NOVI CORPORATE CAMPUS PARCEL 1
JSP18-43

NOVI CORPORATE CAMPUS PARCEL 1, JSP 18-43
Consideration of the request of Dembs Development for Preliminary Site Plan and Storm Water Management Plan approval for a new 93,320 square foot Research/Development/Office building. The subject property contains 6.6 acres and is located in Section 9, north of Twelve Mile Road and east of West Park Drive, in the I-1, Light Industrial District.

Required Action
Approve or deny the Preliminary Site Plan and Storm Water Management plan.

REVIEW	RESULT	DATE	COMMENTS
Planning	Approval recommended	9-18-18	• Items to be addressed by the applicant prior to Electronic Stamping Set approval
Engineering	Approval recommended	9-17-18	• Items to be addressed by the applicant prior to Final Site Plan approval
Landscaping	Approval recommended	9-11-18	• **Waiver to not provide 8 perimeter trees along the western island due to a conflict with an existing water main** (*Staff supported*); • Items to be addressed by the applicant prior to Final Site Plan approval
Woodlands	Not Applicable		
Wetlands	Not Applicable		
Traffic	Approval recommended	9-15-18	• Items to be addressed by the applicant prior to Final Site Plan approval
Traffic Impact Statement	**Approval denied**	10-7-18	• **The TIS Report should be revised to address the comments noted in the review letter** • The changes required are not anticipated to alter the results of the TIS, therefore the site plan can be recommended for approval to move forward
Façade	Approval recommended	9-11-18	• The proposed building is in full compliance with the façade ordinance.
Fire	Approