway is classified as a *Local Road*, is under the jurisdiction of RCOC, has an assumed prima facie speed limit of 55-mph, and has an AADT volume of approximately 1,256 vpd (MDOT 2022). The study section of Fisk Road provides typical three-lane cross-section, with one (1) lane of travel in each direction and a center two-way left-turn lane (TWLTL).

**27725 Stansbury Boulevard, Suite 195
Farmington Hills, MI 48334
P: 248.536.0080
F: 248.536.0079
www.fveng.com**

2.2 EXISTING TRAFFIC VOLUMES

F&V subconsultant QC collected existing Turning Movement Count (TMC) data on Wednesday, December 13, 2023, during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods at the following study intersections:

- Highland Road (M-59) & Fisk Road
- Highland Road (M-59) & JOANN Fabric Driveway

During collection of the turning movement counts, Peak Hour Factors (PHFs), pedestrian and bicycle volumes, and commercial truck percentages were recorded and used in the traffic analysis. The peak hours of each of the study intersections were utilized and the through volumes were carried through the roadway network and balanced upwards at the proposed site driveways. Therefore, traffic volumes used in the analysis and shown on the attached traffic volume figures may not match the raw traffic volumes shown in the data collection.

The weekday AM and PM peak hours for the adjacent roadway network were observed to generally occur between 7:30 AM to 8:30 AM and 4:15 PM to 5:15 PM, respectively. F&V collected an inventory of existing lane use and traffic controls, as shown on the attached **Figure 2**. F&V also obtained the current signal timing permit for the study intersection of Highland Road (M-59) & Fisk Road from MDOT. The existing 2023 peak hour traffic volumes used in the analysis are shown on the attached **Figure 3**. All applicable background data referenced in this memorandum are attached.

3 EXISTING CONDITIONS

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro/SimTraffic (Version 11) traffic analysis software. This analysis was based on the existing lane use and traffic control shown on the attached **Figure 2**, the exiting peak hour traffic volumes shown on the attached **Figure 3**, and methodologies presented in the *Highway Capacity Manual, 6th Edition* (HCM6).

Descriptions of LOS “A” through “F” as defined in the HCM6, are attached. Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. Additionally, SimTraffic network simulations were reviewed to evaluate network operations and vehicle queues. The results for the exiting conditions analysis are attached and shown in **Table 1**.

Table 1: Existing Intersection Operations

Intersection	Control	Approach	Existing Conditions			
			AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Highland Road (M-59) & Fisk Road	Signalized	EBL	14.0	B	53.1	D
		EBT	27.7	C	18.2	B
		EBR	14.7	B	11.0	B
		WBL	15.9	C	11.6	B
		WBTR	22.7	C	25.3	C
		NBL	25.1	C	47.9	D
		NBTR	22.3	C	38.0	D
		SBL	27.3	C	67.0	E
		SBTR	24.7	C	47.1	D
	Overall	25.3	C	28.6	C	
2 Highland Road (M-59) & JOANN Fabric Drive	Stop (Minor)	EBL	10.8	B	17.2	C
		WB	Free			
		SB	12.2	B	40.6	E

The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better, during both the AM and PM peak hours, with the following exceptions:

Highland Road (M-59) & Fisk Road

- During the PM peak hour: the southbound left-turn movement currently operates at LOS E.

Review of SimTraffic network simulations indicates generally acceptable operations. Occasional periods of vehicle queues were observed for this movement; however, the majority of vehicle queues were observed to be processed within each cycle length, leaving minimal residual vehicle queueing. Additionally, any remaining vehicle queues were observed to dissipate and were not present throughout the PM peak hour.

Highland Road (M-59) & JOANN Fabric Drive

- During the PM peak hour: the southbound approach currently operates at LOS E.

The southbound approach was designed to prohibit egress left-turns; however, the left-turn traffic from this approach is causing the reported delay. The total volume of southbound egress traffic during the PM peak hour is very low (3 vehicles), which includes two (2) vehicles making an egress left-turn movement. Additionally, although the delay experienced by these vehicles causes the approach to operate at LOS E, review of SimTraffic microsimulations indicates acceptable operations; the 95th percentile queue length reported for this approach was approximately 15-feet (~1 vehicle), which is not significant.

4 BACKGROUND CONDITIONS (2025)

Historical population and economic profile data was obtained for White Lake Township from the Southeast Michigan Council of Governments (SEMCOG) database, in order to calculate a background growth rate to project the existing 2023 peak hour traffic volumes to the site buildout year of 2025. Population and employment projections from 2020 to 2050 were reviewed and show average annual growth rates of 0.41% and 0.28%, respectively. Therefore, a conservative background growth rate of **0.5%** per year was applied to the existing peak hour traffic volumes to forecast the background 2025 peak hour traffic volume **without the proposed development**, as shown on the attached **Figure 4**.

In addition to background growth, it is important to account for traffic that will be generated by approved developments within the study area that have yet to be constructed or are currently under construction. At the time of this study, no background developments were identified within the vicinity of the project site.

Background peak hour vehicle delays and LOS **without the proposed development** were calculated at the study intersections based on the existing lane use and traffic control shown on the attached **Figure 2**, the background peak hour traffic volumes shown on the attached **Figure 4**, and methodologies presented in the HCM6. The results of the background conditions analysis are attached and summarized in **Table 2**.

Table 2: Background Intersection Operations

Intersection	Control	Approach	Existing Conditions				Background Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Highland Road (M-59) & Fisk Road	Signal	EBL	14.0	B	53.1	D	14.1	B	56.4	E	0.1	-	3.3	D→E
		EBT	27.7	C	18.2	B	28.1	C	18.3	B	0.4	-	0.1	-
		EBR	14.7	B	11.0	B	14.7	B	11.0	B	0.0	-	0.0	-
		WBL	15.9	C	11.6	B	16.0	C	11.8	B	0.1	-	0.2	-
		WBTR	22.7	C	25.3	C	22.9	C	25.8	C	0.2	-	0.5	-
		NBL	25.1	C	47.9	D	25.2	C	48.1	D	0.1	-	0.2	-
		NBTR	22.3	C	38.0	D	23.3	C	38.0	D	0.0	-	0.0	-
		SBL	27.3	C	67.0	E	27.3	C	67.6	E	0.0	-	0.6	-
		SBTR	24.7	C	47.1	D	24.7	C	47.4	D	0.0	-	0.3	-
		Overall	25.3	C	28.6	C	25.6	C	29.0	C	0.3	-	0.4	-
2 Highland Road (M-59) & JOANN Fabric Dr.	Stop (Minor)	EBL	10.8	B	17.2	C	10.9	B	17.4	C	0.1	-	0.2	-
		WB	Free				Free				N/A			
		SB	12.2	B	40.6	E	12.3	B	41.7	E	0.1	-	1.1	-

The results of the background conditions analysis indicates that all approaches and movements at the study intersections are expected to continue operating in a manner similar to the existing conditions analysis, with minor increases in delays and the following additional impacts to LOS:

Highland Road (M-59) & Fisk Road

- During the PM peak hour: The eastbound left-turn movement is expected to operate at LOS E.

Review of SimTraffic network simulations indicates generally acceptable operations. Occasional periods of vehicle queues were observed for the eastbound and southbound left-turn movements during the PM peak hour; however, the majority of vehicle queues were observed to be processed within 1-2 cycle length, leaving minimal residual vehicle queueing. Additionally, any remaining vehicle queues were observed to dissipate and were not present throughout the peak hour.

Review of SimTraffic microsimulations throughout the remaining study roadway network indicates acceptable operations and minimal vehicle queueing during both the AM and PM peak hours.

5 SITE TRIP GENERATION

The number of weekday peak hour (AM and PM) and daily vehicle trips that would be generated by the proposed development were calculated using the rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 11th Edition*. The proposed project includes a commercial development with retail and restaurant land uses. For purposes of this study the following land uses were assumed in the analysis: a coffee shop with drive-through, two (2) fast-casual restaurants, and retail space. Additionally, the two potential fast-casual restaurants will not have breakfast service; therefore, AM peak hour trips were not included for this land use. The site trip generation forecast utilized for this study is summarized in **Table 3**.

Table 3: Site Trip Generation Summary

Land Use	ITE Code	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
					In	Out	Total	In	Out	Total
Strip Retail Plaza (<40k SF)	822	6,184	SF	491	9	6	15	28	27	55
<i>Pass-By (0% AM, 40% PM)</i>				98	0	0	0	11	11	22
New Trips				393	9	6	15	17	15	33
Fast Casual Restaurant	930	4,904	SF	476	0	0	0	34	28	62
<i>Pass-By (0% AM, 43% PM)</i>				205	0	0	0	13	13	26
New Trips				271	0	0	0	21	15	36
Coffee Shop with Drive-Through	937	2,522	SF	1,346	111	106	217	49	49	98
<i>Pass-By (50% AM, 55% PM)</i>				707	54	54	108	27	27	54
New Trips				639	57	52	109	22	22	44
Total Trips				2,313	120	112	232	111	104	215
<i>Total Pass-By</i>				<i>1,010</i>	<i>54</i>	<i>54</i>	<i>108</i>	<i>51</i>	<i>51</i>	<i>102</i>
Total New Trips				1,303	66	58	124	60	53	113

As is typical of commercial developments, a portion of the trips generated by the proposed development are from vehicles already on the adjacent roadway network that will pass the site on their way from an origin to their ultimate destination. Therefore, not all traffic at the site driveway is necessarily new traffic added to the street system. These trips are therefore reduced from the total external trips generated by a study site. This percentage of the trips generated by the development are considered “pass-by”, which are already present of the adjacent roadway network. The percentage of pass-by used in this analysis was determined based on the rates published by ITE in the *Trip Generation Manual, 11th Edition*.

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roadway network based on the proposed stie access plan and driveway configurations, the existing peak hour traffic patterns in the adjacent roadway network, and methodologies published by ITE. The ITE trip distribution



methodology assumes that new trips will enter the network and access the development, then leave the development and return to their direction of origin, whereas pass-by trips will enter and exit the development in their original direction of travel. The site trip distributions utilized in the analysis are summarized in **Table 4**.

Table 4: Site Trip Distribution

New Trips				Pass-By Trips		
AM	PM	To/From	Via	Direction	AM	PM
7%	12%	North	Fisk Road			
40%	52%	East	Highland Road (M-59)	Westbound	42%	56%
53%	36%	West	Highland Road (M-59)	Eastbound	58%	44%
100%	100%	Total			100%	100%

The vehicular traffic volumes shown in **Table 3** were distributed to the study roadway network according to the distribution shown in **Table 4**. Therefore, the site generated trips shown on the attached **Figure 5** were added to the background peak hour traffic volumes shown on the attached **Figure 4**, in order to calculate the future peak hour traffic volumes, with the addition of the proposed development. Future peak hour traffic volumes are shown on the attached **Figure 6**.

7 FUTURE CONDITIONS (2025)

Future peak hour vehicle delays and LOS *with the addition of the site-generated trips from the proposed development*, were calculated based on the proposed lane use and traffic controls shown on the attached **Figure 2**, the future peak hour traffic volumes shown on the attached **Figure 6**, and the methodologies presented in the HCM6. Results of the future conditions analysis are attached and summarized in **Table 5**.

Table 5: Future Intersection Operations

Intersection	Control	Approach	Background Conditions				Future Conditions				Difference			
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1 Highland Road (M-59) & Fisk Road	Signal	EBL	14.1	B	56.4	E	14.4	B	60.0	E	0.3	-	3.6	-
		EBT	28.1	C	18.3	B	29.4	C	18.5	B	1.3	-	0.2	-
		EBR	14.7	B	11.0	B	14.7	B	11.0	B	0.0	-	0.0	-
		WBL	16.0	C	11.8	B	16.5	C	12.0	B	0.5	-	0.2	-
		WBTR	22.9	C	25.8	C	23.5	C	26.5	C	0.0	-	0.0	-
		NBL	25.2	C	48.1	D	25.2	C	48.1	D	0.0	-	0.0	-
		NBTR	23.3	C	38.0	D	23.3	C	38.0	D	0.0	-	0.0	-
		SBL	27.3	C	67.6	E	27.5	C	70.3	E	0.2	-	2.7	-
		SBTR	24.7	C	47.4	D	24.7	C	47.4	D	0.0	-	0.0	-
	Overall	25.6	C	29.0	C	26.5	C	29.8	C	0.9	-	0.8	-	
2 Highland Road (M-59) & JOANN Fabric Dr.	Stop (Minor)	EBL	10.9	B	17.4	C	11.0	B	17.8	C	0.1	-	0.4	-
		WB	Free				Free				N/A			
		SB	12.3	B	41.7	E	12.5	B	43.3	E	0.2	-	1.6	-
3 Highland Road (M-59) & Site Drive	Stop (Minor)	EB	N/A				Free				N/A			
		WBL					10.5	B	10.4	B				
		NB					21.7	C	33.1	D				

Results of the future conditions analysis indicate that all approaches and movements at the study intersections are expected to continue operating in a manner similar to the background conditions analysis, with minor increases in delays and no additional impacts to LOS. Additionally, the proposed site driveway is expected to operate acceptably, at LOS D or better during both the AM and PM peak hours.

8 ACCESS MANAGEMENT

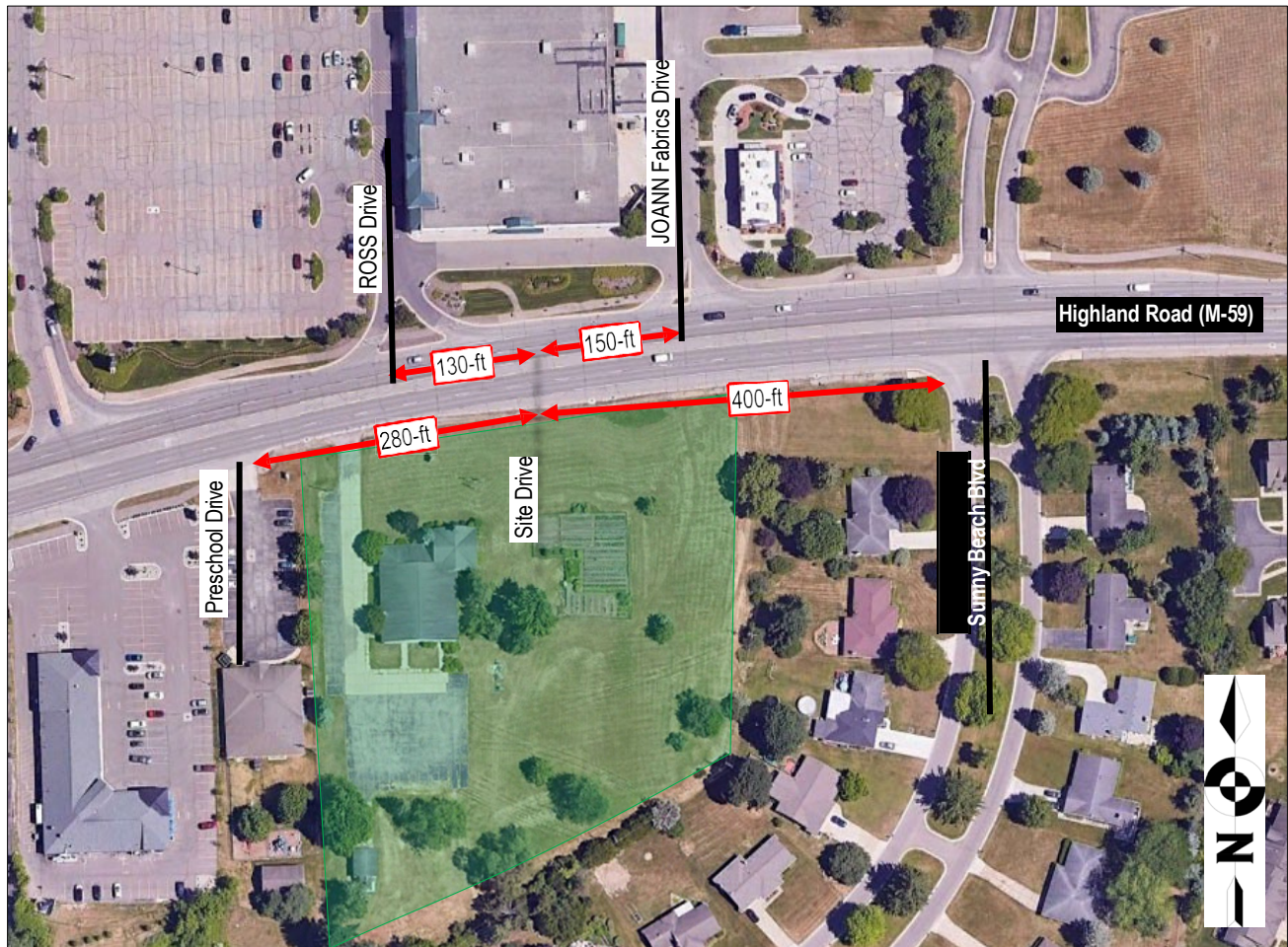
8.1 DRIVEWAY SPACING EVALUATION

The MDOT *Geometric Design Guidance* (Section 1.2.2) criteria were utilized to evaluate the location of the proposed site driveway, in relation to nearby intersections and access points within close proximity to the project site. The intersection corner clearance criteria were evaluated for the 50-mph section of Highland Road (M-59), adjacent to the project site. The distance of the proposed site driveway from nearby intersections and access points, and the warranting criteria are summarized in **Table 6** and displayed in **Exhibit 1**.

Table 6: Desirable Corner Clearance Summary

Adjacent Driveways & Intersections			Distance	Criteria	Meets
Site Drive	to	Preschool Drive	280 feet	455 feet	NO
Site Drive	to	Sunny Beach Boulevard	400 feet	170 feet	YES
Site Drive	to	JOANN Fabrics Drive	150 feet	750 feet	NO
Site Drive	to	ROSS Drive	130 feet	750 feet	NO

Exhibit 1: Proposed Driveway Spacing



The results of the driveway spacing analysis indicate that the location of the proposed site driveway on Highland Road (M-59) is not expected to meet the desirable MDOT spacing criteria, in relation to the nearby intersection and driveways. However, there is not sufficient property frontage to meet the recommended spacing criteria. Additionally, the development site plan includes proposed future cross access, stubbed at the property line to the west; this would provide improved site access, should the adjacent property ever be redeveloped, permitting this cross access between the nearby developments on the south side of Highland Road (M-59).

8.2 AUXILIARY TURN LANE EVALUATION

The MDOT auxiliary turn lane criteria were evaluated at the proposed site driveway on Highland Road (M-59). Highland Road (M-59) currently provides an existing center two-way left-turn lane (TWLTL); therefore, the left-turn lane criteria was not evaluated at the proposed site driveway. This analysis was based on the future peak hour traffic volumes shown on the attached **Figure 6**. The results of the analysis are shown on the attached chart and are summarized in **Table 7**.

Table 7: Right-turn Treatment Criteria Evaluation Summary

Intersection	Peak Period		Recommendation
	AM Peak Hour	PM Peak Hour	
Highland Road (M-59) at Site Drive	Right-Turn Lane	Right-Turn Lane	Right-Turn Lane

The result of the auxiliary turn lane evaluation indicates that a right-turn deceleration lane is warranted on Highland Road (M-59) at the proposed site driveway.

9 FUTURE CONDITIONS WITH IMPROVEMENTS ANALYSIS

Signal timing optimizations were reviewed at the signalized study intersection of Highland Road (M-59) & Fisk Road and were determined to adequately improve the study intersection to LOS D or better during the PM peak hour. Additionally, the recommended right-turn lane was included in the future improvements analysis. The results of the future intersection operations, with the recommended mitigation measures are attached and summarized in **Table 8**.

Table 8: Future Intersection Operations with Improvements

Intersection	Control	Approach	Future Conditions				Future w/ IMP				Difference							
			AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak					
			Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS				
1 Highland Road (M-59) & Fisk Road	Signal	EBL	14.4	B	60.0	E	No Change			50.7	D	No Change			-9.3	E→D		
		EBT	29.4	C	18.5	B									21.2	C	2.7	B→C
		EBR	14.7	B	11.0	B									12.6	B	1.6	-
		WBL	16.5	C	12.0	B									15.8	B	3.8	-
		WBTR	23.5	C	26.5	C									46.7	D	20.2	C→D
		NBL	25.2	C	48.1	D									43.0	D	-5.1	-
		NBTR	23.3	C	38.0	D									34.1	C	0.0	D→C
		SBL	27.5	C	70.3	E									54.0	D	-16.3	E→D
		SBTR	24.7	C	47.4	D									40.9	D	-6.5	-
		Overall	26.5	C	29.8	C									37.7	D	7.9	C→D
3 Highland Road (M-59) & Site Drive	Stop (Minor)	EB	Free				Free				N/A							
		WBL	10.5	B	10.4	B	10.5	B	10.4	B	0.0	-	0.0	-				
		NB	21.7	C	33.1	D	20.8	C	32.9	D	-0.9	-	-0.2	-				

The results of the future conditions with improvements analysis indicate that, with the implementation of the recommended mitigation measures, all study intersection approaches and movements are expected to continue to operate acceptably, at LOS D or better during both the AM and PM peak hours. Review of SimTraffic microsimulations also indicates improved operations and reduced vehicle queues at the signalized study intersection of Highland Road (M-59) & Fisk Road during the PM peak hour.

10 QUEUEING ANALYSIS

The drive-through vehicle queueing was reviewed to determine if the proposed on-site queue lengths provide adequate storage to accommodate the projected operations. The development plan includes two (2) drive-through windows; however, only the coffee-shop has an order board. The fast casual restaurant provides a pick-up window only, for order ahead and food delivery services. Therefore, the drive-through queueing analysis was performed only for the coffee-shop, in order to insure adequate on-site storage is provided to accommodate the projected peak hour trip generation demand.

The coffee-shop is expected to have a peak trip generation of 111 trips during the AM peak hour. Coffee-shops with drive-through typically have an average service rate of approximately 80 vehicles per hour, with 80% of customers utilizing the drive-through. Therefore, of the total vehicles generated by the proposed coffee-shop during the peak period, it is estimated that approximately 89 vehicles will utilize the drive-through; the remaining vehicles will park and walk-in. The evaluation of the queue length included two criteria:

1. A queueing analysis was performed to determine if the projected demand of the site exceeds the service rate and calculate the projected queueing. The projected demand (89 veh/hr) is greater than the service rate (80 veh/hr) of the site; therefore, there is a potential for vehicles to queue past the pickup window, as the demand exceeds the capacity.
2. A Poisson Distribution was performed to determine the probability of random arrivals. The results indicate a maximum potential of five (5) vehicles arriving at any given time.

The results of the analysis are summarized in **Table 9**.

Table 9: Vehicle Queuing Analysis

DRIVE-THROUGH STACKING SPACE CALCULATOR	
Number of Arrivals	86
Time per Vehicle (s)	45
Service Rate (veh/hr)	80
Drive-Through Queue (veh)	9
Peak Arrival (veh)	5
Vehicle Length	25
TOTAL QUEUE (ft)	350

The results of the projected vehicle queuing analysis indicates that the maximum anticipated arrivals generated by the proposed coffee-shop with drive-through can be adequately accommodated within the available queue length, without impacting internal site circulation or the operations along Highland Road (M-59).

11 CONCLUSIONS

The conclusions of this TIS are as follows:

1. Existing Conditions (2023)

- The results of the existing conditions analysis indicates that all approaches and movements at the study intersections are currently operating acceptably, at LOS D or better, during both the AM and PM peak hours, with the following exceptions:
 - Highland Road (M-59) & Fisk Road: The SB left-turn movement is currently operating at LOS E, during the PM peak hour. Review of SimTraffic network simulations indicates generally acceptable operations. Occasional periods of vehicle queues were observed; however, the majority were observed to be processed within each cycle length, leaving minimal residual vehicle queueing.
 - Highland Road (M-59) & JOANN Fabric Drive: The SB approach is currently operating at LOS E during the PM peak hour. This approach was designed to prohibit egress left-turns; however, this traffic is causing the reported delay. The total volume of southbound egress traffic is very low (3 vehicles), which includes two (2) vehicles making an egress left-turn movement.

2. **Background Conditions (2025 No Build)**

- A conservative annual background growth rate of **0.5%** was utilized to project the existing 2023 traffic volumes to the buildout year of 2025.
- The results of the background conditions analysis indicates that the study intersections are expected to continue operating in a manner similar to the existing conditions analysis, with minor increases in delays due increases in background traffic volumes.
 - Highland Road (M-59) & Fisk Road: The EB left-turn movement is expected to operate at LOS E, during the PM peak hour.

3. **Future Conditions (2025 Build)**

- With the addition of the site-generated trips, the study intersections are expected to continue operating in a manner similar to the background conditions analysis, with no additional impacts to LOS.
- All approaches and movements at the proposed site driveway intersection with Highland Road (M-59) are expected to operate acceptably, at LOS D or better, during both the AM and PM peak hours.

4. **Access Management**

- The results of the driveway spacing analysis indicates that the location of the proposed site driveway on Highland Road (M-59) is not expected to meet the desirable MDOT spacing criteria, in relation to the nearby intersection and driveway.
 - However, there is not sufficient property frontage to meet the recommended spacing criteria. Additionally, the proposed development site plan includes proposed future cross access, stubbed at the property line to the west; this would provide improved site access, should the adjacent property ever be redeveloped, permitting this cross access between all of the nearby developments on the south side of Highland Road (M-59), east of Fisk Road.
- The MDOT auxiliary right-turn treatment criteria were evaluated at the proposed site driveway; the result of the analysis indicates that a right-turn lane is recommended on Highland Road (M-59).

5. **Future Conditions with Improvements**

- Signal timing optimizations were reviewed and were determined to adequately improve the study intersection to acceptable operations, to LOS D or better during the PM peak hour; additionally, the vehicle queues at the signalized intersection of Highland Road (M-59) & Fisk Road were observed to reduce, with the implementation of the recommended mitigation measures.

6. **Drive-Through Queueing Evaluation**

- The results of the drive-through queueing evaluation indicates that the proposed site plan can adequately accommodate the projected vehicle queueing generated by the proposed coffee-shop, without impacting internal site circulation or the operations along Highland Road (M-59).

12 RECOMMENDATIONS

The recommendation of this TIS are as follows:

- Provide a right-turn lane on Highland Road (M-59) at the proposed site driveway.
- Optimize the PM peak hour signal timing at the Highland Road (M-59) & Fisk Road intersection.

Any questions related to this memorandum, study, analysis, and results should be addressed to Fleis & VandenBrink.



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

A handwritten signature in black ink that reads "Jacob Swanson".

Digitally signed
by Jacob Swanson
Date: 2024.01.11
15:13:09 -05'00'

Attached: Figures 1 – 6
Proposed Site Plan
Traffic Volume Data
Signal Timing Permits
Synchro / SimTraffic Results
Auxiliary Lane Warrants



FIGURE 1

SITE LOCATION

9101 HIGHLAND ROAD TIS -WHITE LAKE TOWNSHIP, MI



LEGEND

SITE LOCATION



NORTH
SCALE:NOT TO SCALE

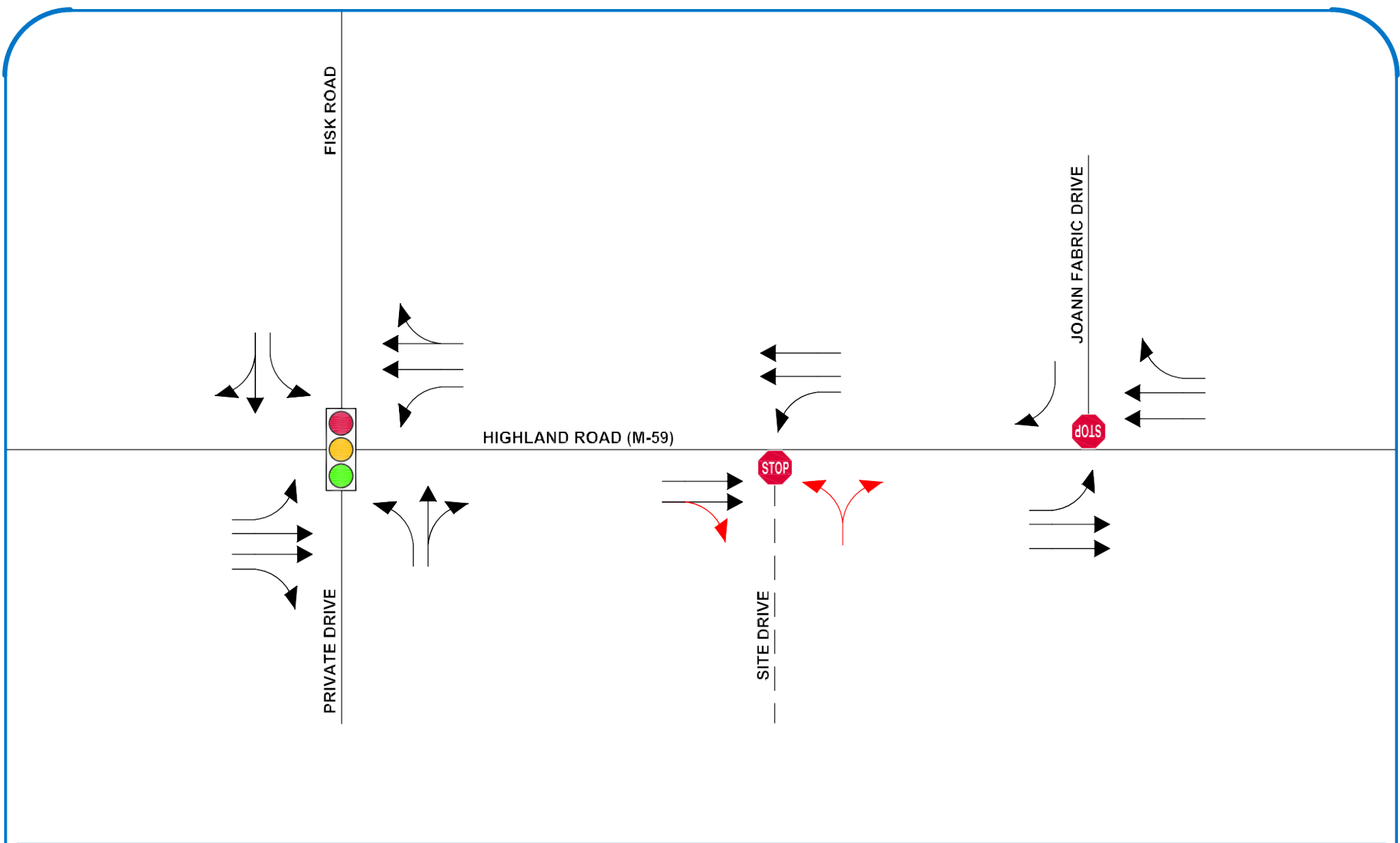








FIGURE 2

LANE USE AND TRAFFIC CONTROL

9101 HIGHLAND ROAD TIS - WHITE LAKE TOWNSHIP, MI

LEGEND

-  ROADS
-  PROPOSED ROADS
-  LANE USE
-  PROPOSED LANE USE
-  SIGNALIZED INTERSECTION
-  UNSIGNALIZED INTERSECTION



NORTH
SCALE: NOT TO SCALE

187
00
J /

ct
w
a.

26/77
+---- 800/1501
r 9/6

HIGHLAND ROAD (M-59)

+---- 950/1830

M N
)

ct
w
a.

6/16
+---- 948/1829

47/167 }
1204/1123----
9/8

ct
w
a.

r
C.O N N
T- O T

1325/1457 ----

ct
w
a.

3/4 }
1322/1453 ----

HIGHLAND ROAD (M-59)



FIGURE 4

BACKGROUND TRAFFIC VOLUMES

9101 HIGHLAND ROAD TIS -WHITE LAKE TOWNSHIP, MI

LEGEND

ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)

TRAFFIC VOLUMES (AM/PM)



NORTH
SCALE: NOT TO SCALE

30/83

+--- 831/1520
r 9/6
HIGHLAND ROAD (M-59)

+--- 927/1802
*r*49/59

6/16
 +--- 974/1860

47/167 }
 1239/1145 ---+
 9/8

rr

1294/1434 ---+
 71/52

3/4 }
 1345/1481 ---+

et:
 |
5ii
 |



FIGURE 6

FUTURE TRAFFIC VOLUMES

9101 HIGHLAND ROAD TIS -WHITE LAKE TOWNSHIP, MI

LEGEND

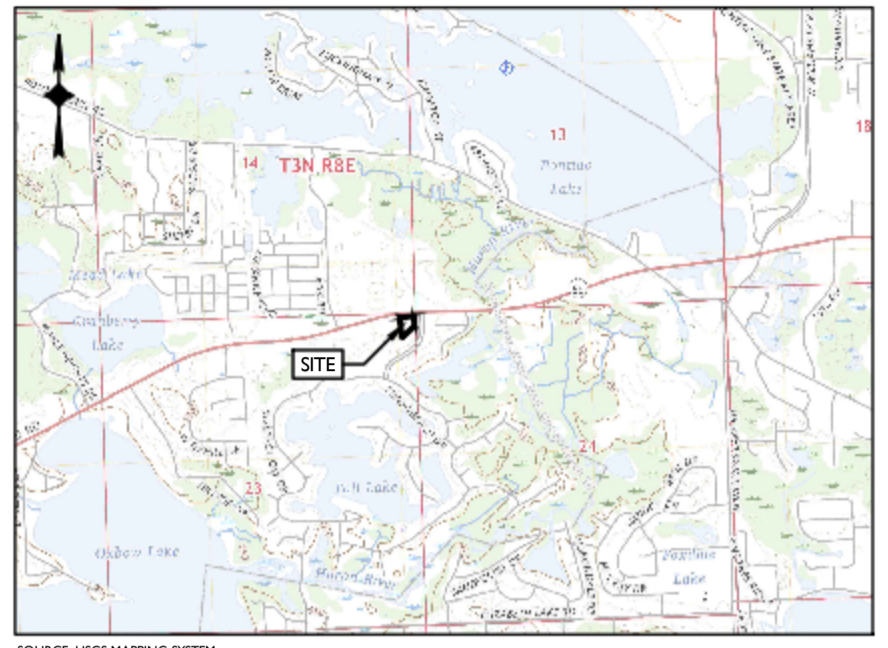
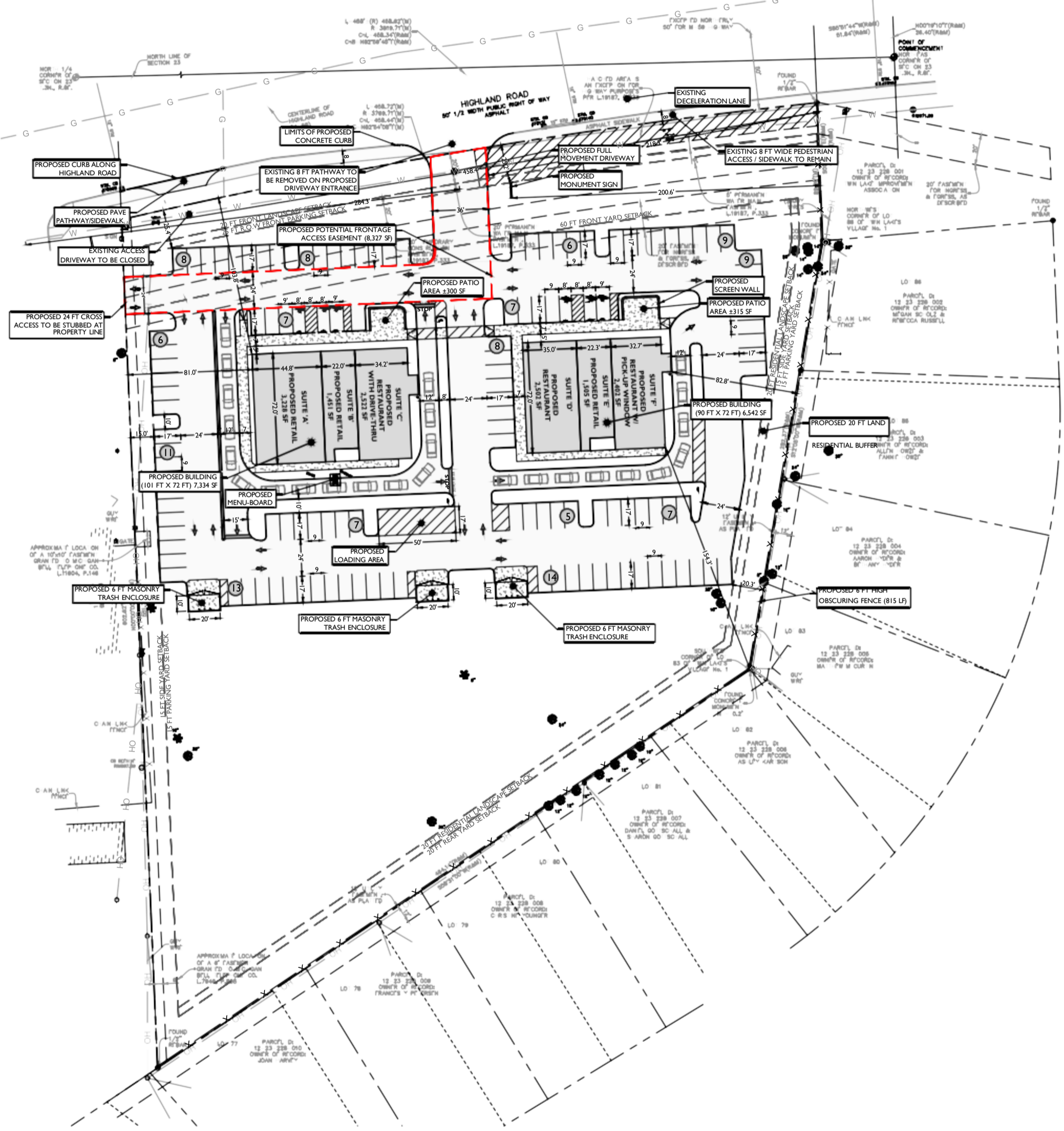
ROADS

PROPOSED ROADS

TRAFFIC VOLUMES (AM/PM)



NORTH
SCALE: NOT TO SCALE



LOCATION MAP
SCALE: 1" = 2,000'±

SYMBOL	DESCRIPTION
---	PROPERTY LINE
- - - -	SETBACK LINE
====	PROPOSED CURB
○ ○ ○ ○	PROPOSED SIGNS / BOLLARDS
■	PROPOSED BUILDING
□	PROPOSED CONCRETE
▨	PROPOSED RETAINING WALL
x x	PROPOSED OBSCURING FENCE

LAND USE AND ZONING	
PID: 12-23-227-003	
EXISTING ZONE: R1-C SINGLE FAMILY RESIDENTIAL	
REZONED TO GENERAL BUSINESS DISTRICT (GB)	
PROPOSED USE	PERMITTED USE
RESTAURANT OR FAST FOOD	PERMITTED USE
DRIVE-THRU WINDOW	SPECIAL LAND USE
RETAIL STORE	PERMITTED USE
MINIMUM LOT AREA	1 AC
MINIMUM FRONT YARD SETBACK	20 FT (2 STORIES)
MINIMUM SIDE YARD SETBACK (ONE)	15 FT
MINIMUM SIDE YARD SETBACK (BOTH)	20 FT
MINIMUM DRIVEWAY FROM RESIDENTIAL	200 FT (1)
MINIMUM FRONT LANDSCAPE SETBACK	20 FT
MINIMUM R.O.W. PARKING SETBACK	25 FT (1)
INTERIOR LANDSCAPING AREA	15% (29,335 SF)
MINIMUM DRIVEWAY SPACING (HIGHLAND ROAD)	455 FT
TRASH ENCLOSURE SETBACK	FRONT LOT LINE (1) REAR YARD
MINIMUM SIDE PARKING SETBACK	15 FT

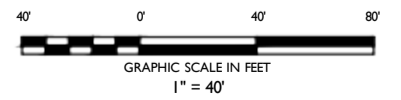
SIGNAGE REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§5.91B	MULTI-TENANT SIGN HEIGHT:	<15 FT
§5.91	SIGN AREA:	<150 SF
§5.91	6 SF PER 1 FT OF SETBACK	
§5.91A	MAXIMUM SIGN AREA:	<150 SF
§5.91A	SIGN SETBACK:	25.2 FT
§5.91A	RESIDENTIAL SETBACK:	200.6 FT

- (1) MAXIMUM SIGN AREA SHALL NOT INCLUDE DECORATIVE ELEMENTS SUCH AS BASES, COLUMNS OR CAPS
- (2) MINIMUM HEIGHT OF A SIGN BASE SHALL BE 2 FT IN HEIGHT
- (3) EACH INDIVIDUAL TENANT

OFF-STREET PARKING REQUIREMENTS		
CODE SECTION	REQUIRED	PROPOSED
§ 5.11.M	FAST FOOD PARKING: 1 SPACE PER 75 SF OF GFA (2,522 SF + 2,402 SF) = 4,924 SF (4,924 SF) (1 SPACE/ 75 SF) = 66 SPACES	125 SPACES
	RESTAURANT PARKING: 1 SPACE PER 100 SF OF GFA (2,502 SF) (1 SPACE/100 SF) = 25 SPACES	
	RETAIL PARKING: 1 SPACE PER 200 SF OF GFA (3,228 SF + 1,451 SF + 1,505 SF) = 6,184 SF (6,184 SF) (1 SPACE/200 SF) = 31 SPACES	
	TOTAL: 66 + 25 + 31 = 122 SPACES	
§ 5.11.M	STACKING SPACES (WEST FAST FOOD): 8 STACKING CARS (9 FT X 18 FT)	15 SPACES (12 FT X 20 FT)
§ 5.11.M	STACKING SPACES (EAST FAST FOOD): 8 STACKING CARS (9 FT X 18 FT)	10 SPACES (12 FT X 20 FT)
§ 5.11.Q	90° PARKING: 9 FT X 18 FT WITH 24 FT AISLE (1)	9 FT X 17 FT W/ 24 FT AISLE
§ 5.19	LANDSCAPE REQUIREMENT: 20 FT WIDTH ALONG RESIDENTIAL 3 FT HIGH BERM WITH A 2 FT CROWN	PROVIDED
§ 5.11.P1	LOADING AREA: 10 FT X 50 FT WITH 15 FT CLEARANCE	17 FT X 50 FT

(1) PARKING SPACE LENGTH MAY BE REDUCED TO 17 FT WHERE 7 FT SIDEWALK OR LANDSCAPE IS PROVIDED

- GENERAL NOTES**
1. THE CONTRACTOR SHALL VERIFY AND FAMILIARIZE THEMSELVES WITH THE EXISTING SITE CONDITIONS AND THE PROPOSED SCOPE OF WORK (INCLUDING DIMENSIONS, LAYOUT, ETC.) PRIOR TO INITIATING THE IMPROVEMENTS IDENTIFIED WITHIN THESE DOCUMENTS. SHOULD ANY DISCREPANCY BE FOUND BETWEEN THE EXISTING SITE CONDITIONS AND THE PROPOSED WORK, THE CONTRACTOR SHALL NOTIFY STONEFIELD ENGINEERING & DESIGN, LLC PRIOR TO THE START OF CONSTRUCTION.
 2. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY PERMITS AND ENSURE THAT ALL REQUIRED APPROVALS HAVE BEEN OBTAINED PRIOR TO THE START OF CONSTRUCTION. COPIES OF ALL REQUIRED PERMITS AND APPROVALS SHALL BE KEPT ON SITE AT ALL TIMES DURING CONSTRUCTION.
 3. ALL CONTRACTORS WILL, TO THE FULLEST EXTENT PERMITTED BY LAW, INDEMNIFY AND HOLD HARMLESS STONEFIELD ENGINEERING & DESIGN, LLC, AND ITS SUB-CONSULTANTS FROM AND AGAINST ANY DAMAGES AND LIABILITIES INCLUDING ATTORNEY'S FEES ARISING OUT OF CLAIMS BY EMPLOYEES OF THE CONTRACTOR IN ADDITION TO CLAIMS CONNECTED TO THE PROJECT AS A RESULT OF NOT CARRYING THE PROPER INSURANCE FOR WORKERS COMPENSATION, LIABILITY INSURANCE, AND LIMITS OF COMMERCIAL GENERAL LIABILITY INSURANCE.
 4. THE CONTRACTOR SHALL NOT DEVIATE FROM THE PROPOSED IMPROVEMENTS IDENTIFIED WITHIN THIS PLAN SET UNLESS APPROVAL IS PROVIDED IN WRITING BY STONEFIELD ENGINEERING & DESIGN, LLC.
 5. THE CONTRACTOR IS RESPONSIBLE TO DETERMINE THE MEANS AND METHODS OF CONSTRUCTION.
 6. THE CONTRACTOR SHALL NOT PERFORM ANY WORK OR CAUSE DISTURBANCE ON A PRIVATE PROPERTY NOT CONTROLLED BY THE PERSON OR ENTITY WHO HAS AUTHORIZED THE WORK WITHOUT PRIOR WRITTEN CONSENT FROM THE OWNER OF THE PRIVATE PROPERTY.
 7. THE CONTRACTOR IS RESPONSIBLE TO RESTORE ANY DAMAGED OR UNDERMINED STRUCTURE OR SITE FEATURE THAT IS IDENTIFIED TO REMAIN ON THE PLAN SET. ALL REPAIRS SHALL USE NEW MATERIALS TO RESTORE THE FEATURE TO ITS EXISTING CONDITION AT THE CONTRACTOR'S EXPENSE.
 8. CONTRACTOR IS RESPONSIBLE TO PROVIDE THE APPROPRIATE SHOP DRAWINGS, PRODUCT DATA, AND OTHER REQUIRED SUBMITTALS FOR REVIEW. STONEFIELD ENGINEERING & DESIGN, LLC WILL REVIEW THE SUBMITTALS IN ACCORDANCE WITH THE DESIGN INTENT AS REFLECTED WITHIN THE PLAN SET.
 9. THE CONTRACTOR IS RESPONSIBLE FOR TRAFFIC CONTROL IN ACCORDANCE WITH MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
 10. THE CONTRACTOR IS REQUIRED TO PERFORM ALL WORK IN THE PUBLIC RIGHT-OF-WAY IN ACCORDANCE WITH THE APPROPRIATE GOVERNING AUTHORITY AND SHALL BE RESPONSIBLE FOR THE PROCUREMENT OF STREET OPENING PERMITS.
 11. THE CONTRACTOR IS REQUIRED TO RETAIN AN OSHA CERTIFIED SAFETY INSPECTOR TO BE PRESENT ON SITE AT ALL TIMES DURING CONSTRUCTION & DEMOLITION ACTIVITIES.
 12. SHOULD AN EMPLOYEE OF STONEFIELD ENGINEERING & DESIGN, LLC, BE PRESENT ON SITE AT ANY TIME DURING CONSTRUCTION, IT DOES NOT RELIEVE THE CONTRACTOR OF ANY OF THE RESPONSIBILITIES AND REQUIREMENTS LISTED IN THE NOTES WITHIN THIS PLAN SET.



ISSUE	DATE	BY	DESCRIPTION
1	11/29/2023	JRC/JRP	SUBMISSION FOR REZONING

STONEFIELD
engineering & design

Detroit, MI • Rutherford, NJ • New York, NY
Boston, MA • Princeton, NJ • Tampa, FL
www.stonefielddesign.com

607 Shelby Suite 200, Detroit, MI 48226
Phone 246.247.1115

9101 HIGHLAND ROAD

PROPOSED MULTI-TENANT BUILDING

PARCEL ID: 12-23-227-003
9101 HIGHLAND ROAD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY, MICHIGAN

J. REID COOKSEY, P.E.
MICHIGAN LICENSE No. 6201069428
LICENSED PROFESSIONAL ENGINEER

STONEFIELD
engineering & design

SCALE: 1" = 40' PROJECT ID: DET-230219

TITLE: **SITE PLAN**

DRAWING: **C-3**



TRUE DATA TO IMPROVE MOBILITY

File Name : 16432201 - Fisk Rd -- Highland Rd_M-59

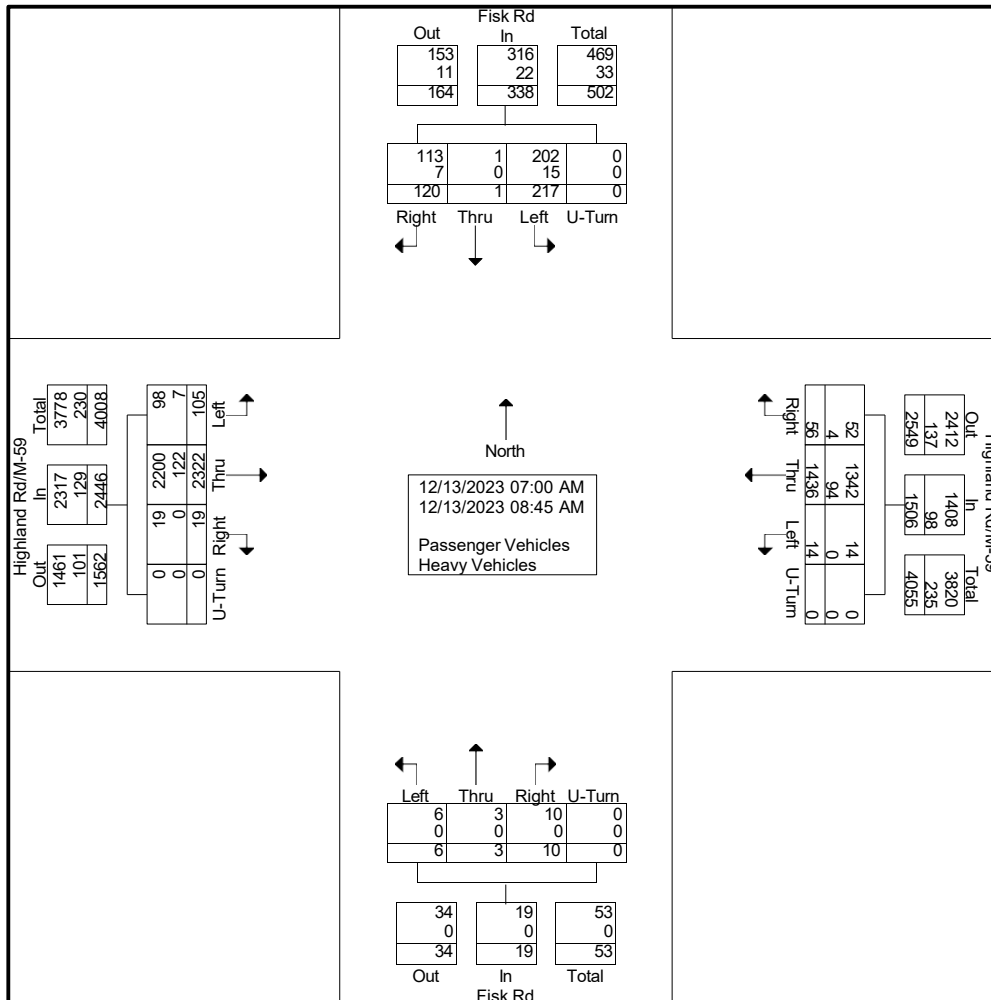
Site Code : 16432201

Start Date : 12/13/2023

Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

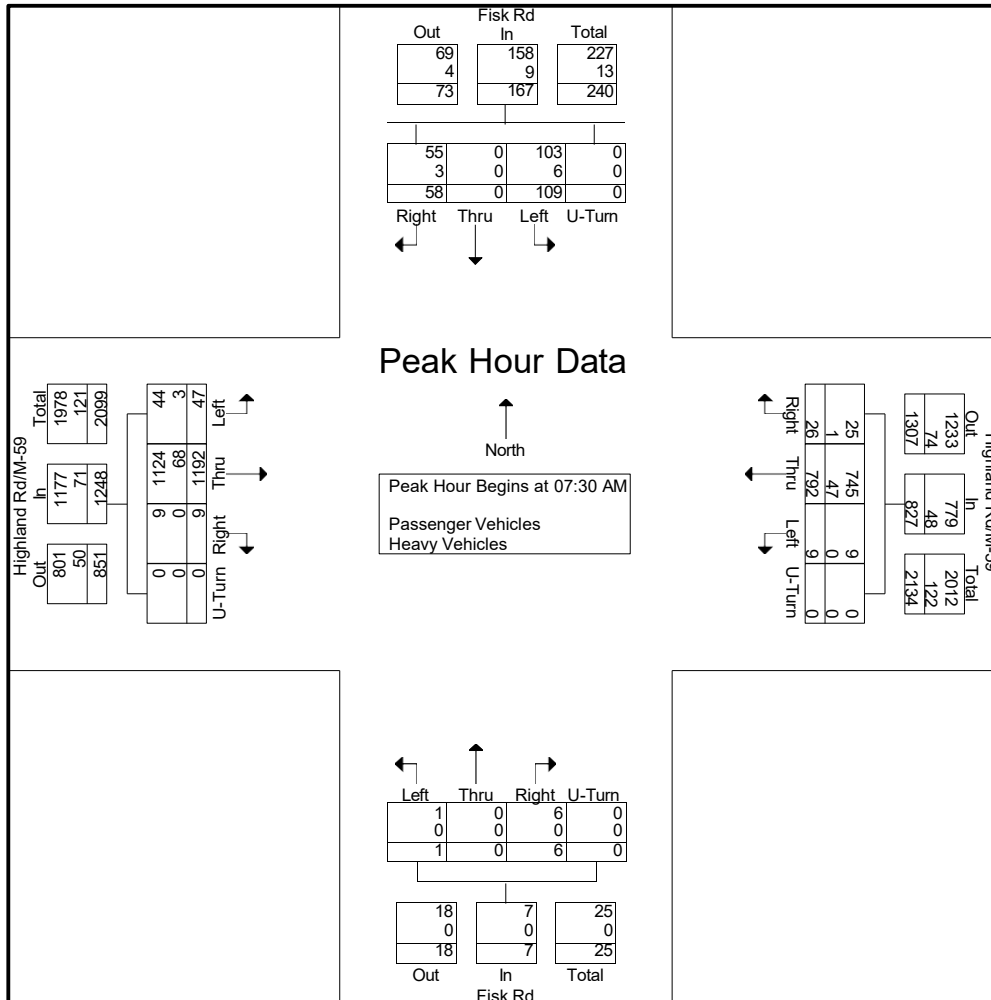
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	9	298	2	0	309	0	126	6	0	132	0	0	0	0	0	27	0	8	0	35	476
07:15 AM	12	314	2	0	328	0	151	2	0	153	0	0	2	0	2	25	0	15	0	40	523
07:30 AM	12	300	2	0	314	1	193	2	0	196	0	0	1	0	1	25	0	11	0	36	547
07:45 AM	12	319	3	0	334	2	195	6	0	203	0	0	1	0	1	29	0	13	0	42	580
Total	45	1231	9	0	1285	3	665	16	0	684	0	0	4	0	4	106	0	47	0	153	2126
08:00 AM	9	293	2	0	304	5	219	11	0	235	1	0	2	0	3	23	0	17	0	40	582
08:15 AM	14	280	2	0	296	1	185	7	0	193	0	0	2	0	2	32	0	17	0	49	540
08:30 AM	20	264	3	0	287	2	177	11	0	190	4	1	0	0	5	23	0	16	0	39	521
08:45 AM	17	254	3	0	274	3	190	11	0	204	1	2	2	0	5	33	1	23	0	57	540
Total	60	1091	10	0	1161	11	771	40	0	822	6	3	6	0	15	111	1	73	0	185	2183
Grand Total	105	2322	19	0	2446	14	1436	56	0	1506	6	3	10	0	19	217	1	120	0	338	4309
Apprch %	4.3	94.9	0.8	0		0.9	95.4	3.7	0		31.6	15.8	52.6	0		64.2	0.3	35.5	0		
Total %	2.4	53.9	0.4	0	56.8	0.3	33.3	1.3	0	35	0.1	0.1	0.2	0	0.4	5	0	2.8	0	7.8	
Passenger Vehicles	98	2200	19	0	2317	14	1342	52	0	1408	6	3	10	0	19	202	1	113	0	316	4060
% Passenger Vehicles	93.3	94.7	100	0	94.7	100	93.5	92.9	0	93.5	100	100	100	0	100	93.1	100	94.2	0	93.5	94.2
Heavy Vehicles	7	122	0	0	129	0	94	4	0	98	0	0	0	0	0	15	0	7	0	22	249
% Heavy Vehicles	6.7	5.3	0	0	5.3	0	6.5	7.1	0	6.5	0	0	0	0	0	6.9	0	5.8	0	6.5	5.8





TRUE DATA TO IMPROVE MOBILITY

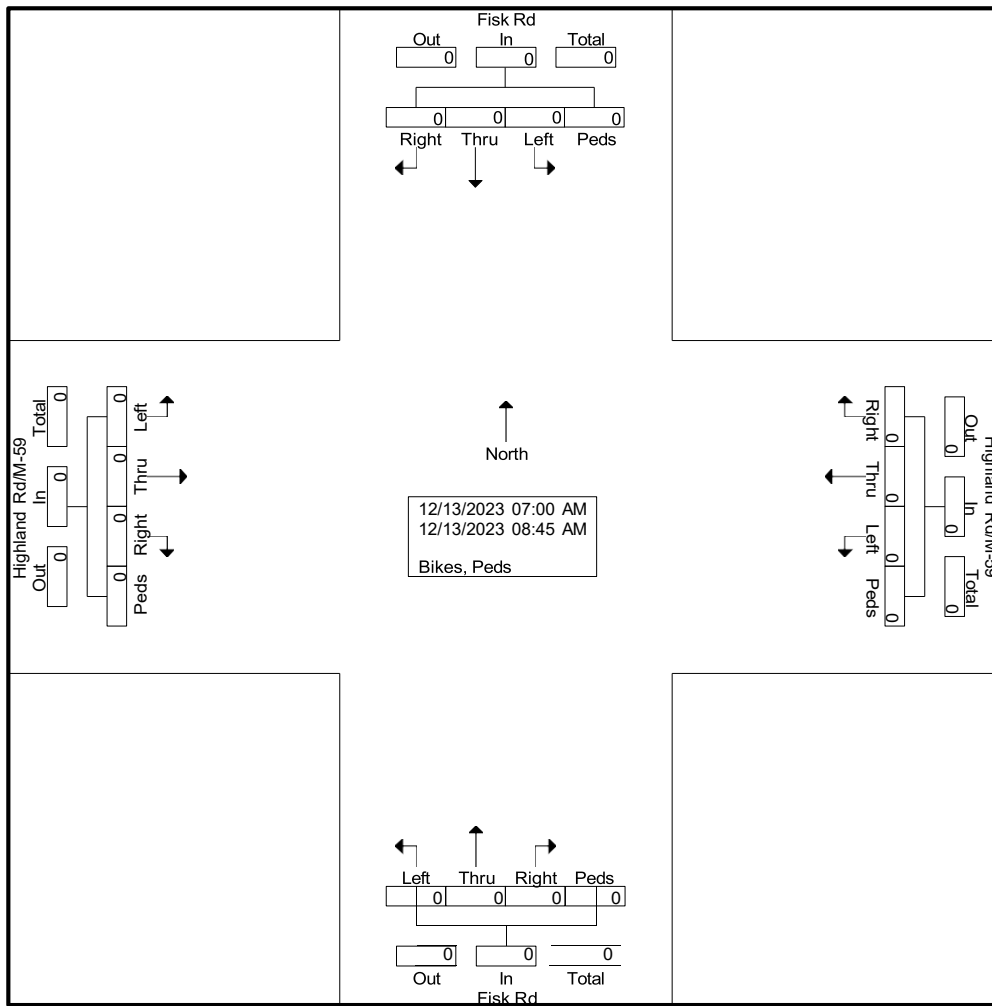
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	12	300	2	0	314	1	193	2	0	196	0	0	1	0	1	25	0	11	0	36	547
07:45 AM	12	319	3	0	334	2	195	6	0	203	0	0	1	0	1	29	0	13	0	42	580
08:00 AM	9	293	2	0	304	5	219	11	0	235	1	0	2	0	3	23	0	17	0	40	582
08:15 AM	14	280	2	0	296	1	185	7	0	193	0	0	2	0	2	32	0	17	0	49	540
Total Volume	47	1192	9	0	1248	9	792	26	0	827	1	0	6	0	7	109	0	58	0	167	2249
% App. Total	3.8	95.5	0.7	0		1.1	95.8	3.1	0		14.3	0	85.7	0		65.3	0	34.7	0		
PHF	.839	.934	.750	.000	.934	.450	.904	.591	.000	.880	.250	.000	.750	.000	.583	.852	.000	.853	.000	.852	.966
Passenger Vehicles	44	1124	9	0	1177	9	745	25	0	779	1	0	6	0	7	103	0	55	0	158	2121
% Passenger Vehicles	93.6	94.3	100	0	94.3	100	94.1	96.2	0	94.2	100	0	100	0	100	94.5	0	94.8	0	94.6	94.3
Heavy Vehicles	3	68	0	0	71	0	47	1	0	48	0	0	0	0	0	6	0	3	0	9	128
% Heavy Vehicles	6.4	5.7	0	0	5.7	0	5.9	3.8	0	5.8	0	0	0	0	0	5.5	0	5.2	0	5.4	5.7





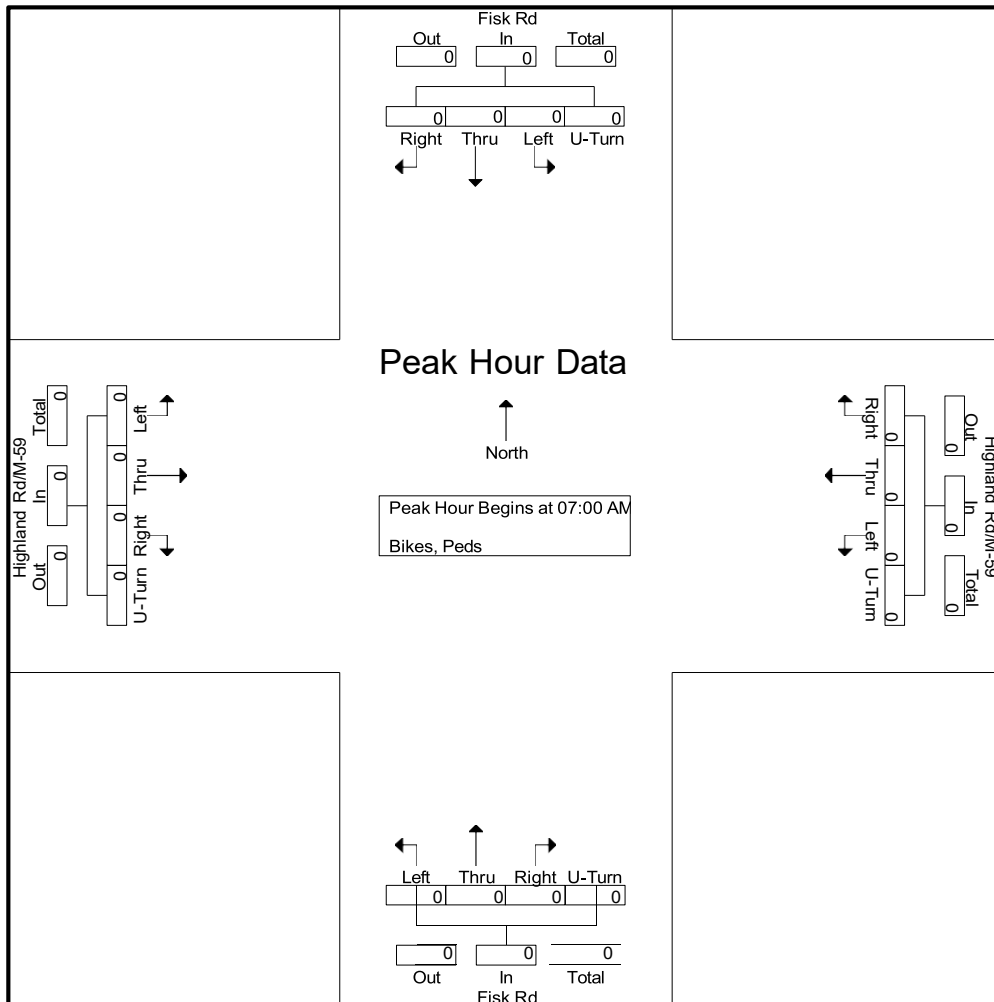
Groups Printed- Bikes, Peds

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000





TRUE DATA TO IMPROVE MOBILITY

File Name : 16432202 - Fisk Rd -- Highland Rd_M-59

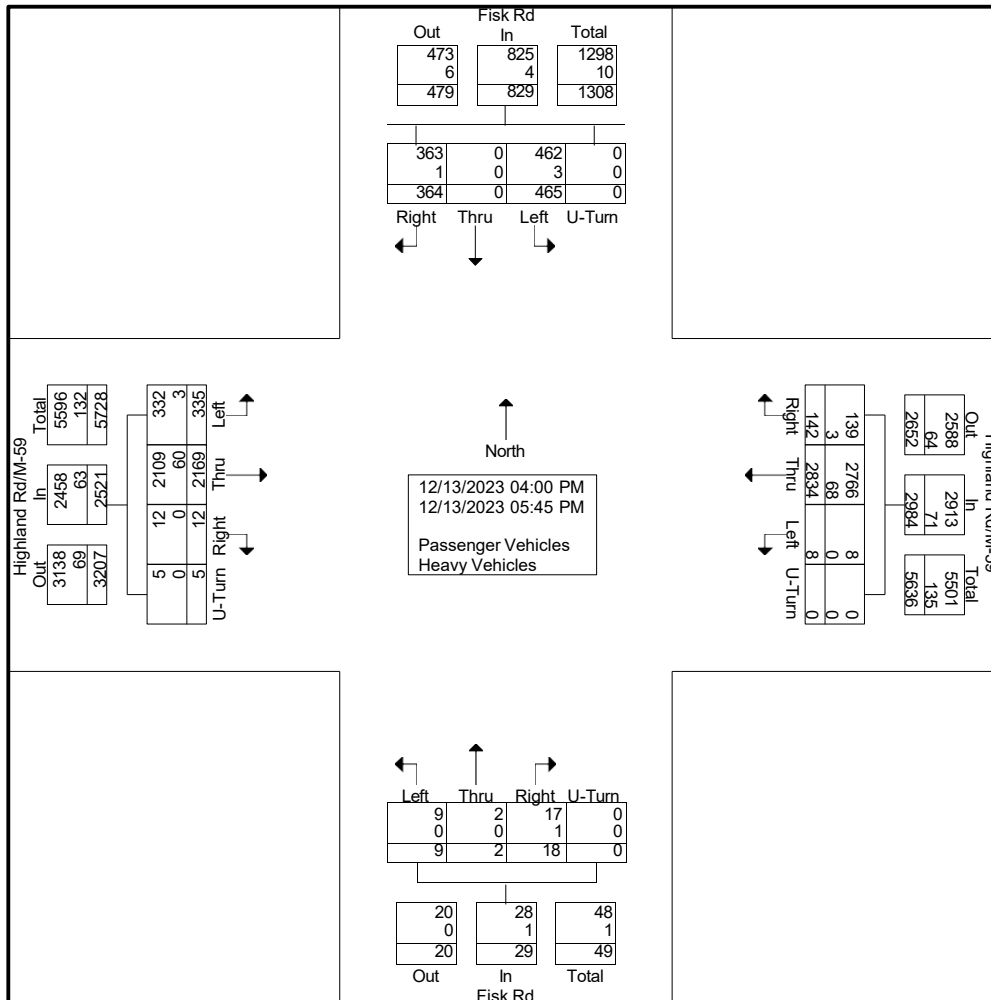
Site Code : 16432202

Start Date : 12/13/2023

Page No : 1

Groups Printed- Passenger Vehicles - Heavy Vehicles

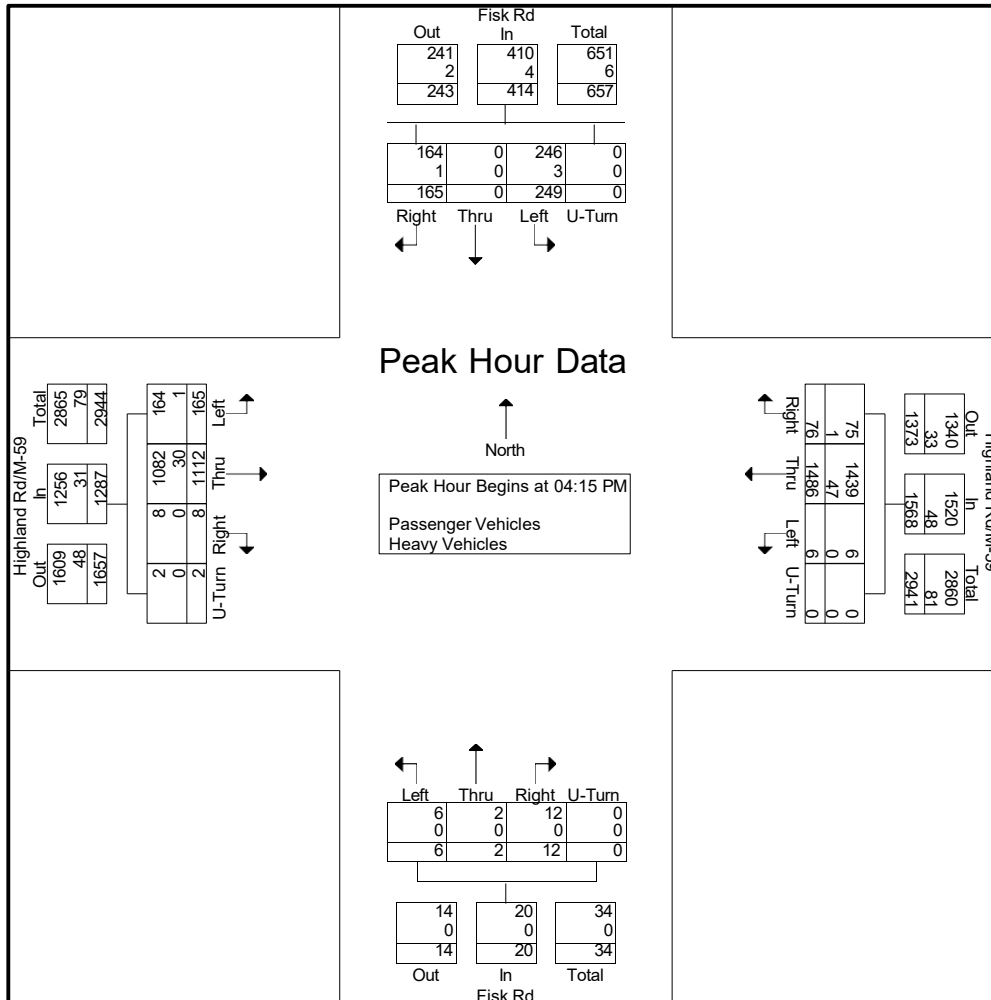
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
04:00 PM	44	269	2	1	316	1	327	22	0	350	1	0	3	0	4	63	0	46	0	109	779
04:15 PM	45	329	3	0	377	2	365	21	0	388	3	0	3	0	6	55	0	44	0	99	870
04:30 PM	32	222	4	1	259	1	363	21	0	385	1	1	2	0	4	64	0	52	0	116	764
04:45 PM	36	268	1	1	306	2	394	24	0	420	2	0	7	0	9	68	0	34	0	102	837
Total	157	1088	10	3	1258	6	1449	88	0	1543	7	1	15	0	23	250	0	176	0	426	3250
05:00 PM	52	293	0	0	345	1	364	10	0	375	0	1	0	0	1	62	0	35	0	97	818
05:15 PM	42	280	1	1	324	0	363	14	0	377	1	0	0	0	1	48	0	55	0	103	805
05:30 PM	39	261	0	0	300	0	339	18	0	357	0	0	1	0	1	58	0	53	0	111	769
05:45 PM	45	247	1	1	294	1	319	12	0	332	1	0	2	0	3	47	0	45	0	92	721
Total	178	1081	2	2	1263	2	1385	54	0	1441	2	1	3	0	6	215	0	188	0	403	3113
Grand Total	335	2169	12	5	2521	8	2834	142	0	2984	9	2	18	0	29	465	0	364	0	829	6363
Apprch %	13.3	86	0.5	0.2		0.3	95	4.8	0		31	6.9	62.1	0		56.1	0	43.9	0		
Total %	5.3	34.1	0.2	0.1	39.6	0.1	44.5	2.2	0	46.9	0.1	0	0.3	0	0.5	7.3	0	5.7	0	13	
Passenger Vehicles	332	2109	12	5	2458	8	2766	139	0	2913	9	2	17	0	28	462	0	363	0	825	6224
% Passenger Vehicles	99.1	97.2	100	100	97.5	100	97.6	97.9	0	97.6	100	100	94.4	0	96.6	99.4	0	99.7	0	99.5	97.8
Heavy Vehicles	3	60	0	0	63	0	68	3	0	71	0	0	1	0	1	3	0	1	0	4	139
% Heavy Vehicles	0.9	2.8	0	0	2.5	0	2.4	2.1	0	2.4	0	0	5.6	0	3.4	0.6	0	0.3	0	0.5	2.2





TRUE DATA TO IMPROVE MOBILITY

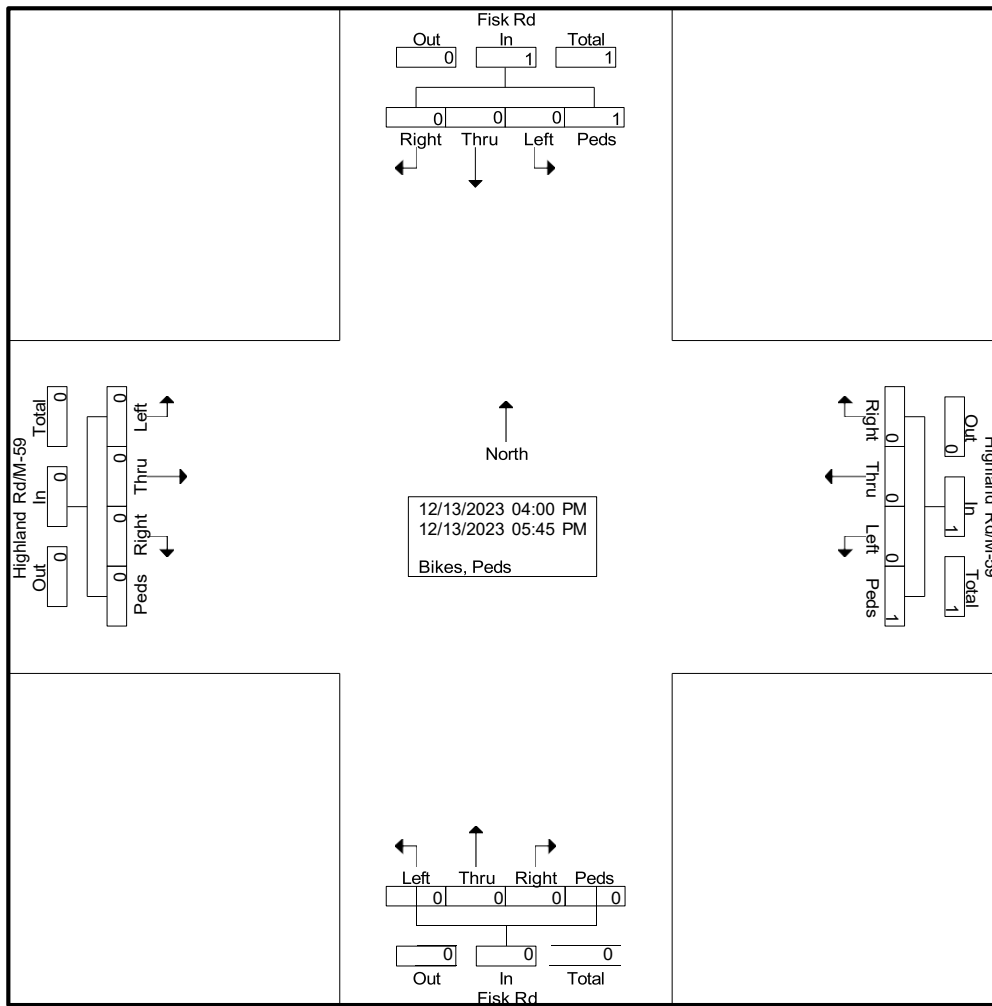
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	45	329	3	0	377	2	365	21	0	388	3	0	3	0	6	55	0	44	0	99	870
04:30 PM	32	222	4	1	259	1	363	21	0	385	1	1	2	0	4	64	0	52	0	116	764
04:45 PM	36	268	1	1	306	2	394	24	0	420	2	0	7	0	9	68	0	34	0	102	837
05:00 PM	52	293	0	0	345	1	364	10	0	375	0	1	0	0	1	62	0	35	0	97	818
Total Volume	165	1112	8	2	1287	6	1486	76	0	1568	6	2	12	0	20	249	0	165	0	414	3289
% App. Total	12.8	86.4	0.6	0.2		0.4	94.8	4.8	0		30	10	60	0		60.1	0	39.9	0		
PHF	.793	.845	.500	.500	.853	.750	.943	.792	.000	.933	.500	.500	.429	.000	.556	.915	.000	.793	.000	.892	.945
Passenger Vehicles	164	1082	8	2	1256	6	1439	75	0	1520	6	2	12	0	20	246	0	164	0	410	3206
% Passenger Vehicles	99.4	97.3	100	100	97.6	100	96.8	98.7	0	96.9	100	100	100	0	100	98.8	0	99.4	0	99.0	97.5
Heavy Vehicles	1	30	0	0	31	0	47	1	0	48	0	0	0	0	0	3	0	1	0	4	83
% Heavy Vehicles	0.6	2.7	0	0	2.4	0	3.2	1.3	0	3.1	0	0	0	0	0	1.2	0	0.6	0	1.0	2.5





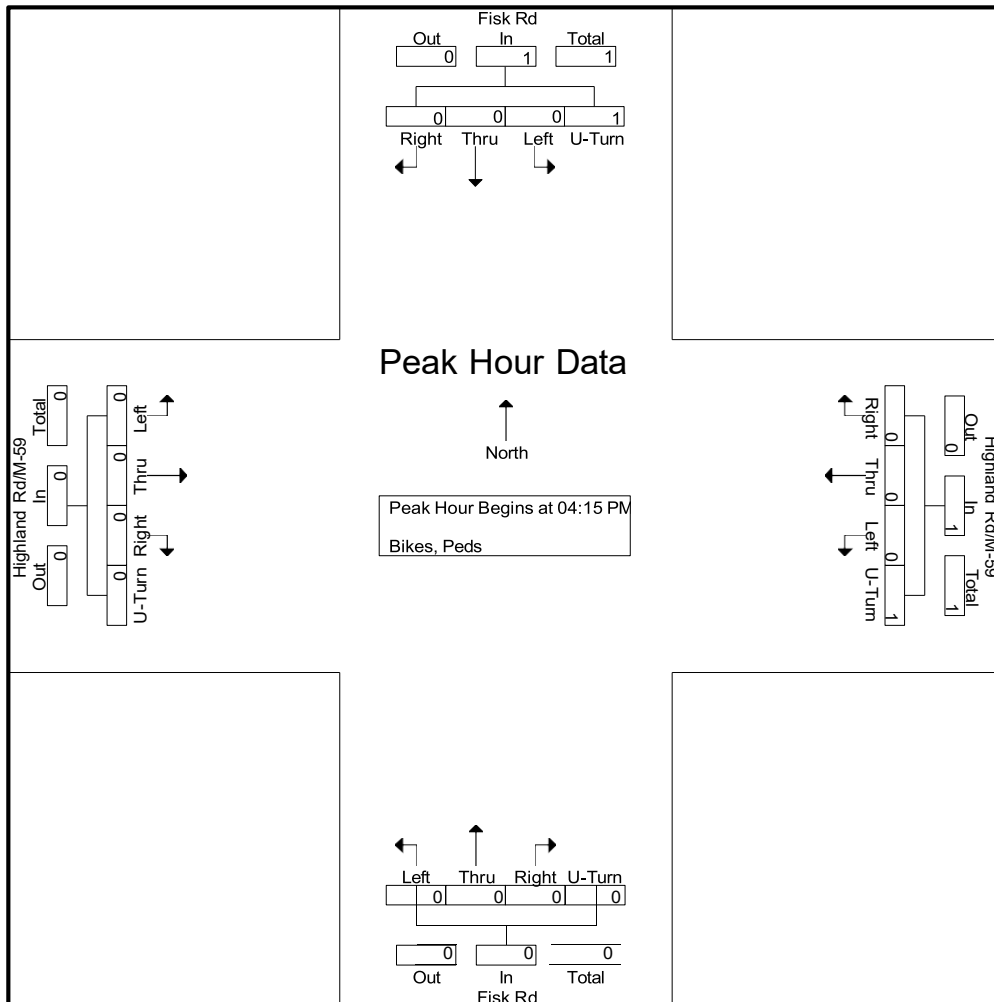
Groups Printed- Bikes, Peds

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
Grand Total	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
Apprch %	0	0	0	0		0	0	0	100	50	0	0	0	0		0	0	0	100	50	
Total %	0	0	0	0		0	0	0	50	50	0	0	0	0		0	0	0	50	50	





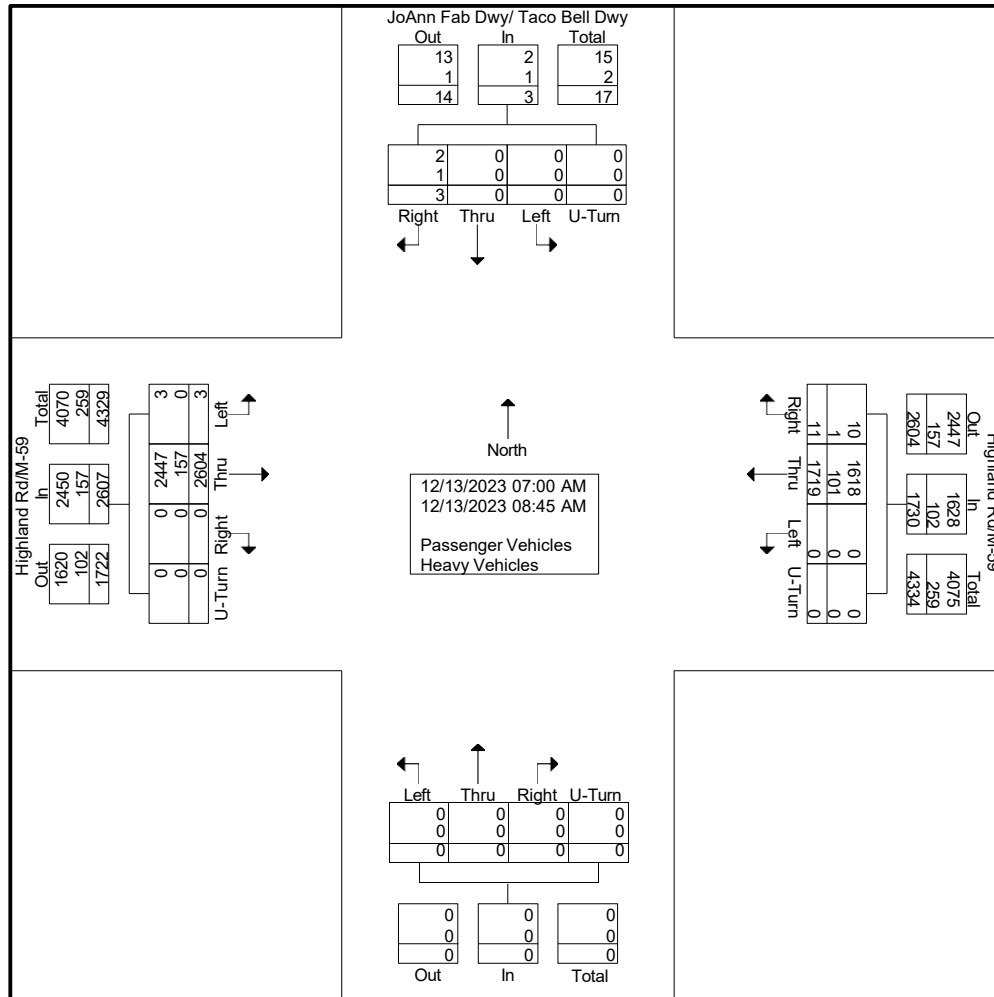
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Fisk Rd Northbound					Fisk Rd Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:15 PM																						
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
Total Volume	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	2
% App. Total	0	0	0	0	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0	100	100	2
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250	.250





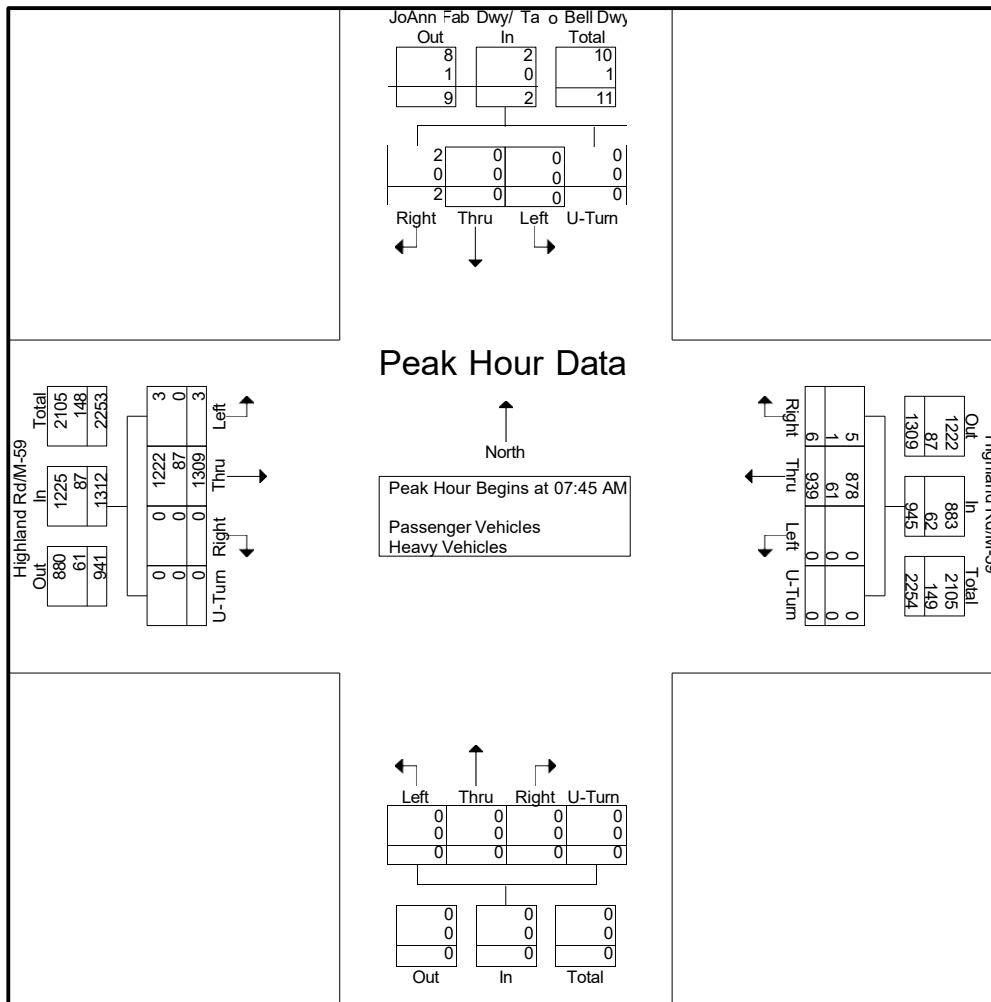
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
07:00 AM	0	328	0	0	328	0	141	0	0	141	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	355	0	0	355	0	172	3	0	175	0	0	0	0	0	0	0	1	0	1	531
07:30 AM	0	327	0	0	327	0	214	1	0	215	0	0	0	0	0	0	0	0	0	0	542
07:45 AM	0	367	0	0	367	0	232	2	0	234	0	0	0	0	0	0	0	0	0	0	601
Total	0	1377	0	0	1377	0	759	6	0	765	0	0	0	0	0	0	0	1	0	1	2143
08:00 AM	0	307	0	0	307	0	265	0	0	265	0	0	0	0	0	0	0	0	0	0	572
08:15 AM	1	320	0	0	321	0	220	1	0	221	0	0	0	0	0	0	0	0	0	0	542
08:30 AM	2	315	0	0	317	0	222	3	0	225	0	0	0	0	0	0	0	2	0	2	544
08:45 AM	0	285	0	0	285	0	253	1	0	254	0	0	0	0	0	0	0	0	0	0	539
Total	3	1227	0	0	1230	0	960	5	0	965	0	0	0	0	0	0	0	2	0	2	2197
Grand Total	3	2604	0	0	2607	0	1719	11	0	1730	0	0	0	0	0	0	0	3	0	3	4340
Apprch %	0.1	99.9	0	0	0	0	99.4	0.6	0	0	0	0	0	0	0	0	0	100	0	0	
Total %	0.1	60	0	0	60.1	0	39.6	0.3	0	39.9	0	0	0	0	0	0	0	0.1	0	0.1	
Passenger Vehicles	3	2447	0	0	2450	0	1618	10	0	1628	0	0	0	0	0	0	0	2	0	2	4080
% Passenger Vehicles	100	94	0	0	94	0	94.1	90.9	0	94.1	0	0	0	0	0	0	0	66.7	0	66.7	94
Heavy Vehicles	0	157	0	0	157	0	101	1	0	102	0	0	0	0	0	0	0	1	0	1	260
% Heavy Vehicles	0	6	0	0	6	0	5.9	9.1	0	5.9	0	0	0	0	0	0	0	33.3	0	33.3	6





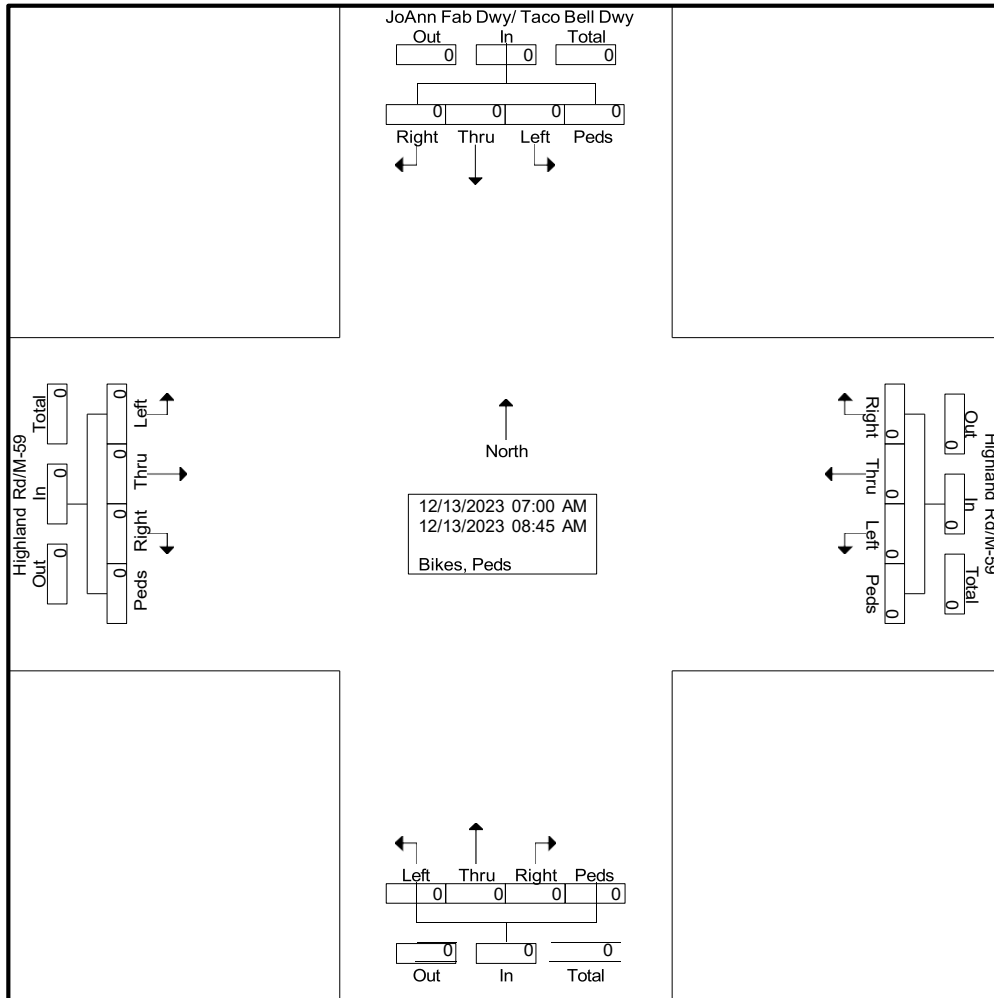
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	367	0	0	367	0	232	2	0	234	0	0	0	0	0	0	0	0	0	0	601
08:00 AM	0	307	0	0	307	0	265	0	0	265	0	0	0	0	0	0	0	0	0	0	572
08:15 AM	1	320	0	0	321	0	220	1	0	221	0	0	0	0	0	0	0	0	0	0	542
08:30 AM	2	315	0	0	317	0	222	3	0	225	0	0	0	0	0	0	0	2	0	2	544
Total Volume	3	1309	0	0	1312	0	939	6	0	945	0	0	0	0	0	0	0	2	0	2	2259
% App. Total	0.2	99.8	0	0		0	99.4	0.6	0		0	0	0	0	0	0	0	100	0		
PHF	.375	.892	.000	.000	.894	.000	.886	.500	.000	.892	.000	.000	.000	.000	.000	.000	.000	.250	.000	.250	.940
Passenger Vehicles	3	1222	0	0	1225	0	878	5	0	883	0	0	0	0	0	0	0	2	0	2	2110
% Passenger Vehicles	100	93.4	0	0	93.4	0	93.5	83.3	0	93.4	0	0	0	0	0	0	0	100	0	100	93.4
Heavy Vehicles	0	87	0	0	87	0	61	1	0	62	0	0	0	0	0	0	0	0	0	0	149
% Heavy Vehicles	0	6.6	0	0	6.6	0	6.5	16.7	0	6.6	0	0	0	0	0	0	0	0	0	0	6.6





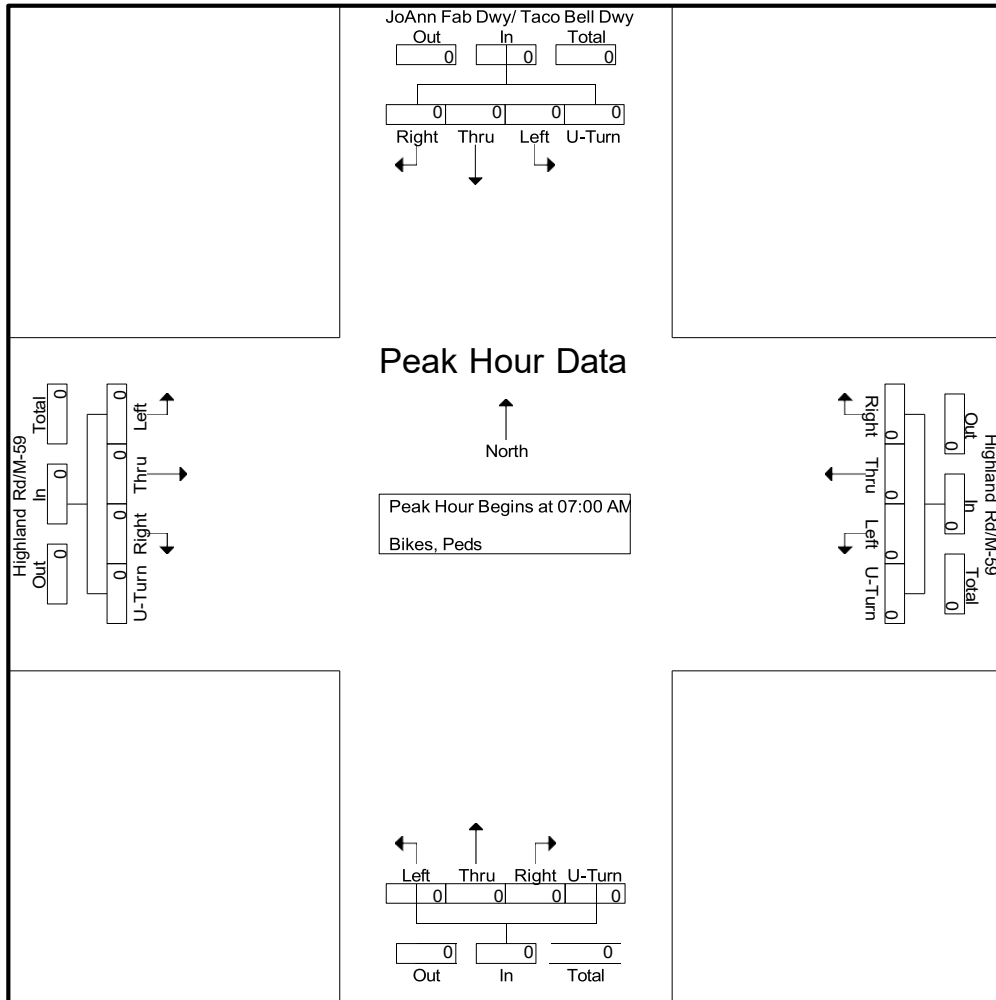
Groups Printed- Bikes, Peds

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					





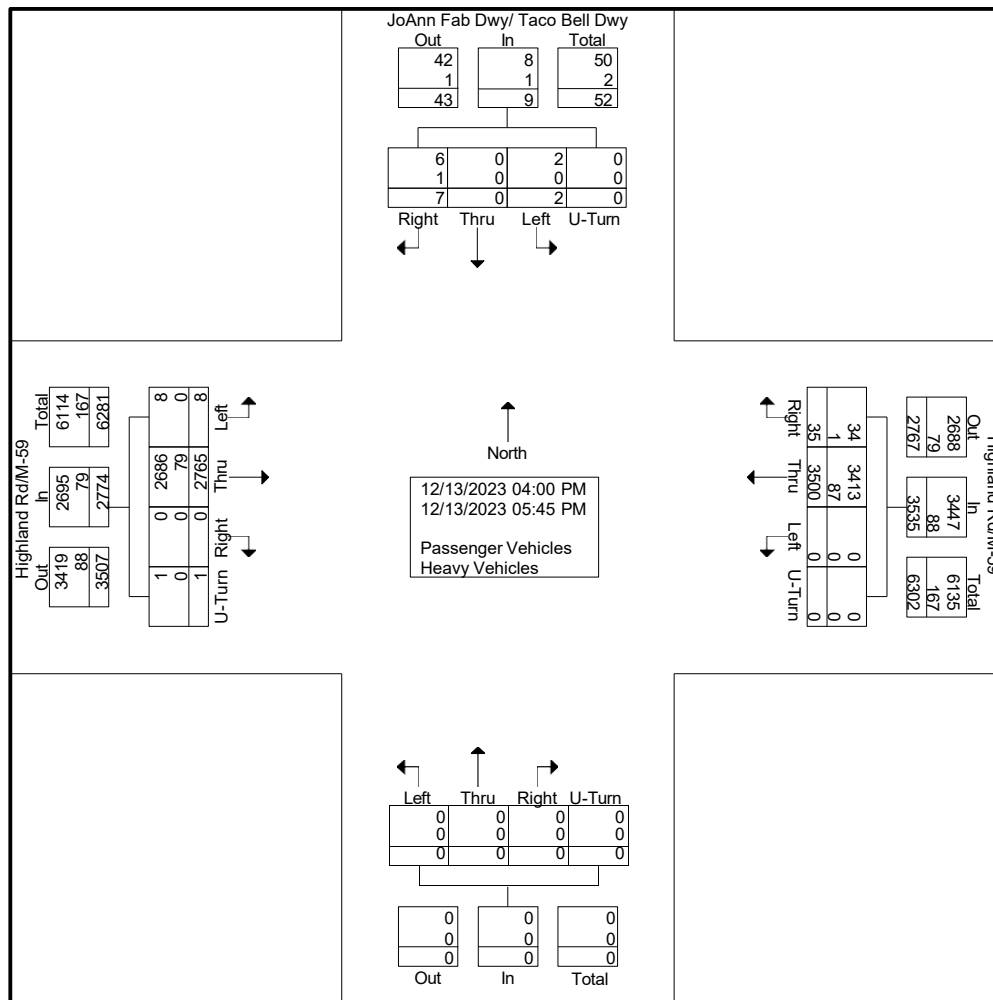
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:00 AM																						
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000





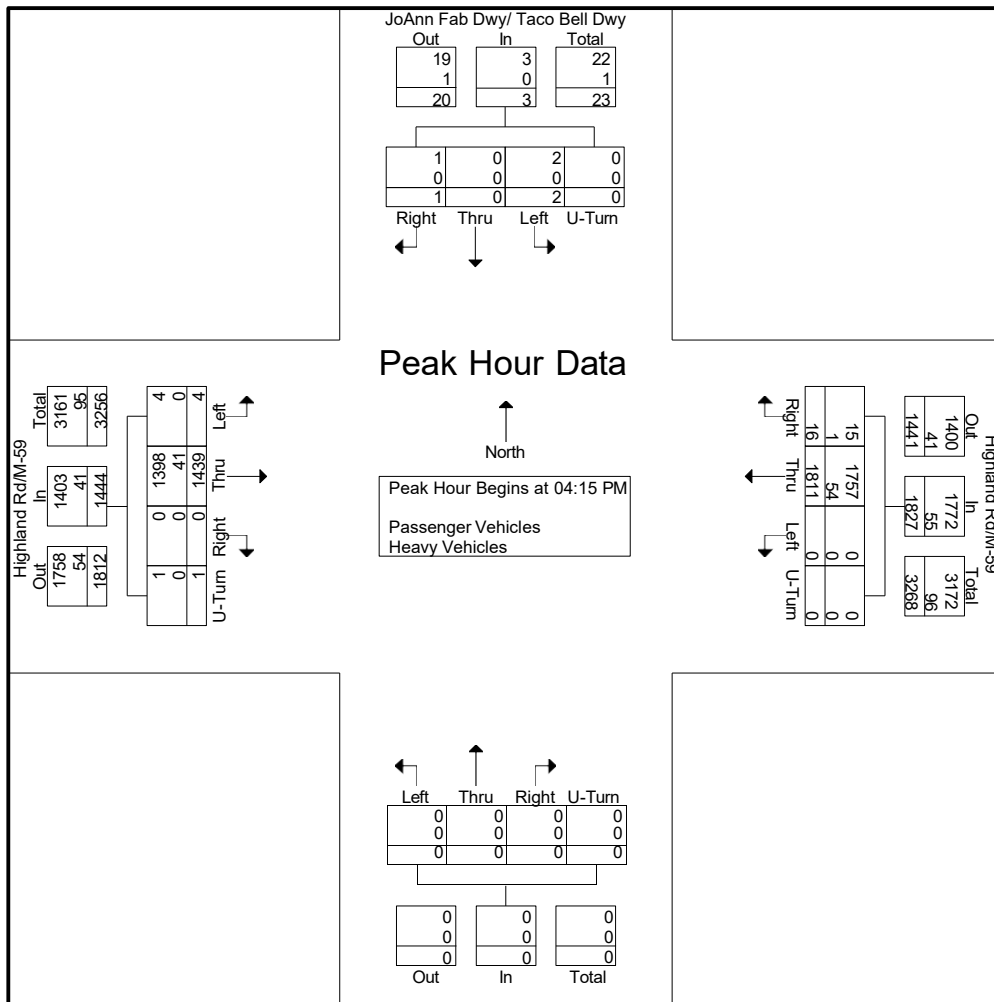
Groups Printed- Passenger Vehicles - Heavy Vehicles

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total	
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total		
04:00 PM	0	337	0	0	337	0	423	7	0	430	0	0	0	0	0	0	0	0	0	0	0	767
04:15 PM	3	390	0	0	393	0	442	1	0	443	0	0	0	0	0	1	0	0	0	0	1	837
04:30 PM	0	326	0	0	326	0	447	5	0	452	0	0	0	0	0	0	0	1	0	0	1	779
04:45 PM	1	355	0	1	357	0	473	5	0	478	0	0	0	0	0	1	0	0	0	0	1	836
Total	4	1408	0	1	1413	0	1785	18	0	1803	0	0	0	0	0	2	0	1	0	0	3	3219
05:00 PM	0	368	0	0	368	0	449	5	0	454	0	0	0	0	0	0	0	0	0	0	0	822
05:15 PM	1	331	0	0	332	0	442	8	0	450	0	0	0	0	0	0	0	5	0	0	5	787
05:30 PM	1	350	0	0	351	0	426	0	0	426	0	0	0	0	0	0	0	1	0	0	1	778
05:45 PM	2	308	0	0	310	0	398	4	0	402	0	0	0	0	0	0	0	0	0	0	0	712
Total	4	1357	0	0	1361	0	1715	17	0	1732	0	0	0	0	0	0	0	6	0	0	6	3099
Grand Total	8	2765	0	1	2774	0	3500	35	0	3535	0	0	0	0	0	2	0	7	0	0	9	6318
Apprch %	0.3	99.7	0	0	0	0	99	1	0	0	0	0	0	0	0	22.2	0	77.8	0	0	0	0
Total %	0.1	43.8	0	0	43.9	0	55.4	0.6	0	56	0	0	0	0	0	0	0	0.1	0	0	0.1	0
Passenger Vehicles	8	2686	0	1	2695	0	3413	34	0	3447	0	0	0	0	0	2	0	6	0	0	8	6150
% Passenger Vehicles	100	97.1	0	100	97.2	0	97.5	97.1	0	97.5	0	0	0	0	0	100	0	85.7	0	0	88.9	97.3
Heavy Vehicles	0	79	0	0	79	0	87	1	0	88	0	0	0	0	0	0	0	1	0	0	1	168
% Heavy Vehicles	0	2.9	0	0	2.8	0	2.5	2.9	0	2.5	0	0	0	0	0	0	0	14.3	0	0	11.1	2.7





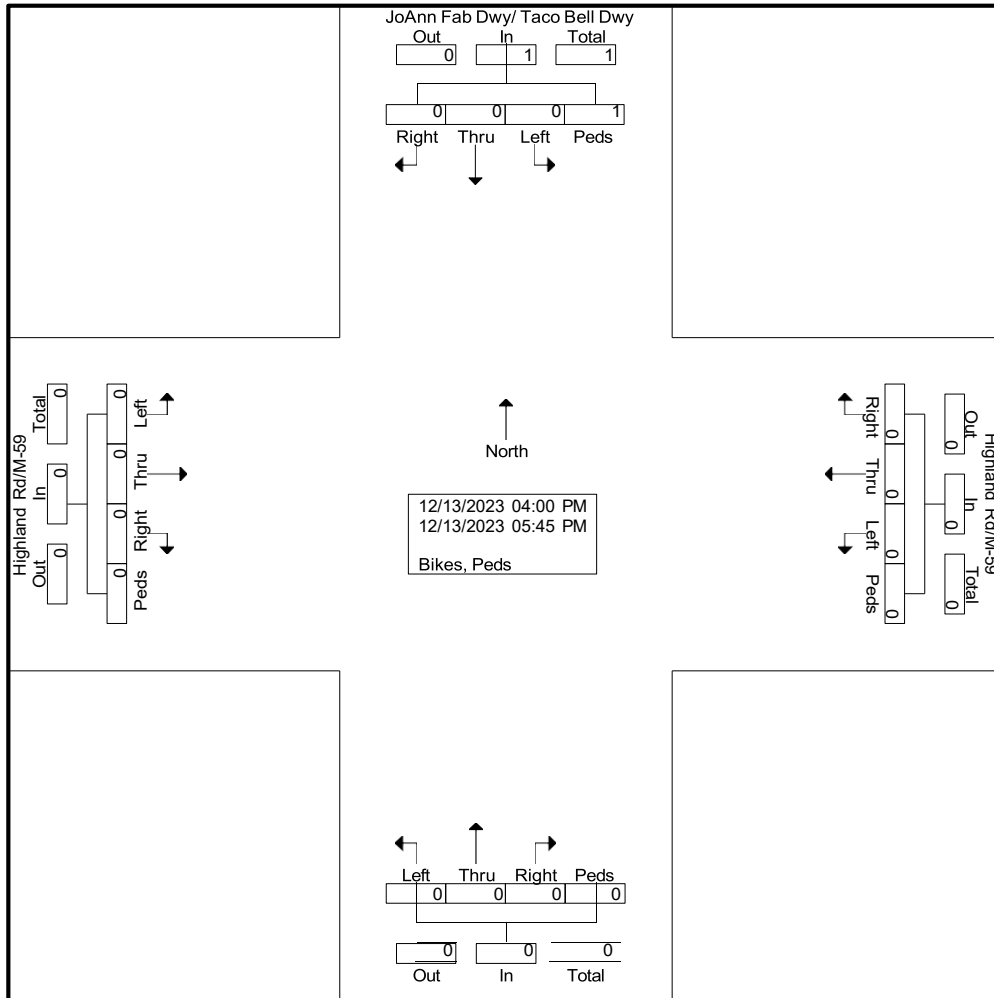
Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total
	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	3	390	0	0	393	0	442	1	0	443	0	0	0	0	0	1	0	0	0	1	837
04:30 PM	0	326	0	0	326	0	447	5	0	452	0	0	0	0	0	0	0	1	0	1	779
04:45 PM	1	355	0	1	357	0	473	5	0	478	0	0	0	0	0	1	0	0	0	1	836
05:00 PM	0	368	0	0	368	0	449	5	0	454	0	0	0	0	0	0	0	0	0	0	822
Total Volume	4	1439	0	1	1444	0	1811	16	0	1827	0	0	0	0	0	2	0	1	0	3	3274
% App. Total	0.3	99.7	0	0.1		0	99.1	0.9	0		0	0	0	0		66.7	0	33.3	0		
PHF	.333	.922	.000	.250	.919	.000	.957	.800	.000	.956	.000	.000	.000	.000	.000	.500	.000	.250	.000	.750	.978
Passenger Vehicles	4	1398	0	1	1403	0	1757	15	0	1772	0	0	0	0	0	2	0	1	0	3	3178
% Passenger Vehicles	100	97.2	0	100	97.2	0	97.0	93.8	0	97.0	0	0	0	0	0	100	0	100	0	100	97.1
Heavy Vehicles	0	41	0	0	41	0	54	1	0	55	0	0	0	0	0	0	0	0	0	0	96
% Heavy Vehicles	0	2.8	0	0	2.8	0	3.0	6.3	0	3.0	0	0	0	0	0	0	0	0	0	0	2.9





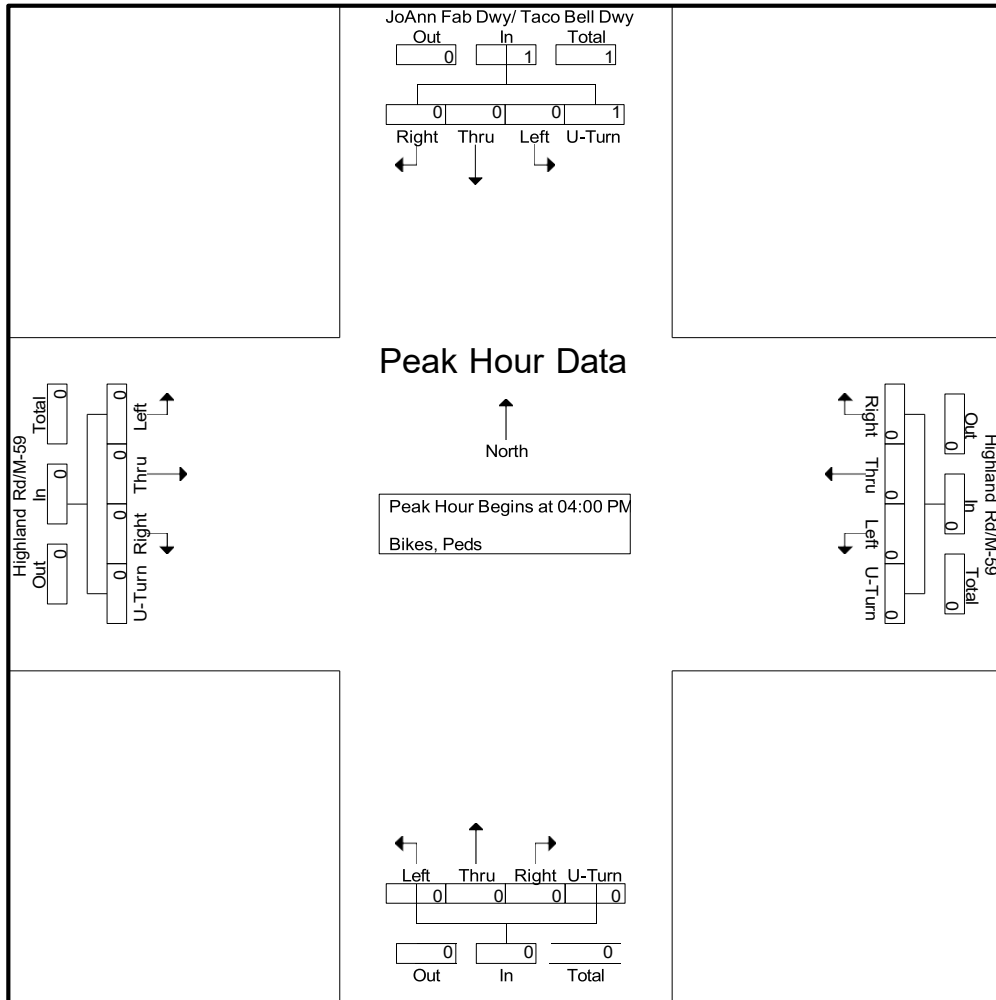
Groups Printed- Bikes, Peds

Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
Apprch %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	
Total %	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	100	





Start Time	Highland Rd/M-59 Eastbound					Highland Rd/M-59 Westbound					Northbound					JoAnn Fab Dwy/ Taco Bell Dwy Southbound					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 04:00 PM																						
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
% App. Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.250	.250	





Transportation Data Management System

Disclaimer: The Michigan Department of Transportation (MDOT) works with individual agencies (cities/villages, counties, metropolitan planning organizations (MPOs), regional planning organizations (RPOs), and other areas of MDOT) to identify existing traffic count programs and/or traffic data[more](#)

List View

All DIRs

Report Center

	Record			1			of 1	Goto Record	<input type="text"/>	<input type="button" value="go"/>	
Location ID	63-0739					MPO ID	2717				
Type	SPOT					HPMS ID					
On NHS	No					On HPMS	No				
LRS ID	0704601					LRS Loc Pt.	0.3140493				
SF Group	Local Road					Route Type					
AF Group	NoFactor					Route					
GF Group	Local Road					Active	Yes				
Class Dist Grp	NTL_7					Category					
Seas Clss Grp											
WIM Group											
QC Group	Default										
Funct'l Class	(7) Local Road or Street					Milepost					
Located On	Fisk Rd										
Loc On Alias											
SOUTH OF	Pontiac Lake Rd										
More Detail											
STATION DATA											

Directions: **2-WAY** **NB** **SB**

AADT							
Year	AADT	DHV-30	K %	D %	PA	BC	Src
2022	1,256	130	10		1,194 (95%)	62 (5%)	

VOLUME COUNT			
	Date	Int	Total
	Mon 8/22/2022	60	1,274

VOLUME TREND	
Year	Annual Growth

CLASSIFICATION			
	Date	Int	Total
No Data			

NOTES/FILES			
	Note	Date	

Search... 

Crash and Road Data

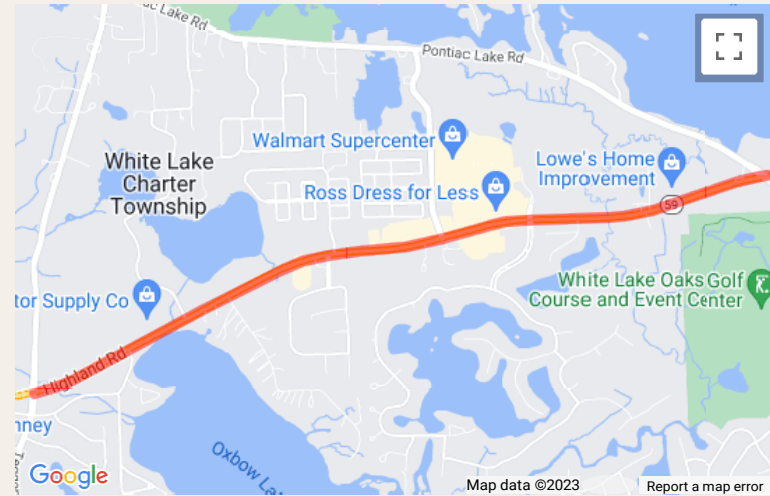
Road Segment Report

Highland Rd, (PR Number 648906)

From:	Teggerdine Rd 9.938 BMP
To:	Pontiac Lake Rd 12.354 EMP
Jurisdiction:	State
FALINK ID:	1797
Community:	White Lake Township
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	2 Way
Length:	2.416 miles
Number of Lanes:	5
Posted Speed:	50 (source: TCO)
Route Classification:	M-59
Annual Crash Average 2018-2022:	<u>82</u>
Traffic Volume (2022)*:	33,400 (Observed AADT)
Pavement Type (2022):	Asphalt
Pavement Rating (2022):	Fair

* AADT values are derived from **Traffic Counts**

Street View



OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

JAN 23 2017

LOCATION: 11 - 5 g (F, S)

DATE: 1-17-17

CITY/TOWNSHIP: 114 te La1(t)

BY: Iz' - A-

COUNTY#: 13 & (STATE#: b y) - fl - 01 - 0 CHARGES: 11J - = c: 1 7 - = S' - = { : : / . 2 .

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE

UNDERGROUND: _____

EDISON OK: YES NO JOB#: _____

COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
CHANGE TIMING.../ .Q. f.....											X								
<input checked="" type="checkbox"/> CHANGE OFFSET.....											X								
CHANGE CYCLE LENGTH.....																			
ADD DIAL/SPLIT.....																			

CHANGE BREAKOUT OR EPROM: _____

CHANGE HOURS OF OPERATION:

OLD: 6 9, M -- Jf I-P = - - - - - c: >

NEW: G c - . oe

REPROGRAM TBC (, , , f : . . c ... E \ , r k - J

INSTALL INTERCONNECT: TBC MINJTROL TONE

MBTOK: YES NO

NO CHANGE - RECORD CORRECTION

LOTHER: R v i

* MDOT RETIMING - FINAL *

APPROVED BY: [Signature] DATE: 1 / 17 / 17

DATE INSTALLED: 1/21/17

INSTALLED BY: RICHARDSON CASBY

**ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070**

INTERSECTION: W S9 (W HLJ.t-l) & F1Sl<

CITY/VILLAGE/TOWNSHIP: _____

COUNTY#: 4\35 MOOT#: b2o4\C1-026 REV#: DETROIT EDISON#: _____

DRAWN BY: Lab1'9"1 '0 APPROVED BY: _____ DATE DRAWN: 1\11rj

INSTALLED BY: _____ DATE INSTLD: _____

HOURS OF OPERATION: L D\MS - G.\n - \GRh

HOURS OF FLASHING: 7 t>k1S•. \()Ph - b-Ar\

=====

2. UTILITIES -1. ACCESS

CODE.....: \ 4 2.. CODE: Four digits (0000 - 9999)

=====

4. UNIT DATA-5. RING STRUCTURE

.....NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR...**

CHANNEL:	RING	PHNXT	CONCURRENT PHASES														CHANNEL					
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED		
PHASE 1:	1	2.	1				1	1														
PHASE 2:	1	4		1				\	1												2	9
PHASE 3:					1																	
PHASE 4:	1	\				1				\											4-	10
PHASE 5:	2	to	\	1			1														S	
PHASE 6:	1	8	\	1					1												-	11
PHASE 7:										1												
PHASE 8:	2.	'S				t					1										'a	12.
PHASE 9:												1										
PHASE 10:													1									
PHASE 11:														1								
PHASE 12:															1							
PHASE 13:																1						
PHASE 14:																	1					
PHASE 15:																		1				
PHASE 16:																			1			

CODES:

RINGR! .9 -1\1- ! Phase (1-4)
 PHNXT P _se_ - -t.! . ng (1-16)
 CONCUR PH _ Ph_ase To Be Concurrent (0=NO, 1=YES)

For veh le channel & ped channel, enter "1" under channel# shown.

3. PHASE DATA-1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green	5	10		7	S;	HI		7									00-99
Passaae	3.0			3.0	3.0			3.0									0.0-9.9
Maximum #1		0		":1		ao											000-999
Maximum #2																	000-999
Yellow Clearance	4-1	4-1		3-0	41	4-1		1?1-0									3.0-9.9
Red Clearance	lf.	1.t.		(:/b	1.&		("									0.0-9.9

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

3 PHASE DATA- 3 PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk		7		7		7		7									00-99
Pedest Clearance		14		14		14		14									00-99
Flashing Walk																	
Extend Ped Clear		0		0		0		0									
Act Rest in Walk																	

3 PHASE DATA- 4 INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial	\	4		\	I	4		\								
NA Response																

CODES: 0 1 2 3 4
 Initial none inactive red yellow green
 NA Response none to 1 to 2 both

3 PHASE DATA- 5 VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		2		3		2								
Pedestrian Recall		2				2										

CODES: 0 1 2 3 4
 Vehicle none 1 call min max soft
 Pedestrian none 1 call ped bot N.A.

3. PHASE DATA- 6. NONLOCK-& MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory	I				I											
Dual Entrv				I				I								
Last Car Passage																
Conditional Service																

CODES: 0 = NO 1 = YES

3 PHASE DATA- 8 SPECIAL DETECTOR- 0 SPC 1-8 (EpiC 300/M52)

Detector# on Print	1	2	S,Z	b..f	,a'	'8'	'7'	'8'
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assianed Phase	\	\	,g		5,	S	4-	4

CODES: 0 1 2 3 4

Operation Mode: Norm Veh Norm Ped 1 call StBar A St Bar a

See attached detection sheet
for D-connector pin
assignments

A. CONTROLS RANGE (SEC)

Extend Time																	00-99
Delay Time																	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 2. VEH 9-16 (2070)

Det
2070 "D" Conn
Assl ned Phase

Jl heet
or pin
ments

CODES: 0
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

	NGE (SEC)
Extend Time	0 0-99
Delay Time	00-999

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2.070

4. UNIT DATA - 8. I/O MISCELLANEOUS

Rina#	1	2	3	4	CONN	MODE
Input Response	\	2.			.D..	
Output Select	I	2-			"D"	

Connector "D" : 0 = Standard & 1 = Alternate

1/0 Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector	\	

Controller with Solo Detection:
EPAC300/M52 enter "1" under D Conn Input
2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER:		FRE	AUT	MAN		
MODE:	0	PRM	YLO	PYL	POM	SOM
MAX :	0	INH	MX1	MX2		FAC
CORR:	2.	OWL	MOW	SWY	SW+	
OFST:	___	BEG	END OF GREEN			
FRCE:	___	PLN CYC LE TIME				
MX DWELL:		YIELD PERIOD:				

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: ___ SPLIT: ___ OFFSET: ___ SYNC: ___

To set cycle zero in manual control enter "1" for sync then press "E".

5. COORDINATION DATA - 3. OIAUSPLIT OATA

Mode: 0 = actuated, 1 = coord phase, 2 = minimum recall, 3 = maximum recall,
 4 = pedestrian recall, 5 = maximum + pedestrian recall, 6 = phase omit,
 7 = dual coord phase.

Sequence: 00 - 15 (Unit data has definition)

Ring Lag: Ring offset from local cycle zero when not barrier locked to Ring #1.

Time: 00 - 99 seconds.

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac300, Mod 52 and 2070

5. COORDINATION DATA- 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: *110 Secs*

PHASE	1	2	3	4	5	6	7	8
TIME	17	<i>C.1</i>		<i>17</i>	<i>61</i>			<i>3</i>
MODE	<i>12</i>	<i>J</i>		<i>2</i>		<i>I</i>		<i>2</i>

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 Secs* *Program Cycle Length*

PHASE	1	2	3	4	5	6	7	8
TIME	<i>13</i>	<i>45</i>		<i>20</i>	<i>13</i>	<i>45</i>		<i>20</i>
MODE	<i>2</i>	<i>1</i>		<i>2</i>	<i>2</i>	<i>1</i>		<i>2</i>

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	<i>y</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING4LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING4LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING4 LAG			

OFFSET	1	2	3
TIME	<i>22</i>		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING2LAG			
RING 3 LAG			
RING4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING2LAG			
RING3LAG			
RING4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING2LAG			
RING 3 LAG			
RING4 LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER Epac.300, Mod 52 and 2070

5. COORDINATION DATA- 3. DIAUSPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: **J Q S**

PHASE	1	2	3	5	6	7	8
TIME	3	1					2
MODE	Q	1					2

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

OFFSET	1	2	3
TIME	115"		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RJNG2 LAG			
RING 3 LAG			
RING4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
R1NG2 LAG			
RING3 LAG			
R1NG4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
R1NG 2 LAG			
RING 3 LAG			
R1NG4 LAG			

OFFSET	1	2	3
TIME			
SEQUENCE			
RING2 LAG			
RING3 LAG			
RaNG4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
R1NG2 LAG			
RfNG3 LAG			
RfNG4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RIHG2 LAG			
RING3 LAG			
RtNG4 LAG			
OffSET	1	2	3
rr.ue			
seQOENCE			
RING'2 LA'G			
RtNG3 LAG			
RING4LAG			

ROAD COMMISSION FOR OAKLAND COUNTY, WATERFORD, MICHIGAN
PROGRAM LOG FOR EAGLE SIGNAL CONTROLLER E c300 Mod 52 and 2070

7. PREEMPT DATA -1. ALL PREEMPTS:

RING TIMES	1	2	3	4		
MIN GREEN/W ALK						
VERRIDE	FL	1/2	2/3	3/4	4/5	5/6
ST US						
CODE	0 = NO, 1 = YES					

7. PREEMPTDATA-PREEMPT1

1. MISC DATA: (0 = no, 1 = yes)

TEST..: N-LOCK.: LINK PR . .
 DELAY: EXTEND: DURATION:
 MXCALL: LOCK OUT:

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

4. PEDESTRI STATUS:

PHASE	1	2	3	4	5	6	7	8
TRKG								
D L								

(0=dont wlk, 1=wlk, 2=flwlk, J=dark)

CYCLE (0 = no, 1 = act, 2 = recall)

2. INTERVAL TIMES:

SEL PED CLR: TRK YEL CHG:
 SEL YEL CHG: TRK RED CLR:
 SELRED CLR: DWELLGRE
 TRACK GREEN: RET PED R:
 TRKPED CLR: RETY CHG:
 RE EL CLR:

5. OVERLAP STATUS:

0 LAP	A	B	C	D
TRK N				
DWELL				

(0=red, 1=fly, 2=flr, 3=flv, 4=dark, ...)
 CYCLE (0 = no, 1 = t)

3. VEHICLE STATUS:

PHASE	1	2	4	5	6	7	8
TRK GRN							
DWELL							

(0=red, -grn, 2=flr, 3=flv, 4=dark)
 CYCL no, 1=act, 2=min recall, 3=max recall

6. LOW PRIORITY: (0 = no, 1=yes)

TEST..: N-LOCK.: KIP.....
 DELAY: EXTEND: D TION:
 DWELL: MXCALL: LOC UT:
 RING 1 2 3 4 5 6 8
 DWELL !-----
 CALLS

SIGNAL PHASING

PHASE	ROAD	PHASE	LOAD SW	FLAS
1	t=.B k9 LT (C.i '2.,01,J\	C..L	I	-
2	we. .e.	A	2.	f1.A
3				
4	Se, , ,	R	4	FU
5	'v-1 r^SS> 1..:r (C... w\	AI	5	-
6	, e. t-"li...:!	C.	b	FL.A
7				
8	Ne.	D	8	!=Le.,
OLA	f:'e S.91..-t' I .._-w..Jt. ... - ..Lt>.....-J 'tbW-Ow hQ<ZD,,,J\ 'li..a., W\	C.1..	9	1..A
OLB				
OLC	we,Y'IL't(\."6.'v-\r-IC-..-1 n- 'f (Z.c1.,1, Q+,1-..)	AL	I\	-LA
01,..D				
1PEO				
2PED	v.JL h<9 f>6;D (r-1oe.."t--\ 1-eC-)	wA	-.\ .	
3PEP				
PED.	e v; e'O "\,JC T- t.,c.,!	WR.,.	-r4.	"
..p O				
6fEO\.	Mt;9 <=-eQsol.11"1-'(* c; *	we	*tS	
7PED				
SPED	e, ,iP (t;,\S:T. LEC_)	wl)	lg,	

CONTROLLER INFORMATION SHEET
Size P44-16 Cabinet with MOD 52 EPAC w/ FYA

INTERSECTION: M-59 (Highland) & Fisk
 COUNTY NO: 4135
 STATE NO: 63041-01-026
 PREPARED BY: Rachel Jones
 DATE: 10/10/11

Backpanel :-

Load Switch 1:	EB M59 LT (G: green arrow)	CL	
Load Switch 2:	WB M-59	A	FLA
Load Switch 4:	SB Fisk	B	FLR
Load Switch 5:	WB M59 LT (G: green arrow)	AL	
Load Switch 6:	EB M59	C	FLA
Load Switch 8:	NB Fisk	D	FLR
Load Switch 9:	(OLA) EB M59 LT	CL	FLA
	(G: flashing yellow arrow; Y: yellow arrow; R: red arrow)		
Load Switch 11:	(OLC) WB M59 LT	AL	FLA
	(G: flashing yellow arrow; Y: yellow arrow; R: red arrow)		
Load Switch 13:	WB M59 Ped (North Leg)	WA	
Load Switch 14:	SB Fisk Ped (West Leg)	WB	
Load Switch 15:	EB M59 Ped (South Leg)	WC	
Load Switch 16:	NB Fisk Ped (East Leg)	WD	

Jumpers :-

A28-A29,A34-A35,A37-A38,A43-A44,B28-B29,B34-B35,B37-B38,B43-B44,B52-B53,
 B55-B56,B58-B59,B61-B62,D22-D26, C56-PB10, D56-PB10, 10R-PB9, 12R-PB9.

Signal Monitor :-

1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 4-8, 5-9, 5-11,
 6-9, 6-11, 9-11.
 All switches OFF EXCEPT: Dual Select A&B; G&Y Enable;
 FYA 1-9, 5-11; SSM 2,4,6,8,9,11.
 Minimum Flash = 4+2+1

Autoscope SOLOJ-

(Yool o

Co-#-4135

Mini-Hub O Detector Port Master Front Panel Input/Output Pio Assignment

The Mini-Hub II has inputs and outputs available through the front panel Input/ Output connector and through the back edge connector. The pin assignments for the Mini-Hub II front connector are listed in the following table. Edge connector pins are identified by NUMBER on the component (front) side of the board. Edge connector pins are identified by LETTER on the backside of board

Pin #	Mini-Hub II conn.	Edge conn.	Front Harness	Description	D-Conn. Term #	O- Conn. Detector Descript.	On Print Detector number	Phase
1	Output 1 LED	F	1	ES MS.5 1...:r	I	9	1	1
2	Output 2 LED	W	14	EB J-1S9 Ltk&/	f>	14	2	1
3	Output 3 LED	S	2	6-81--15 Tt-tCZU..L				
4	Output 4 LED	y	15	E;"Sh ""f""1W.-R				
5	Output 5 LED	(JP1)4	3	t-I F"ISK. Lt	(15	5	0
6	Output 6 LED	(JP7)5	16	N% r S.V. 'i.it'Q..J.._e..i'	8	't.t: \b	6	g
7	Output 7 LED	(JP2)8	4	L> t"\$9 t. 1'	4	'teJ... 1	1	5
8	Output 8 LED	(JP8)9	17	We.. i"";9 '-""fflr;o-l	5	\	<a	5
9	Output 9 LED	(JP3)13	5					
10	Output 10 LED	(JP9)14	18					
11	Output 11 LED	(JP4)17	6	c::, L'	2	10	11	4
12	Output 12 LED	(JP10)18	19	\$8, 'PIS.I(f	3	\\	'2..	4
13	Output 13 LED		7					
14	Output 14 LED		20					
15	Output 15 LED		8					
16	Output 16 LED		21					
17	Input 1 LED	(JP5)1	9	LS\ - 12.c0 Cc-3a)				
18	Input 2 LED	(JP11)2	22	l.. '2-,Q,e') Cc. -3.o)				
19	Input 3 LED	(JP6)3	10					
20	Input 4 LED	(JP12)10	23	LS4 (C.-3,)				
21	Input 5 LED		11	LSS-11 (.t).. :))				
22	Input 6 LED		24	LS b '12-.tt) (o . '3o>				
23	Input 7 LED		12					
24	Input 8 LED	(with JP14)	25	l.S.% e-G> (c. 3o)				

- Input 8 with JPI 4 inserted becomes 24 VDC through Input/ Output Connector on front panel. Logic Ground is the GREY (pin 1J) wire form Input/ Output connector on front oanel.

Chapter 5 Connecting Solo MVP Power and Communications Cables

Usually, the Solo cable (the "pigtail" cable from the Solo MVP) is spliced to a Branch Cable, either in a junction box or in the hand-hole at the pole base. The Branch cable runs from the splice point to the cabinet, and terminates to the ACTP. Use the chart below (copy the blank cable provided in Appendix A) to record which pairs of the Solo cable are spliced to the Branch cable pairs. For Branch cable lengths of 300 ft or less, a separate cable to power the Solo Pro is not normally necessary.

Be sure to use splicing methods and materials appropriate for low voltage communications splicing. When splicing is completed, properly seal the splice.

When the branch cables are brought into the cabinet, label each (Joble, stringing, with cable 1 from the Solo MVP using Phases 2 and 5, and working clockwise around the intersection, labeling cables 2, 3, and 4).

Terminate the cables to the ACTP in the same order. The wiring circle designates the Sensor numbers (in the Autoscope Properties Editor) in the same order as the cables are terminated will facilitate easier maintenance and troubleshooting.

An example is shown in the table below. In this example, a 6-pair branch cable is used, however all communications are usually combined in one cable.

A blank copy of this table is provided for duplication in Appendix A.



Appendix IX

Solo System-Wide Interconnections

Record the following information for each of all Solo MVP connections:

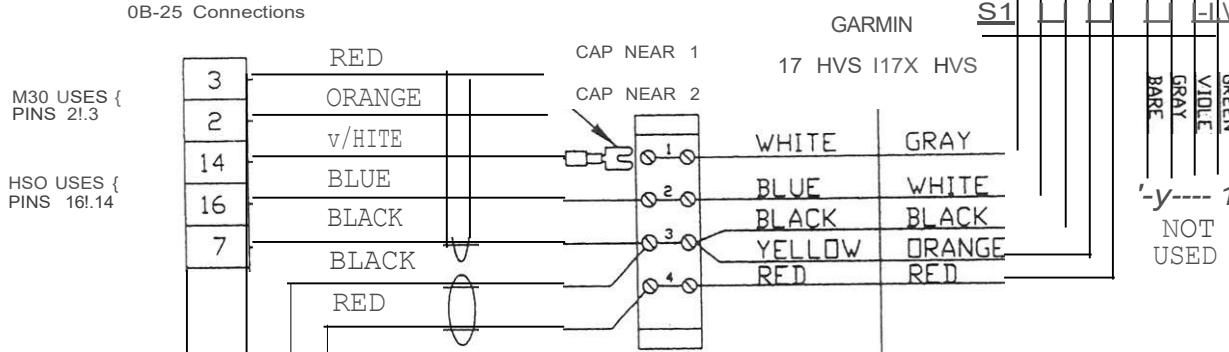
Solo MVP			Branch Power Cable	Branch Communication Cable			Communication Interface Panel	
PIN	PAIR COLOR	WIRE COLOR	WIRE COLOR	PAIR	PAIR COLOR	WIRE COLOR	SIGNAL	TERMINAL
A	BRN/BLK	BRN	B		BUI	24V PWR	1	
B	BRN/BLK	BLK	L	8	24V RTN	2		
N		GRN/YEL	e.0	6	EARTH GND	3		
P	BLU/BLK	BLU	BLU	1	SUP RX+	4		
U	BLU/BLK	BLK	WR1	1	SUP RX-	5		
D	R=DiBLK	RED	gf-u	2	SUP TX+	6		
R	REOIBLK	BLK	{3(1,1)}	2	SUP TX-	7		
	YEL/BLK	YEL		J	DET+	8		
	YELIBLK	BLK	wr1-r	J	DET-	9		
J	HI/BLK	WHI	bCEi	J	VIDEO+	10		
1	HI/BLK	BLK	L,01-11	4	VIDEO-	11		

* IS SEPARATE POWER

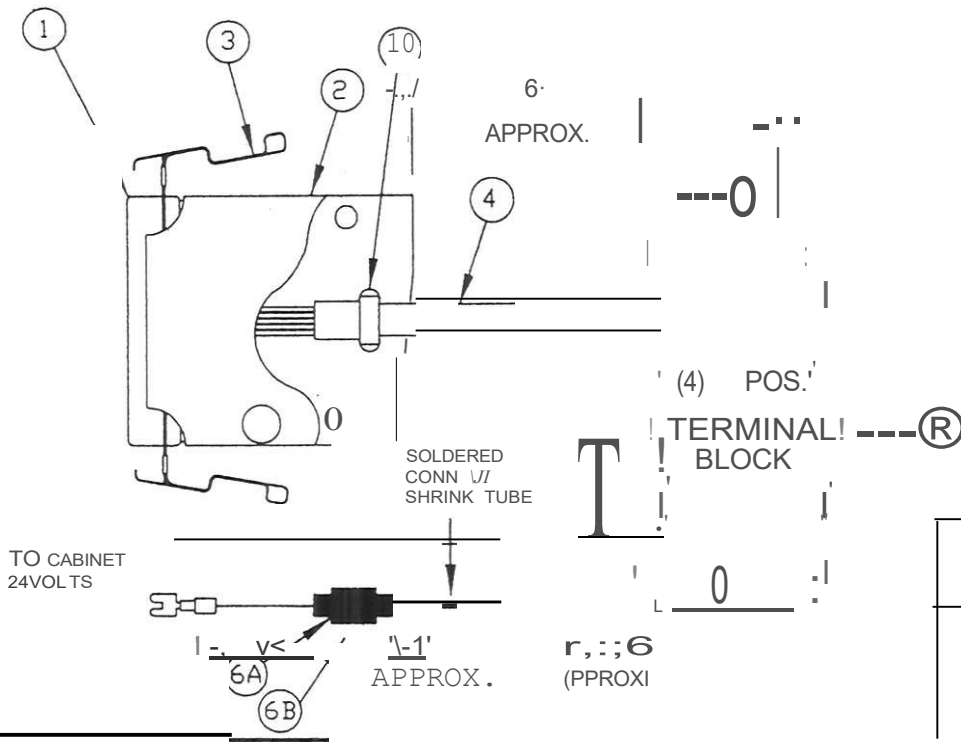
BLK WITH

30' 9CON. GPS
28Av/G

DET. No.	DESCRIPTION	VENDOR	PART No.	QTY.
1	DB-25 HALE	AMP	747912-4	
2	HOUSING KIT	AMP	207345-1	
3	SPRING LATCH DB CONNECTOR	NEVARK	44F87SI	2
4	6 CONDUCTOR 22AVG	Alpha	1176C	6 FT
5	TERMINAL	3M	HVVJS-IOFJX	7



M30 USES { PINS 21.3
HSO USES { PINS 16.14



6A	FUSE HOLDER NEVARK 167KH34
6B	rusE <J/2AI, NEYARK M27F654
7	j2 CONDUCTOR BELDEN CABLE 8205-060
8	2> CHANNEL NUTS UNISTRUT TEAL #A400G-1032EG
8A	2) Screw 10-32 x 1 e an head phillips SS
8 B	2ec.) *10 lock washer/flc,t wc.sher-/fender- we.sher
9	j4 POSITION TERMINAL BLOCK NEVARK *28F724
10	jTIE-RAP

REVISED 11/10/09 DG <17X HVS)

CARRIER AND GABLE INC.
TECH SERVICES
5020
GPS TO SEPAC



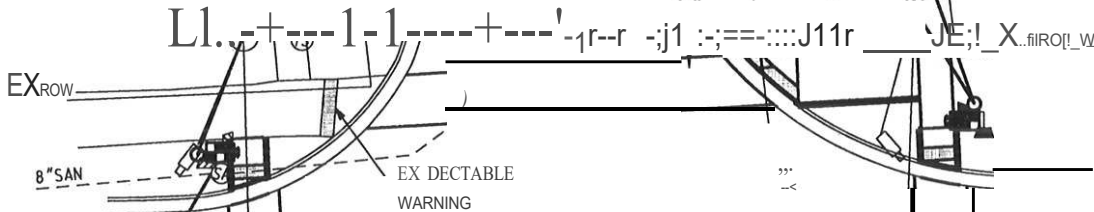
EX. CONTROLLER
EX, HH
EX. ANCHOR BASE STEEL POLE

EX. ANCHOR BASE STEEL STRAIN POL E

FIK



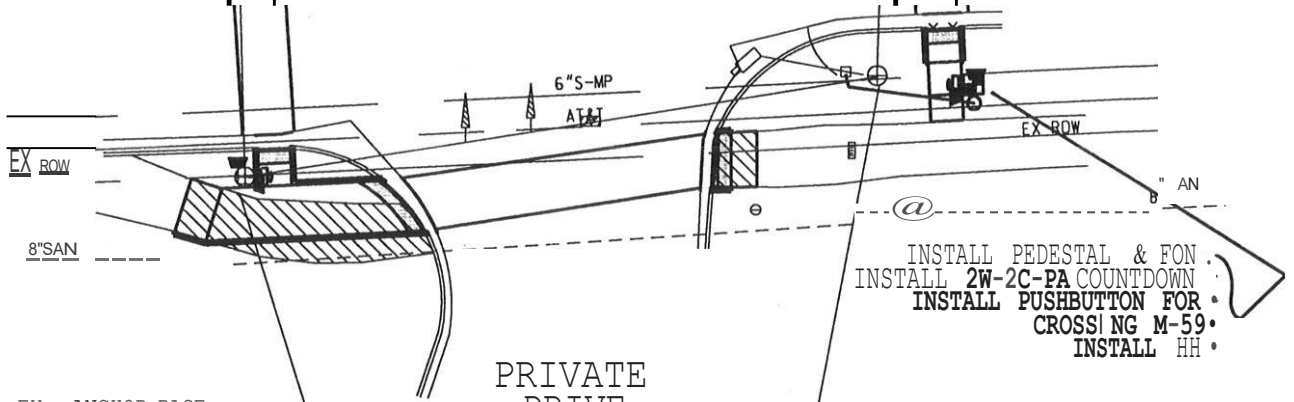
INSTALL PEDESTAL & FON
INSTALL 2W-2C-PA COUNTDOWN
INSTALL PUSHBUTTON
FOR CROSSING M-59
INSTALL HH



INSTALL PEDESTAL & FON
INSTALL 2W-2C-PA COUNTDOWN
INSTALL PUSHBUTTON
2 T es NGM-59

M-59

M-59



INSTALL PEDESTAL & FON
INSTALL 2W-2C-PA COUNTDOWN
INSTALL PUSHBUTTON FOR
CROSSING M-59
INSTALL HH

EX. ANCHOR BASE
STEEL STRAIN POLE
INSTALL 2W-2C-BA COUNTDOWN
INSTALL PUSHBUTTON FOR
CROSSING M-59

EX. ANCHOR BASE STEEL STRAIN POLE
EX, HH

:it-4135

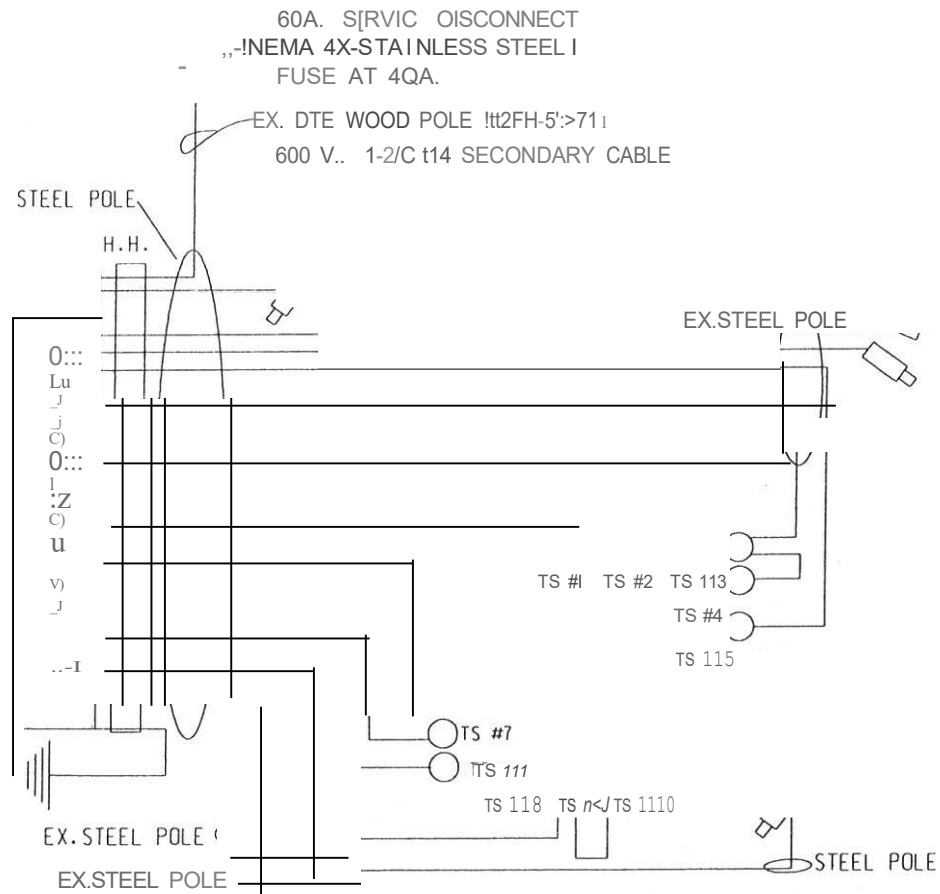
SEE SIDEWALK DETAIL
PLANS FOR NEW ADA RAMP



TRAFFIC & SAFETY DIVISION

AUTH. NO.	DRAWN DJP
CONT. SEC. 63041	DATE 03-08-11
REF. 110761	SCALE N.T.S.
LAN 63041-01-026	SHEE 3 1 OF 2

M-59 !HIGHLAND 1 AT FISK RD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY



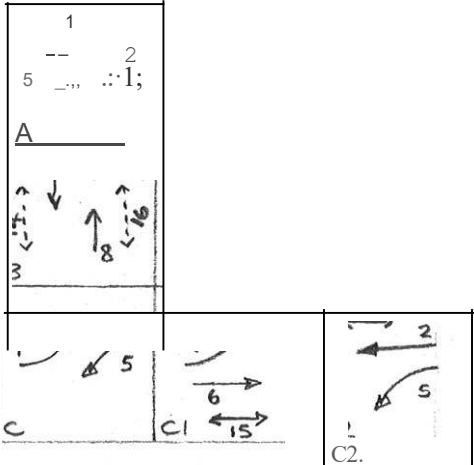
WIRING DIAGRAM
NOT TO SCALE

ALL SIGNAL CABLES SHALL BE 1-7/C # 16 P.J.
CAMERA CABLE TO BE YM 49001 OR EQUAL

CONTACT: MR. DENNIS MERCIER OF DETROIT ENERGY AT 248-427-2954 FOR REMOVAL OF EX. SERVICE & PROVIDE NEW SERVICE, COST TO CONTRACTOR: \$840,64

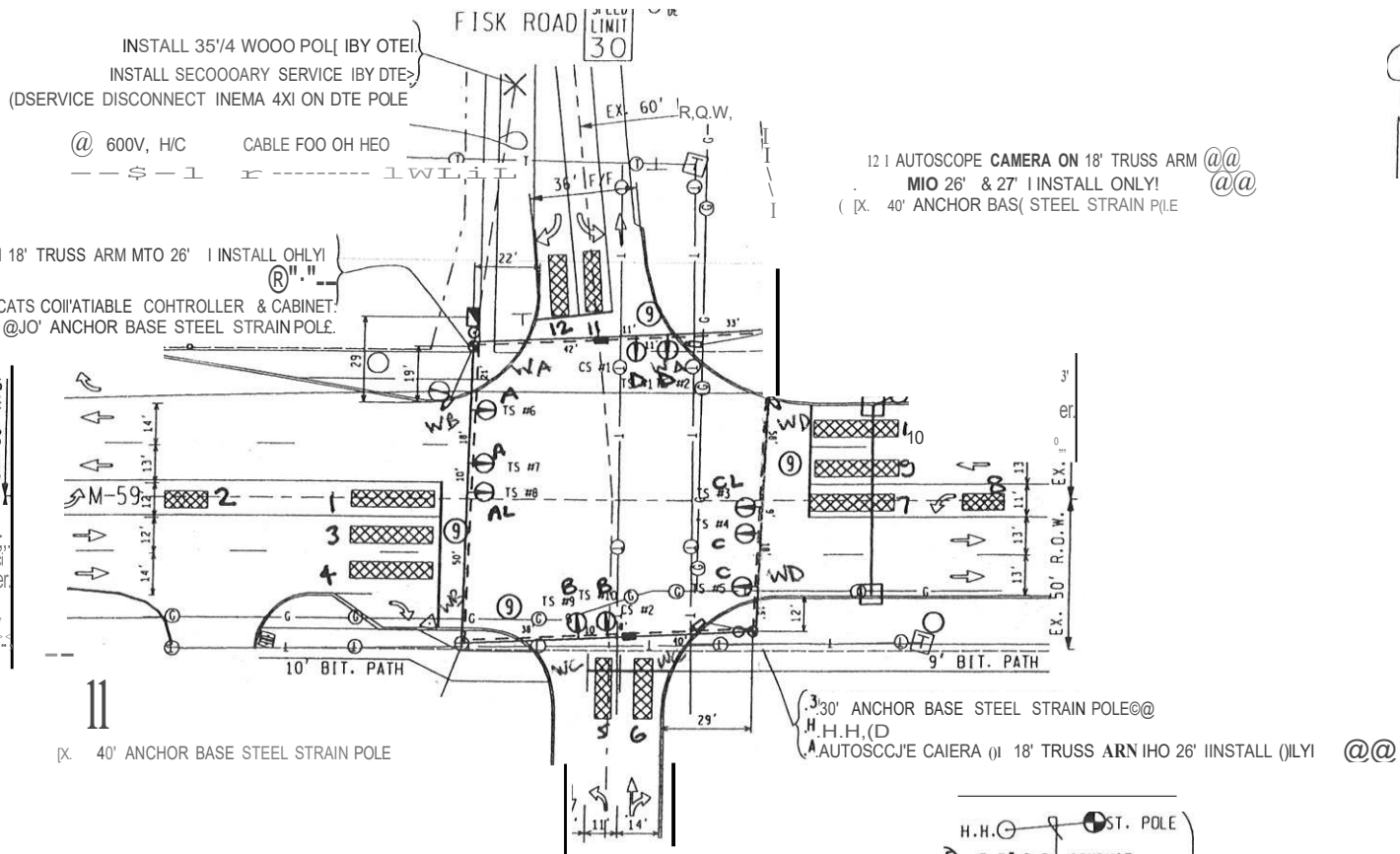
FOR ELECTRICAL SERVICE INSPECTION CONTACT THE MICHIGAN DEPARTMENT OF LABOR AND ECONOMIC GROWTH AT 248-312-0163 COST TO BE PAID BY THE CONTRACTOR.

LIST OF MATERIAL		
NO	ITEM	QUANTITIES
1	Service Disconnect	1 Ea
2	Controller and Cabinet, Digital Type	1 Ea
3	Controller and Cabinet, Digital Type, Delivered	1 Ea
4	Controller Fdn, Bose cont	1 Ea
5	Hh, ROJnd	2 Ea
6	Strain Pole, Steel, Anchor Base, 30 Foot	2 Ea
7	Strain Pole Fdn, Cased	12 Ft
8	Strain Pole Fdn, Uncased	12 Ft
9	Span Wire	4 Ea
10	TS, One Woy Span Wire Ntd (LED)	10 Ea
11	Cose Sign, One Woy, 24 inch by 30 inch, Non-Illuminated	4 Ea
12	Bracket, Truss, With 18 Foot Arm	4 Ea
13	Autoscope, Correro Solo Pro	35 Ft
14	Conduit, 08, 1, 1 1/2 inch	
15	Conduit, DB, 3, 3 inch	30 Ft
16	Conduit, OB, 4, 3 inch	150 Ft
17	Cable, Sec, 600V, 1, 2/C114	



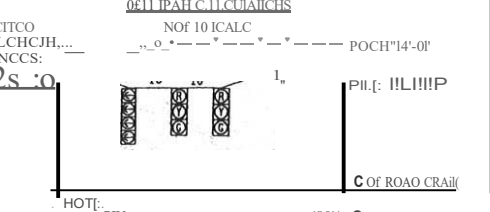
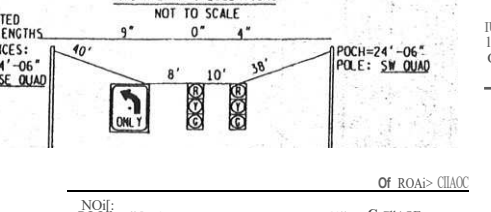
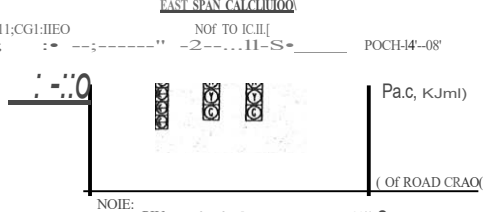
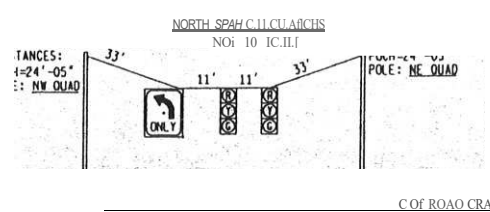
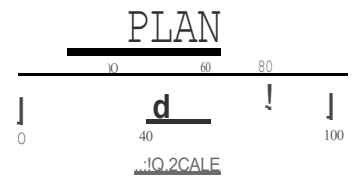
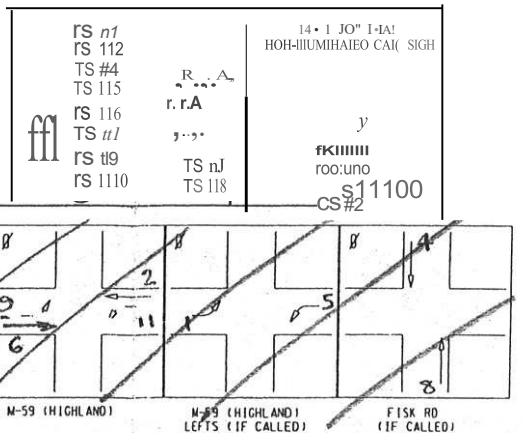
1-1 O.E. COU...
1-11 O.E. COU...
11 P.H.

@@@AUTOSCOPE CAMERA ON 18' TRUSS ARM MTO 26' I INSTALL ONLY!
LS EPAC SCATS CONTROLLABLE CONTROLLER & CABINET.
@JO' ANCHOR BASE STEEL STRAIN POLE.



AUTOSCOPE CAMERAS ARE TO BE PROVIDED BY R.C.O.C. REFER TO SPECIAL PROVISION INCLUDED

H.H. ST. POLE
3-3" D.B. CONDUIT
1-1 1/2" D.B. CONDUIT



ADJUSTMENTS ARE TO BE MADE FOR ANY DIFFERENCE GRADE AT POLE VS. ROAD GRADE.
1 IS CALCULATED AT 1000 POUNDS TENSION.

NOTE: POCH 14'-08" IS SHOWN '80' C CRAOE. BELO ADJUSTMENT TO BE MADE FOR ANY OTHER POCH IN CRAOE AT PILE VI. ROAD CRAOE, POCH IS CALCULATED AT J.229 POUNDS TENSION.

NOTE: POCH 14'-08" IS SHOWN '80' C CRAOE. BELO ADJUSTMENT TO BE MADE FOR ANY OTHER POCH IN CRAOE AT PILE VI. ROAD CRAOE, POCH IS CALCULATED AT J.229 POUNDS TENSION.

Community Profiles

YOU ARE VIEWING DATA FOR:

White Lake Township

7525 Highland Rd
White Lake, MI 48383-2938
<http://www.whitelaketwp.com/>



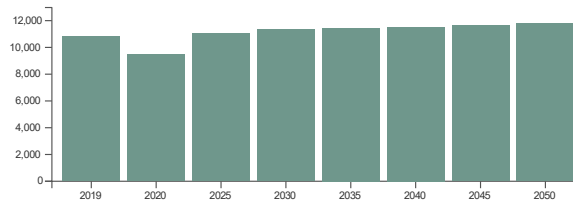
Census 2020 Population: 30,950
Area: 37.1 square miles

[VIEW COMMUNITY EXPLORER MAP](#) [VIEW 2020 CENSUS MAP](#)

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** **Economic**

Forecasted Jobs



Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: SEMCOG 2050 Regional Development Forecast

Forecasted Jobs by Industry Sector

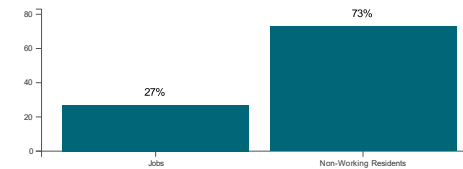
Forecasted Jobs By Industry Sector	2019	2020	2025	2030	2035	2040	2045	2050	Change 2019-2050	Pct Change 2019-2050
Natural Resources, Mining, & Construction	1,022	1,006	1,229	1,253	1,269	1,253	1,236	1,219	197	19.3%
Manufacturing	208	194	223	216	210	195	188	182	-26	-12.5%
Wholesale Trade	293	265	282	297	307	308	307	308	15	5.1%
Retail Trade	2,227	1,940	2,106	2,046	1,930	1,851	1,814	1,768	-459	-20.6%
Transportation, Warehousing, & Utilities	327	319	390	404	415	420	429	434	107	32.7%
Information & Financial Activities	1,716	1,477	1,774	1,793	1,819	1,835	1,846	1,910	194	11.3%
Professional and Technical Services & Corporate HQ	855	813	968	1,023	1,080	1,116	1,168	1,246	391	45.7%
Administrative, Support, & Waste Services	1,132	868	1,051	1,123	1,175	1,207	1,263	1,303	171	15.1%
Education Services	970	897	972	1,016	1,017	1,027	1,033	1,038	68	7%
Healthcare Services	322	284	377	407	433	465	498	532	210	65.2%
Leisure & Hospitality	1,030	762	960	1,004	1,030	1,040	1,045	1,065	35	3.4%
Other Services	557	491	560	587	603	617	621	624	67	12%
Public Administration	158	152	166	172	174	173	173	172	14	8.9%
Total Employment Numbers	10,817	9,468	11,058	11,341	11,462	11,507	11,621	11,801	984	9.1%

Note: The base year for the employment forecast is 2019, as 2020 employment was artificially low due to the COVID recession.

Source: SEMCOG 2050 Regional Development Forecast

Daytime Population

Daytime Population	ACS 2016
Jobs	5,496
Non-Working Residents	14,870
Age 15 and under	6,198
Not in labor force	7,856
Unemployed	816
Daytime Population	20,366



Source: 2012-2016 American Community Survey 5-Year Estimates and 2012-2016 Census Transportation Planning Products Program (CTPP). For additional information, visit SEMCOG's [Interactive Commuting Patterns Map](#)

Note: The number of residents attending school outside Southeast Michigan is not available. Likewise, the number of students commuting into Southeast Michigan to attend school is also not known.

Community Profiles

YOU ARE VIEWING DATA FOR:

White Lake Township

7525 Highland Rd
White Lake, MI 48383-2938
<http://www.whitelaketwp.com/>



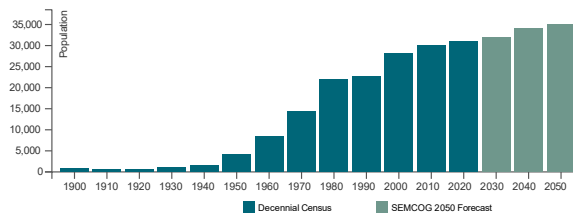
Census 2020 Population: 30,950
Area: 37.1 square miles

- [VIEW COMMUNITY EXPLORER MAP](#)
- [VIEW 2020 CENSUS MAP](#)

Population and Households

Link to American Community Survey (ACS) Profiles: [Select a Year](#) [Social | Demographic](#)
Population and Household Estimates for Southeast Michigan, 2022

Population Forecast



Population and Households

Population and Households	Census 2020	Census 2010	Change 2010-2020	Pct Change 2010-2020	SEMCOG Jul 2022	SEMCOG 2050
Total Population	30,950	30,019	931	3.1%	30,739	35,002
Group Quarters Population	88	76	12	15.8%	105	342
Household Population	30,862	29,943	919	3.1%	30,634	34,660
Housing Units	12,776	12,214	562	4.6%	12,949	-
Households (Occupied Units)	12,089	11,262	827	7.3%	12,110	14,325
Residential Vacancy Rate	5.4%	7.8%	-2.4%	-	6.5%	-
Average Household Size	2.55	2.66	-0.11	-	2.53	2.42

Source: U.S. Census Bureau and SEMCOG 2050 Regional Development Forecast

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2018 Avg.
Natural Increase (Births - Deaths)	218	89	22
Births	424	309	284
Deaths	206	220	262
Net Migration (Movement In - Movement Out)	112	-59	58
Population Change (Natural Increase + Net Migration)	330	30	80

Source: Michigan Department of Community Health Vital Statistics, U.S. Census Bureau, and SEMCOG

Household Types

Household Types	Census 2010	ACS 2021	Change 2010-2021	Pct Change 2010-2021	SEMCOG 2050
With Seniors 65+	2,520	3,804	1,284	51%	-
Without Seniors	8,742	8,015	-727	-8.3%	-
Live Alone, 65+	882	1,141	259	29.4%	-
Live Alone, <65	1,406	1,127	-279	-19.8%	-
2+ Persons, With children	4,009	3,577	-432	-10.8%	-
2+ Persons, Without children	4,965	5,974	1,009	20.3%	-
Total Households	11,262	11,819	557	4.9%	-

Source: U.S. Census Bureau, Decennial Census, 2017-2021 American Community Survey 5-Year Estimates, and SEMCOG 2050 Regional Development Forecast

Level of Service Criteria for Stop Sign Controlled Intersections

The level of service criteria are given in Exhibit 20-2. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in queue.

The average total delay for any particular controlled movement is a function three (capacity) factors: distribution of gaps in the major-street traffic stream, driver judgment in selecting gaps through which to execute the desired maneuvers, and the follow-up headways required by each driver in a queue.

The basic capacity model assumes gaps in the conflicting movements are randomly distributed. When traffic signals are present on the major street, upstream of the subject intersection, flows may not be random but will likely have some platoon structure. Although the procedures in this chapter provide a method for approximating the operations of a TWSC intersection with an upstream signal, the operations of such an intersection is arguably best handled by including it in a complete simulation

Exhibit 20-2. Level of Service Criteria for Stop-Controlled Intersections (Motor Vehicles)

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Average total delay less than 10 sec/veh is defined as Level of Service (LOS) A. Follow-up times of less than 5 sec have been measured when there is no conflicting traffic for a minor street movement, so control delays of less than 10 sec/veh are appropriate for low flow conditions. A total delay of 50 sec/veh is assumed as the break point between LOS E and F.

The LOS criteria for TWSC intersections differ somewhat from the criteria used in Chapter 19 for signalized intersections, primarily because user perceptions differ among transportation facility types. The expectation is that a signalized intersection is designed to carry higher traffic volumes and will present greater delay than an unsignalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, where drivers on the minor approaches to unsignalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized than signalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection.

LOS F exists when there are insufficient gaps of suitable size to allow a side street demand to cross safely through a major street traffic stream. This level of service is generally evident from extremely long total delays experienced by side street traffic and by queueing on the minor approaches. The method, however, is based on a constant critical gap size - that is, the critical gap remains constant, no matter how long the side street motorist waits. LOS F may also appear in the form of side street vehicles' selecting smaller-than-usual gaps. In such cases, safety may be a problem and some disruption to the major traffic stream may result. It is important to note that LOS F may not always result in long queues but may result in adjustments to normal gap acceptance behavior. The latter is more difficult to observe on the field than queueing, which is more obvious.

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle. The criteria are given in Exhibit 19-8.

Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

LOS A describes operations with a control delay of 10 s/veh or less. This level is typically assigned when the volume-to-capacity ratio is low and either progression is extremely favorable or the cycle length is very short. If LOS A is the result of favorable progression, most vehicles arrive during a green indication and travel through the intersection without stopping.

LOS B describes operations with control delay between 10 and 20 s/veh. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

Exhibit 19.8. Level-of-Service Criteria for Signalized Intersections (Motorized Vehicles)

LEVEL OF SERVICE	STOPPED DELAY PER VEHICLE (SEC)
A	≤ 10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

1. If the v/c ratio for a lane group exceeds 1.0, a LOS F is assigned to the individual lane group. LOS for approach-based and intersection-wide assessments are determined solely by the control delay.

LOS C describes operations with control delay between 20 and 35 s/veh. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e. one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicle stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D describes operations with control delay between 35 and 55 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E describes operations with control delay between 55 and 80 s/veh. This level is typically assigned when when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level, considered to be unacceptable to most drivers, often occurs with over-saturation, that is, when arrival flow rates exceed the capacity of the intersection. This level is typically assigned when the volume-to-capacity ratio is high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Source: Highway Capacity Manual, 6th Edition. Transportation Research Board, National Research Council

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Existing Conditions
 AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	1192	9	9	792	26	1	0	6	109	0	55
Future Volume (veh/h)	47	1192	9	9	792	26	1	0	6	109	0	55
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1906	1906	1906	1906	1906	1906	2000	2000	2000	1922	1922	1922
Adj Flow Rate, veh/h	51	1282	10	10	900	30	2	0	10	128	0	65
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.60	0.60	0.60	0.85	0.85	0.85
Percent Heavy Veh, %	6	6	6	6	6	6	0	0	0	5	5	5
Cap, veh/h	354	1558	695	264	1538	51	424	0	480	463	0	461
Arrive On Green	0.07	0.43	0.43	0.07	0.43	0.43	0.28	0.00	0.28	0.28	0.00	0.28
Sat Flow, veh/h	1816	3622	1616	1816	3577	119	1358	0	1695	1371	0	1629
Grp Volume(v), veh/h	51	1282	10	10	456	474	2	0	10	128	0	65
Grp Sat Flow(s),veh/h/ln	1816	1811	1616	1816	1811	1885	1358	0	1695	1371	0	1629
Q Serve(g_s), s	1.3	28.1	0.3	0.2	17.2	17.2	0.1	0.0	0.4	6.7	0.0	2.7
Cycle Q Clear(g_c), s	1.3	28.1	0.3	0.2	17.2	17.2	2.8	0.0	0.4	7.1	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.06	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	354	1558	695	264	779	811	424	0	480	463	0	461
V/C Ratio(X)	0.14	0.82	0.01	0.04	0.59	0.59	0.00	0.00	0.02	0.28	0.00	0.14
Avail Cap(c_a), veh/h	354	1558	695	264	779	811	424	0	480	463	0	461
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	22.6	14.7	15.6	19.5	19.5	25.1	0.0	23.3	25.8	0.0	24.1
Incr Delay (d2), s/veh	0.9	5.1	0.0	0.3	3.2	3.1	0.0	0.0	0.1	1.5	0.0	0.6
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	0.5	11.5	0.1	0.1	7.0	7.3	0.0	0.0	0.2	2.2	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.0	27.7	14.7	15.9	22.7	22.6	25.1	0.0	23.3	27.3	0.0	24.7
LnGrp LOS	B	C	B	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h		1343			940			12				193
Approach Delay, s/veh		27.1			22.6			23.6				26.4
Approach LOS		C			C			C				C
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	45.0		32.0	13.0	45.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 39		25.5	* 6.7	* 39		25.5				
Max Q Clear Time (g_c+I1), s	2.2	30.1		9.1	3.3	19.2		4.8				
Green Ext Time (p_c), s	0.0	5.1		0.5	0.0	5.1		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				25.3								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Highland Road (M-59) & JOANN Fabric Drive

Existing Conditions
 AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↗↗	↗↗	↗	↘↘	
Traffic Vol, veh/h	3	1309	939	6	0	2
Future Vol, veh/h	3	1309	939	6	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	60	60
Heavy Vehicles, %	7	7	7	7	0	0
Mvmt Flow	3	1471	1055	7	0	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1062	0	-	0	1797 528
Stage 1	-	-	-	-	1055 -
Stage 2	-	-	-	-	742 -
Critical Hdwy	4.24	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.27	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	623	-	-	-	*200 500
Stage 1	-	-	-	-	*301 -
Stage 2	-	-	-	-	*534 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	623	-	-	-	*199 500
Mov Cap-2 Maneuver	-	-	-	-	*252 -
Stage 1	-	-	-	-	*299 -
Stage 2	-	-	-	-	*534 -






















Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	623	-	-	-	500
HCM Lane V/C Ratio	0.005	-	-	-	0.007
HCM Control Delay (s)	10.8	-	-	-	12.2
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

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

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	165	1112	8	6	1486	76	6	2	12	249	0	165
Future Volume (veh/h)	165	1112	8	6	1486	76	6	2	12	249	0	165
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1953	1953	1953	2000	2000	2000	1984	1984	1984
Adj Flow Rate, veh/h	194	1308	9	6	1598	82	10	3	20	280	0	185
Peak Hour Factor	0.85	0.85	0.85	0.93	0.93	0.93	0.60	0.60	0.60	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	1	1	1
Cap, veh/h	231	2142	954	306	2056	105	200	48	319	342	0	357
Arrive On Green	0.06	0.57	0.57	0.06	0.57	0.57	0.21	0.21	0.21	0.21	0.00	0.21
Sat Flow, veh/h	1875	3741	1667	1860	3592	183	1217	225	1502	1398	0	1679
Grp Volume(v), veh/h	194	1308	9	6	822	858	10	0	23	280	0	185
Grp Sat Flow(s),veh/h/ln	1875	1870	1667	1860	1856	1920	1217	0	1727	1398	0	1679
Q Serve(g_s), s	5.1	27.6	0.3	0.1	40.8	41.5	0.9	0.0	1.3	24.0	0.0	11.7
Cycle Q Clear(g_c), s	5.1	27.6	0.3	0.1	40.8	41.5	12.6	0.0	1.3	25.3	0.0	11.7
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	231	2142	954	306	1062	1099	200	0	367	342	0	357
V/C Ratio(X)	0.84	0.61	0.01	0.02	0.77	0.78	0.05	0.00	0.06	0.82	0.00	0.52
Avail Cap(c_a), veh/h	231	2142	954	306	1062	1099	200	0	367	342	0	357
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.2	16.9	11.0	11.5	19.7	19.8	47.4	0.0	37.7	47.8	0.0	41.8
Incr Delay (d2), s/veh	28.8	1.3	0.0	0.1	5.5	5.5	0.5	0.0	0.3	19.2	0.0	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.8	10.9	0.1	0.1	17.1	17.9	0.3	0.0	0.6	9.7	0.0	5.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	53.1	18.2	11.0	11.6	25.2	25.3	47.9	0.0	38.0	67.0	0.0	47.1
LnGrp LOS	D	B	B	B	C	C	D	A	D	E	A	D
Approach Vol, veh/h		1511			1686			33			465	
Approach Delay, s/veh		22.6			25.2			41.0			59.1	
Approach LOS		C			C			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	75.0		32.0	13.0	75.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 69		25.5	* 6.7	* 69		25.5				
Max Q Clear Time (g_c+I1), s	2.1	29.6		27.3	7.1	43.5		14.6				
Green Ext Time (p_c), s	0.0	11.2		0.0	0.0	12.8		0.1				
Intersection Summary												
HCM 6th Ctrl Delay			28.6									
HCM 6th LOS			C									
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Highland Road (M-59) & JOANN Fabric Drive

Existing Conditions
 PM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	
Traffic Vol, veh/h	4	1439	1811	16	2	1
Future Vol, veh/h	4	1439	1811	16	2	1
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	75	75
Heavy Vehicles, %	3	3	3	3	0	0
Mvmt Flow	4	1564	1906	17	3	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1924	0	-	0	2697 954
Stage 1	-	-	-	-	1907 -
Stage 2	-	-	-	-	790 -
Critical Hdwy	4.16	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.23	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	299	-	-	-	*14 263
Stage 1	-	-	-	-	*105 -
Stage 2	-	-	-	-	*462 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	299	-	-	-	*14 263
Mov Cap-2 Maneuver	-	-	-	-	*81 -
Stage 1	-	-	-	-	*104 -
Stage 2	-	-	-	-	*462 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	40.6
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	299	-	-	-	105
HCM Lane V/C Ratio	0.015	-	-	-	0.038
HCM Control Delay (s)	17.2	-	-	-	40.6
HCM Lane LOS	C	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	69	362	318	125	35	235	217	9	22	148	69
Average Queue (ft)	27	227	206	9	6	133	127	0	3	60	26
95th Queue (ft)	60	320	304	57	22	206	198	6	14	117	56
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)			38	0							
Queuing Penalty (veh)			3	0							

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	16
Average Queue (ft)	2	1
95th Queue (ft)	12	10
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 4

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	348	308	268	83	24	405	398	29	39	355	157
Average Queue (ft)	170	193	168	5	4	273	277	3	7	173	71
95th Queue (ft)	349	270	243	39	16	370	381	16	24	311	131
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)						0	0				
Queuing Penalty (veh)						0	0				
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)	0		26			0					
Queuing Penalty (veh)	0		2			0					

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive























Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	23	25
Average Queue (ft)	3	3
95th Queue (ft)	16	15
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 3

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Background Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	1204	9	9	800	26	1	0	6	110	0	56
Future Volume (veh/h)	47	1204	9	9	800	26	1	0	6	110	0	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1906	1906	1906	1906	1906	1906	2000	2000	2000	1922	1922	1922
Adj Flow Rate, veh/h	51	1295	10	10	909	30	2	0	10	129	0	66
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.60	0.60	0.60	0.85	0.85	0.85
Percent Heavy Veh, %	6	6	6	6	6	6	0	0	0	5	5	5
Cap, veh/h	351	1558	695	261	1539	51	423	0	480	463	0	461
Arrive On Green	0.07	0.43	0.43	0.07	0.43	0.43	0.28	0.00	0.28	0.28	0.00	0.28
Sat Flow, veh/h	1816	3622	1616	1816	3578	118	1357	0	1695	1371	0	1629
Grp Volume(v), veh/h	51	1295	10	10	460	479	2	0	10	129	0	66
Grp Sat Flow(s),veh/h/ln	1816	1811	1616	1816	1811	1885	1357	0	1695	1371	0	1629
Q Serve(g_s), s	1.3	28.5	0.3	0.2	17.5	17.5	0.1	0.0	0.4	6.7	0.0	2.7
Cycle Q Clear(g_c), s	1.3	28.5	0.3	0.2	17.5	17.5	2.8	0.0	0.4	7.1	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.06	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	351	1558	695	261	779	811	423	0	480	463	0	461
V/C Ratio(X)	0.15	0.83	0.01	0.04	0.59	0.59	0.00	0.00	0.02	0.28	0.00	0.14
Avail Cap(c_a), veh/h	351	1558	695	261	779	811	423	0	480	463	0	461
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	22.8	14.7	15.8	19.6	19.6	25.1	0.0	23.3	25.8	0.0	24.1
Incr Delay (d2), s/veh	0.9	5.3	0.0	0.3	3.3	3.2	0.0	0.0	0.1	1.5	0.0	0.6
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	0.5	11.7	0.1	0.1	7.2	7.4	0.0	0.0	0.2	2.2	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.1	28.1	14.7	16.0	22.9	22.8	25.2	0.0	23.3	27.3	0.0	24.7
LnGrp LOS	B	C	B	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h		1356			949			12				195
Approach Delay, s/veh		27.5			22.7			23.6				26.4
Approach LOS		C			C			C				C
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	45.0		32.0	13.0	45.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 39		25.5	* 6.7	* 39		25.5				
Max Q Clear Time (g_c+I1), s	2.2	30.5		9.1	3.3	19.5		4.8				
Green Ext Time (p_c), s	0.0	4.9		0.6	0.0	5.2		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				25.6								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Highland Road (M-59) & JOANN Fabric Drive

Background Conditions
 AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↗↗	↗↗	↗	↘↘	
Traffic Vol, veh/h	3	1322	948	6	0	2
Future Vol, veh/h	3	1322	948	6	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	60	60
Heavy Vehicles, %	7	7	7	7	0	0
Mvmt Flow	3	1485	1065	7	0	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1072	0	-	0	1814 533
Stage 1	-	-	-	-	1065 -
Stage 2	-	-	-	-	749 -
Critical Hdwy	4.24	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.27	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	617	-	-	-	*222 496
Stage 1	-	-	-	-	*297 -
Stage 2	-	-	-	-	*502 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	617	-	-	-	*221 496
Mov Cap-2 Maneuver	-	-	-	-	*256 -
Stage 1	-	-	-	-	*296 -
Stage 2	-	-	-	-	*502 -

























Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	617	-	-	-	496
HCM Lane V/C Ratio	0.005	-	-	-	0.007
HCM Control Delay (s)	10.9	-	-	-	12.3
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

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

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Background Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	167	1123	8	6	1501	77	6	2	12	251	0	167
Future Volume (veh/h)	167	1123	8	6	1501	77	6	2	12	251	0	167
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1953	1953	1953	2000	2000	2000	1984	1984	1984
Adj Flow Rate, veh/h	196	1321	9	6	1614	83	10	3	20	282	0	188
Peak Hour Factor	0.85	0.85	0.85	0.93	0.93	0.93	0.60	0.60	0.60	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	1	1	1
Cap, veh/h	228	2142	954	302	2056	105	197	48	319	342	0	357
Arrive On Green	0.06	0.57	0.57	0.06	0.57	0.57	0.21	0.21	0.21	0.21	0.00	0.21
Sat Flow, veh/h	1875	3741	1667	1860	3592	184	1213	225	1502	1398	0	1679
Grp Volume(v), veh/h	196	1321	9	6	830	867	10	0	23	282	0	188
Grp Sat Flow(s),veh/h/ln	1875	1870	1667	1860	1856	1920	1213	0	1727	1398	0	1679
Q Serve(g_s), s	5.2	28.0	0.3	0.1	41.5	42.2	0.9	0.0	1.3	24.2	0.0	11.9
Cycle Q Clear(g_c), s	5.2	28.0	0.3	0.1	41.5	42.2	12.8	0.0	1.3	25.5	0.0	11.9
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	228	2142	954	302	1062	1099	197	0	367	342	0	357
V/C Ratio(X)	0.86	0.62	0.01	0.02	0.78	0.79	0.05	0.00	0.06	0.82	0.00	0.53
Avail Cap(c_a), veh/h	228	2142	954	302	1062	1099	197	0	367	342	0	357
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.6	17.0	11.0	11.6	19.8	20.0	47.6	0.0	37.7	47.9	0.0	41.9
Incr Delay (d2), s/veh	31.8	1.3	0.0	0.1	5.7	5.8	0.5	0.0	0.3	19.7	0.0	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	11.1	0.1	0.1	17.4	18.3	0.3	0.0	0.6	9.9	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.4	18.3	11.0	11.8	25.6	25.8	48.1	0.0	38.0	67.6	0.0	47.4
LnGrp LOS	E	B	B	B	C	C	D	A	D	E	A	D
Approach Vol, veh/h		1526			1703			33				470
Approach Delay, s/veh		23.1			25.6			41.1				59.5
Approach LOS		C			C			D				E
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	75.0		32.0	13.0	75.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 69		25.5	* 6.7	* 69		25.5				
Max Q Clear Time (g_c+I1), s	2.1	30.0		27.5	7.2	44.2		14.8				
Green Ext Time (p_c), s	0.0	11.4		0.0	0.0	12.8		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				29.0								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
2: Highland Road (M-59) & JOANN Fabric Drive

Background Conditions
PM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↑↑	↑↑	↗	↘	
Traffic Vol, veh/h	4	1453	1829	16	2	1
Future Vol, veh/h	4	1453	1829	16	2	1
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	75	75
Heavy Vehicles, %	3	3	3	3	0	0
Mvmt Flow	4	1579	1925	17	3	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1943	0	-	0	2724 964
Stage 1	-	-	-	-	1926 -
Stage 2	-	-	-	-	798 -
Critical Hdwy	4.16	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.23	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	294	-	-	-	*13 259
Stage 1	-	-	-	-	*102 -
Stage 2	-	-	-	-	*462 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	294	-	-	-	*13 259
Mov Cap-2 Maneuver	-	-	-	-	*78 -
Stage 1	-	-	-	-	*100 -
Stage 2	-	-	-	-	*462 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	41.7
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	294	-	-	-	102
HCM Lane V/C Ratio	0.015	-	-	-	0.039
HCM Control Delay (s)	17.4	-	-	-	41.7
HCM Lane LOS	C	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	81	397	406	106	32	261	239	13	17	155	66
Average Queue (ft)	31	233	213	10	5	139	136	1	2	59	24
95th Queue (ft)	67	343	342	62	22	216	218	6	12	119	52
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)			40	0							
Queuing Penalty (veh)			4	0							

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	17
Average Queue (ft)	1	1
95th Queue (ft)	12	8
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 4

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	331	294	286	102	24	409	381	18	24	345	173
Average Queue (ft)	154	186	174	7	3	261	261	3	6	180	78
95th Queue (ft)	297	263	253	48	16	358	357	15	20	309	144
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)	0										
Queuing Penalty (veh)	0										
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)	25										
Queuing Penalty (veh)	2										

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive























Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	34	21
Average Queue (ft)	4	2
95th Queue (ft)	21	13
Link Distance (ft)		321
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)	500	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 2

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Future Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	1239	9	9	831	30	1	0	6	115	0	56
Future Volume (veh/h)	47	1239	9	9	831	30	1	0	6	115	0	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1906	1906	1906	1906	1906	1906	2000	2000	2000	1922	1922	1922
Adj Flow Rate, veh/h	51	1332	10	10	944	34	2	0	10	135	0	66
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.60	0.60	0.60	0.85	0.85	0.85
Percent Heavy Veh, %	6	6	6	6	6	6	0	0	0	5	5	5
Cap, veh/h	340	1558	695	254	1533	55	423	0	480	463	0	461
Arrive On Green	0.07	0.43	0.43	0.07	0.43	0.43	0.28	0.00	0.28	0.28	0.00	0.28
Sat Flow, veh/h	1816	3622	1616	1816	3566	128	1357	0	1695	1371	0	1629
Grp Volume(v), veh/h	51	1332	10	10	479	499	2	0	10	135	0	66
Grp Sat Flow(s),veh/h/ln	1816	1811	1616	1816	1811	1883	1357	0	1695	1371	0	1629
Q Serve(g_s), s	1.3	29.8	0.3	0.2	18.5	18.5	0.1	0.0	0.4	7.1	0.0	2.7
Cycle Q Clear(g_c), s	1.3	29.8	0.3	0.2	18.5	18.5	2.8	0.0	0.4	7.5	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.07	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	340	1558	695	254	779	810	423	0	480	463	0	461
V/C Ratio(X)	0.15	0.86	0.01	0.04	0.62	0.62	0.00	0.00	0.02	0.29	0.00	0.14
Avail Cap(c_a), veh/h	340	1558	695	254	779	810	423	0	480	463	0	461
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.5	23.1	14.7	16.2	19.9	19.9	25.1	0.0	23.3	25.9	0.0	24.1
Incr Delay (d2), s/veh	0.9	6.2	0.0	0.3	3.6	3.5	0.0	0.0	0.1	1.6	0.0	0.6
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	0.5	12.4	0.1	0.1	7.6	7.9	0.0	0.0	0.2	2.3	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	29.4	14.7	16.5	23.5	23.4	25.2	0.0	23.3	27.5	0.0	24.7
LnGrp LOS	B	C	B	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h		1393			988			12			201	
Approach Delay, s/veh		28.7			23.4			23.6			26.6	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	45.0		32.0	13.0	45.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 39		25.5	* 6.7	* 39		25.5				
Max Q Clear Time (g_c+I1), s	2.2	31.8		9.5	3.3	20.5		4.8				
Green Ext Time (p_c), s	0.0	4.4		0.6	0.0	5.3		0.0				

Intersection Summary

HCM 6th Ctrl Delay	26.5
HCM 6th LOS	C

Notes

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

HCM 6th TWSC
 2: Highland Road (M-59) & JOANN Fabric Drive

Future Conditions
 AM Peak Hour

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↗↗	↗↗	↗	↘↘	
Traffic Vol, veh/h	3	1345	974	6	0	2
Future Vol, veh/h	3	1345	974	6	0	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	89	89	60	60
Heavy Vehicles, %	7	7	7	7	0	0
Mvmt Flow	3	1511	1094	7	0	3

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1101	0	-	0	1856 547
Stage 1	-	-	-	-	1094 -
Stage 2	-	-	-	-	762 -
Critical Hdwy	4.24	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.27	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	601	-	-	-	*196 486
Stage 1	-	-	-	-	*287 -
Stage 2	-	-	-	-	*502 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	601	-	-	-	*195 486
Mov Cap-2 Maneuver	-	-	-	-	*242 -
Stage 1	-	-	-	-	*286 -
Stage 2	-	-	-	-	*502 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	601	-	-	-	486
HCM Lane V/C Ratio	0.006	-	-	-	0.007
HCM Control Delay (s)	11	-	-	-	12.5
HCM Lane LOS	B	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

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

HCM 6th TWSC
3: Site Drive & Highland Road (M-59)

Future Conditions
AM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	
Traffic Vol, veh/h	1294	71	49	927	58	54
Future Vol, veh/h	1294	71	49	927	58	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	92	92
Heavy Vehicles, %	7	7	7	7	2	2
Mvmt Flow	1454	80	55	1042	63	59

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1534	0	2125
Stage 1	-	-	-	-	1494
Stage 2	-	-	-	-	631
Critical Hdwy	-	-	4.24	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.27	-	3.52
Pot Cap-1 Maneuver	-	-	705	-	77
Stage 1	-	-	-	-	473
Stage 2	-	-	-	-	492
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	705	-	71
Mov Cap-2 Maneuver	-	-	-	-	244
Stage 1	-	-	-	-	473
Stage 2	-	-	-	-	454























Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	21.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	336	-	-	705	-
HCM Lane V/C Ratio	0.362	-	-	0.078	-
HCM Control Delay (s)	21.7	-	-	10.5	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1.6	-	-	0.3	-

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

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Future Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	167	1145	8	6	1520	83	6	2	12	258	0	167
Future Volume (veh/h)	167	1145	8	6	1520	83	6	2	12	258	0	167
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1953	1953	1953	2000	2000	2000	1984	1984	1984
Adj Flow Rate, veh/h	196	1347	9	6	1634	89	10	3	20	290	0	188
Peak Hour Factor	0.85	0.85	0.85	0.93	0.93	0.93	0.60	0.60	0.60	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	1	1	1
Cap, veh/h	224	2142	954	296	2049	111	197	48	319	342	0	357
Arrive On Green	0.06	0.57	0.57	0.06	0.57	0.57	0.21	0.21	0.21	0.21	0.00	0.21
Sat Flow, veh/h	1875	3741	1667	1860	3580	194	1213	225	1502	1398	0	1679
Grp Volume(v), veh/h	196	1347	9	6	843	880	10	0	23	290	0	188
Grp Sat Flow(s),veh/h/ln	1875	1870	1667	1860	1856	1918	1213	0	1727	1398	0	1679
Q Serve(g_s), s	5.2	28.9	0.3	0.1	42.7	43.5	0.9	0.0	1.3	24.2	0.0	11.9
Cycle Q Clear(g_c), s	5.2	28.9	0.3	0.1	42.7	43.5	12.8	0.0	1.3	25.5	0.0	11.9
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	224	2142	954	296	1062	1098	197	0	367	342	0	357
V/C Ratio(X)	0.88	0.63	0.01	0.02	0.79	0.80	0.05	0.00	0.06	0.85	0.00	0.53
Avail Cap(c_a), veh/h	224	2142	954	296	1062	1098	197	0	367	342	0	357
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.1	17.1	11.0	11.8	20.1	20.3	47.6	0.0	37.7	48.2	0.0	41.9
Incr Delay (d2), s/veh	34.9	1.4	0.0	0.1	6.1	6.2	0.5	0.0	0.3	22.1	0.0	5.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.2	11.5	0.1	0.1	18.0	19.0	0.3	0.0	0.6	10.4	0.0	5.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	60.0	18.5	11.0	12.0	26.2	26.5	48.1	0.0	38.0	70.3	0.0	47.4
LnGrp LOS	E	B	B	B	C	C	D	A	D	E	A	D
Approach Vol, veh/h		1552			1729			33			478	
Approach Delay, s/veh		23.7			26.3			41.1			61.3	
Approach LOS		C			C			D			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	75.0		32.0	13.0	75.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 69		25.5	* 6.7	* 69		25.5				
Max Q Clear Time (g_c+I1), s	2.1	30.9		27.5	7.2	45.5		14.8				
Green Ext Time (p_c), s	0.0	11.7		0.0	0.0	12.7		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				29.8								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↘	↗↗	↗↗	↗	↘↘	
Traffic Vol, veh/h	4	1481	1860	16	2	1
Future Vol, veh/h	4	1481	1860	16	2	1
Conflicting Peds, #/hr	1	0	0	1	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	500	-	-	425	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	75	75
Heavy Vehicles, %	3	3	3	3	0	0
Mvmt Flow	4	1610	1958	17	3	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	1976	0	-	0	2772 980
Stage 1	-	-	-	-	1959 -
Stage 2	-	-	-	-	813 -
Critical Hdwy	4.16	-	-	-	6.8 6.9
Critical Hdwy Stg 1	-	-	-	-	5.8 -
Critical Hdwy Stg 2	-	-	-	-	5.8 -
Follow-up Hdwy	2.23	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	285	-	-	-	*11 253
Stage 1	-	-	-	-	*98 -
Stage 2	-	-	-	-	*438 -
Platoon blocked, %		-	-	-	1
Mov Cap-1 Maneuver	285	-	-	-	*11 253
Mov Cap-2 Maneuver	-	-	-	-	*75 -
Stage 1	-	-	-	-	*97 -
Stage 2	-	-	-	-	*438 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	43.3
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	285	-	-	-	98
HCM Lane V/C Ratio	0.015	-	-	-	0.041
HCM Control Delay (s)	17.8	-	-	-	43.3
HCM Lane LOS	C	-	-	-	E
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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

HCM 6th TWSC
3: Site Drive & Highland Road (M-59)

Future Conditions
PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑		↘	↑↑	↘	
Traffic Vol, veh/h	1434	52	59	1802	53	51
Future Vol, veh/h	1434	52	59	1802	53	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	1559	57	62	1897	58	55

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	1616	0	2661
Stage 1	-	-	-	-	1588
Stage 2	-	-	-	-	1073
Critical Hdwy	-	-	4.16	-	6.84
Critical Hdwy Stg 1	-	-	-	-	5.84
Critical Hdwy Stg 2	-	-	-	-	5.84
Follow-up Hdwy	-	-	2.23	-	3.52
Pot Cap-1 Maneuver	-	-	*726	-	*~ 16
Stage 1	-	-	-	-	*460
Stage 2	-	-	-	-	*290
Platoon blocked, %	-	-	1	-	1
Mov Cap-1 Maneuver	-	-	*726	-	*~ 14
Mov Cap-2 Maneuver	-	-	-	-	*159
Stage 1	-	-	-	-	*460
Stage 2	-	-	-	-	*265

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	33.1
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	238	-	-	* 726	-
HCM Lane V/C Ratio	0.475	-	-	0.086	-
HCM Control Delay (s)	33.1	-	-	10.4	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	2.4	-	-	0.3	-

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

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	78	404	392	90	36	253	243	9	21	151	72
Average Queue (ft)	29	247	234	8	5	133	130	0	2	64	21
95th Queue (ft)	63	359	356	48	23	211	208	5	11	125	51
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)		0	40	0							
Queuing Penalty (veh)		0	4	1							

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	24	16
Average Queue (ft)	1	1
95th Queue (ft)	12	8
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Site Drive & Highland Road (M-59)

Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	9	85	10	194
Average Queue (ft)	0	26	0	70
95th Queue (ft)	6	59	7	143
Link Distance (ft)	408		134	190
Upstream Blk Time (%)				2
Queuing Penalty (veh)				0
Storage Bay Dist (ft)		500		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 4

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	316	334	305	67	28	412	427	30	30	332	164
Average Queue (ft)	148	179	169	5	4	278	282	4	7	182	79
95th Queue (ft)	288	257	251	36	18	383	387	19	23	296	144
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)						0	0				
Queuing Penalty (veh)						1	0				
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)			26			0					
Queuing Penalty (veh)			2			0					

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	33	25
Average Queue (ft)	4	3
95th Queue (ft)	20	15
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Site Drive & Highland Road (M-59)























Movement	EB	WB	WB	NB
Directions Served	TR	L	T	LR
Maximum Queue (ft)	12	81	72	213
Average Queue (ft)	0	28	3	197
95th Queue (ft)	6	59	32	224
Link Distance (ft)	408		134	190
Upstream Blk Time (%)			0	98
Queuing Penalty (veh)			0	0
Storage Bay Dist (ft)		500		
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Zone Summary

Zone wide Queuing Penalty: 3

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Future Conditions w/ IMP
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	1239	9	9	831	30	1	0	6	115	0	56
Future Volume (veh/h)	47	1239	9	9	831	30	1	0	6	115	0	56
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1906	1906	1906	1906	1906	1906	2000	2000	2000	1922	1922	1922
Adj Flow Rate, veh/h	51	1332	10	10	944	34	2	0	10	135	0	66
Peak Hour Factor	0.93	0.93	0.93	0.88	0.88	0.88	0.60	0.60	0.60	0.85	0.85	0.85
Percent Heavy Veh, %	6	6	6	6	6	6	0	0	0	5	5	5
Cap, veh/h	340	1558	695	254	1533	55	423	0	480	463	0	461
Arrive On Green	0.07	0.43	0.43	0.07	0.43	0.43	0.28	0.00	0.28	0.28	0.00	0.28
Sat Flow, veh/h	1816	3622	1616	1816	3566	128	1357	0	1695	1371	0	1629
Grp Volume(v), veh/h	51	1332	10	10	479	499	2	0	10	135	0	66
Grp Sat Flow(s),veh/h/ln	1816	1811	1616	1816	1811	1883	1357	0	1695	1371	0	1629
Q Serve(g_s), s	1.3	29.8	0.3	0.2	18.5	18.5	0.1	0.0	0.4	7.1	0.0	2.7
Cycle Q Clear(g_c), s	1.3	29.8	0.3	0.2	18.5	18.5	2.8	0.0	0.4	7.5	0.0	2.7
Prop In Lane	1.00		1.00	1.00		0.07	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	340	1558	695	254	779	810	423	0	480	463	0	461
V/C Ratio(X)	0.15	0.86	0.01	0.04	0.62	0.62	0.00	0.00	0.02	0.29	0.00	0.14
Avail Cap(c_a), veh/h	340	1558	695	254	779	810	423	0	480	463	0	461
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.5	23.1	14.7	16.2	19.9	19.9	25.1	0.0	23.3	25.9	0.0	24.1
Incr Delay (d2), s/veh	0.9	6.2	0.0	0.3	3.6	3.5	0.0	0.0	0.1	1.6	0.0	0.6
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	0.5	12.4	0.1	0.1	7.6	7.9	0.0	0.0	0.2	2.3	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.4	29.4	14.7	16.5	23.5	23.4	25.2	0.0	23.3	27.5	0.0	24.7
LnGrp LOS	B	C	B	B	C	C	C	A	C	C	A	C
Approach Vol, veh/h		1393			988			12			201	
Approach Delay, s/veh		28.7			23.4			23.6			26.6	
Approach LOS		C			C			C			C	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	45.0		32.0	13.0	45.0		32.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 39		25.5	* 6.7	* 39		25.5				
Max Q Clear Time (g_c+I1), s	2.2	31.8		9.5	3.3	20.5		4.8				
Green Ext Time (p_c), s	0.0	4.4		0.6	0.0	5.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay				26.5								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗	↘	↑↑	↘	
Traffic Vol, veh/h	1294	71	49	927	58	54
Future Vol, veh/h	1294	71	49	927	58	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	89	89	89	89	92	92
Heavy Vehicles, %	7	7	7	7	2	2
Mvmt Flow	1454	80	55	1042	63	59

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	1534	0	2085 727
Stage 1	-	-	-	-	1454 -
Stage 2	-	-	-	-	631 -
Critical Hdwy	-	-	4.24	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.27	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	705	-	87 *563
Stage 1	-	-	-	-	516 -
Stage 2	-	-	-	-	492 -
Platoon blocked, %	-	-	1	-	1 1
Mov Cap-1 Maneuver	-	-	705	-	80 *563
Mov Cap-2 Maneuver	-	-	-	-	257 -
Stage 1	-	-	-	-	516 -
Stage 2	-	-	-	-	454 -























Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	20.8
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	348	-	-	705	-
HCM Lane V/C Ratio	0.35	-	-	0.078	-
HCM Control Delay (s)	20.8	-	-	10.5	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	1.5	-	-	0.3	-

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

HCM 6th Signalized Intersection Summary
 1: Private Drive/Fisk Road & Highland Road (M-59)

Future Conditions w/ IMP
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	167	1145	8	6	1520	83	6	2	12	258	0	167
Future Volume (veh/h)	167	1145	8	6	1520	83	6	2	12	258	0	167
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1969	1969	1969	1953	1953	1953	2000	2000	2000	1984	1984	1984
Adj Flow Rate, veh/h	196	1347	9	6	1634	89	10	3	20	290	0	188
Peak Hour Factor	0.85	0.85	0.85	0.93	0.93	0.93	0.60	0.60	0.60	0.89	0.89	0.89
Percent Heavy Veh, %	2	2	2	3	3	3	0	0	0	1	1	1
Cap, veh/h	259	1986	885	270	1751	95	254	57	382	401	0	427
Arrive On Green	0.10	0.53	0.53	0.06	0.49	0.49	0.25	0.25	0.25	0.25	0.00	0.25
Sat Flow, veh/h	1875	3741	1667	1860	3580	194	1213	225	1502	1398	0	1680
Grp Volume(v), veh/h	196	1347	9	6	843	880	10	0	23	290	0	188
Grp Sat Flow(s),veh/h/ln	1875	1870	1667	1860	1856	1918	1213	0	1728	1398	0	1680
Q Serve(g_s), s	7.2	31.7	0.3	0.2	51.0	52.0	0.8	0.0	1.2	23.7	0.0	11.3
Cycle Q Clear(g_c), s	7.2	31.7	0.3	0.2	51.0	52.0	12.1	0.0	1.2	25.0	0.0	11.3
Prop In Lane	1.00		1.00	1.00		0.10	1.00		0.87	1.00		1.00
Lane Grp Cap(c), veh/h	259	1986	885	270	908	938	254	0	439	401	0	427
V/C Ratio(X)	0.76	0.68	0.01	0.02	0.93	0.94	0.04	0.00	0.05	0.72	0.00	0.44
Avail Cap(c_a), veh/h	259	1986	885	270	908	938	254	0	439	401	0	427
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	31.6	20.6	13.3	15.5	28.7	28.9	42.7	0.0	33.8	43.3	0.0	37.6
Incr Delay (d2), s/veh	18.6	1.9	0.0	0.2	16.9	17.8	0.3	0.0	0.2	10.8	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.8	13.0	0.1	0.1	24.7	26.2	0.3	0.0	0.5	9.0	0.0	4.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	50.2	22.5	13.3	15.6	45.5	46.7	43.0	0.0	34.1	54.0	0.0	40.9
LnGrp LOS	D	C	B	B	D	D	D	A	C	D	A	D
Approach Vol, veh/h		1552			1729			33				478
Approach Delay, s/veh		26.0			46.0			36.8				48.8
Approach LOS		C			D			D				D
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	13.0	70.0		37.0	18.0	65.0		37.0				
Change Period (Y+Rc), s	* 6.3	* 6.3		6.5	* 6.3	* 6.3		6.5				
Max Green Setting (Gmax), s	* 6.7	* 64		30.5	* 12	* 59		30.5				
Max Q Clear Time (g_c+I1), s	2.2	33.7		27.0	9.2	54.0		14.1				
Green Ext Time (p_c), s	0.0	10.9		0.7	0.1	3.7		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				38.1								
HCM 6th LOS				D								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 3: Site Drive & Highland Road (M-59)

Future Conditions w/ IMP
 PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑	↓	↑↑	↓	
Traffic Vol, veh/h	1434	52	59	1802	53	51
Future Vol, veh/h	1434	52	59	1802	53	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	3	3	3	3	2	2
Mvmt Flow	1559	57	62	1897	58	55

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	1616	0	2632 780
Stage 1	-	-	-	-	1559 -
Stage 2	-	-	-	-	1073 -
Critical Hdwy	-	-	4.16	-	6.84 6.94
Critical Hdwy Stg 1	-	-	-	-	5.84 -
Critical Hdwy Stg 2	-	-	-	-	5.84 -
Follow-up Hdwy	-	-	2.23	-	3.52 3.32
Pot Cap-1 Maneuver	-	-	*726	-	*~ 18 *488
Stage 1	-	-	-	-	*460 -
Stage 2	-	-	-	-	*290 -
Platoon blocked, %	-	-	1	-	1 1
Mov Cap-1 Maneuver	-	-	*726	-	*~ 16 *488
Mov Cap-2 Maneuver	-	-	-	-	*160 -
Stage 1	-	-	-	-	*460 -
Stage 2	-	-	-	-	*265 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	32.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	239	-	-	* 726	-
HCM Lane V/C Ratio	0.473	-	-	0.086	-
HCM Control Delay (s)	32.9	-	-	10.4	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	2.3	-	-	0.3	-

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

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	78	366	360	86	38	239	246	12	25	145	65
Average Queue (ft)	31	241	223	9	6	128	131	0	3	63	24
95th Queue (ft)	65	342	330	55	25	205	218	5	16	125	54
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)			40	0							
Queuing Penalty (veh)			4	0							

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	28	16
Average Queue (ft)	1	1
95th Queue (ft)	11	9
Link Distance (ft)		321
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Site Drive & Highland Road (M-59)

Movement	EB	WB	WB	NB
Directions Served	R	L	T	LR
Maximum Queue (ft)	13	61	11	170
Average Queue (ft)	1	22	0	79
95th Queue (ft)	6	54	8	156
Link Distance (ft)			134	177
Upstream Blk Time (%)				5
Queuing Penalty (veh)				0
Storage Bay Dist (ft)	100	500		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 4

Intersection: 1: Private Drive/Fisk Road & Highland Road (M-59)

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	190	307	299	82	113	491	500	22	33	355	156
Average Queue (ft)	84	199	188	4	6	383	388	4	5	182	73
95th Queue (ft)	155	281	276	37	71	530	533	17	20	304	135
Link Distance (ft)		1480	1480			471	471		200		1113
Upstream Blk Time (%)						6	7				
Queuing Penalty (veh)						52	58				
Storage Bay Dist (ft)	500			50	500			100		1000	
Storage Blk Time (%)			29			6					
Queuing Penalty (veh)			2			0					

Intersection: 2: Highland Road (M-59) & JOANN Fabric Drive

Movement	EB	WB	WB	SB
Directions Served	L	T	T	LR
Maximum Queue (ft)	30	83	77	21
Average Queue (ft)	3	6	7	2
95th Queue (ft)	17	57	58	12
Link Distance (ft)		1430	1430	321
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	500			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: Site Drive & Highland Road (M-59)

Movement	EB	WB	WB	WB	NB
Directions Served	R	L	T	T	LR
Maximum Queue (ft)	8	79	61	65	207
Average Queue (ft)	0	31	9	10	188
95th Queue (ft)	4	65	63	69	204
Link Distance (ft)			134	134	177
Upstream Blk Time (%)		0	0	1	98
Queuing Penalty (veh)		0	4	6	0
Storage Bay Dist (ft)	100	500			
Storage Blk Time (%)		0	0		
Queuing Penalty (veh)		0	0		

Zone Summary

Zone wide Queuing Penalty: 123

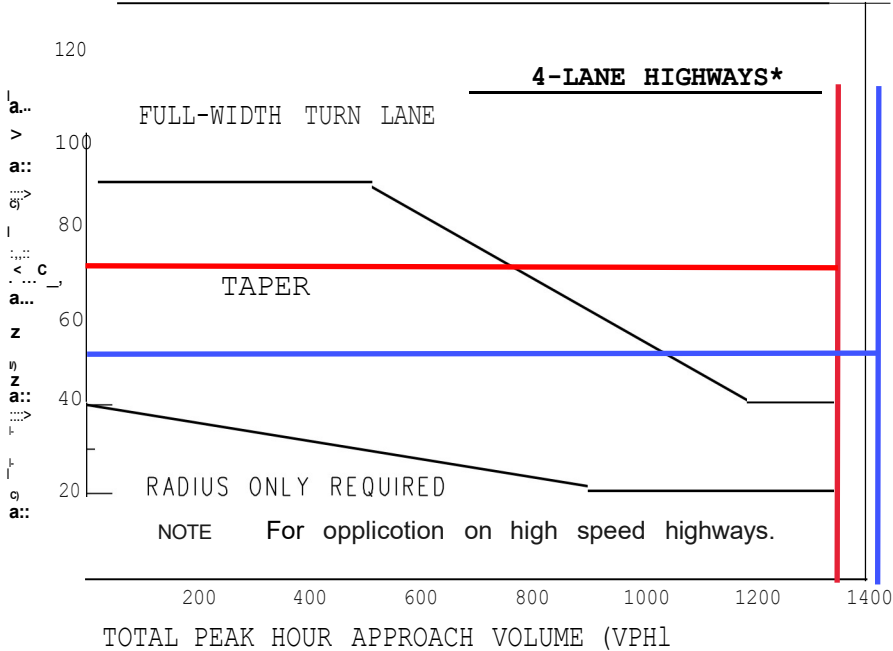
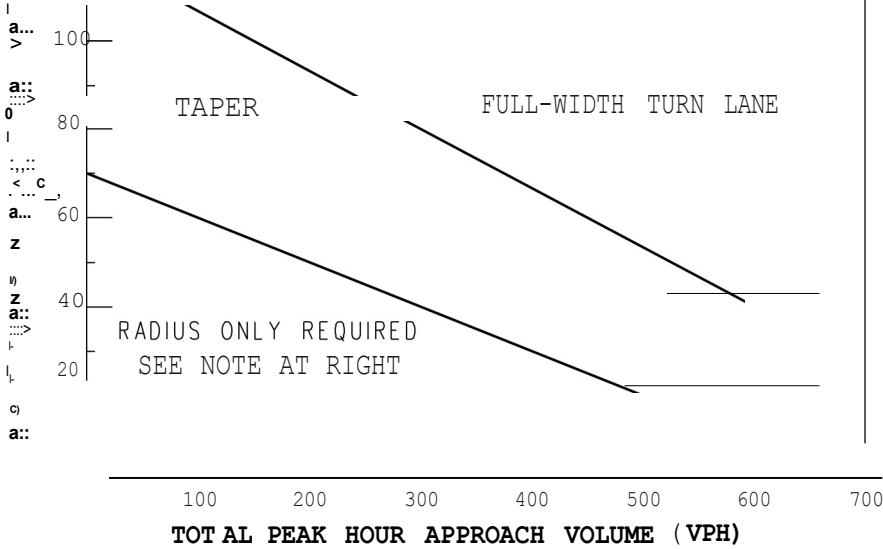
EB Highland Road (M-59) & Site Drive

2-LANE HIGHWAYS*

NOTE:

For posted speeds at or under 45 mph, peak hour right turns greater than 40 vph, and total peak hour approach less than 300 vph, adjust right turn volumes.

Adjust peak hour right turns Peak hour right turns - 20



*If a center left-turn lane exists (i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

AM=71
PM=52

AM=1365
PM=1486

RT Radius Recommended

Sample Problem:

The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

Solution:

Figure indicates that the intersection of 300 vph and 100 vph is located above the upper trend line; thus, a right-turn lane may be recommended.

<p>JVIDOT <small>Michigan Department of Transportation</small></p> <p>TRAFFIC AND SAFETY NOTE</p>	<p>TRAFFIC VOLUME GUIDELINES FDR RIGHT-TURN LANES AND TAPERS</p>
<p>DRAWN BY: MTS CHECKED BY: JAT</p>	<p>08/05/2004 PLAN DATE:</p>
<p>FILE: K:/OGN/its notes/Note604A tsn.dgn</p>	<p style="font-size: large; font-weight: bold;">604A</p> <p style="font-size: x-small;">SHEET 2 OF 2</p>
<p>REV. 08/05/2004</p>	

Coffee Shop Drive Through Lane

95th Percentile Probability - Drive Through Queue Length (# of Vehicles)

Volume = 89 vph
 service rate = 80 veh/hr
 $\lambda = 1.1125$

λ^x	1	2	3	4	5	6	7	8	9	Poisson Queue
	No Veh in Cycle	X	X!	$P = (e^{(-\lambda)})(\lambda^x)/X!$	ΣP	P* # Cycle containing Volume in 1	Σ Cycles in 6	Volume in Cycle (1*6)	Σ volume	
1.0000	0	0	1	32.87%	32.87%	26	26	0	0	NO
1.1125	1	1	1	36.57%	69.45%	29	56	29	29	NO
1.2377	2	2	2	20.34%	89.79%	16	11	33	62	NO
1.3769	3	3	6	7.54%	97.33%	6	17	18	80	NO
1.5318	4	4	24	2.10%	99.43%	2	19	7	87	NO
1.7041	5	5	120	0.47%	99.90%	0	19	2	88	MET
1.8958	6	6	720	0.09%	99.98%	0	19	0	89	MET
2.1091	7	7	5040	0.01%	100.00%	0	19	0	89	MET
2.3464	8	8	40320	0.00%	100.00%	0	19	0	89	MET
2.6104	9	9	362880	0.00%	100.00%	0	19	0	89	MET
2.9040	10	10	3628800	0.00%	100.00%	0	19	0	89	MET
3.2307	11	11	39916800	0.00%	100.00%	0	19	0	89	MET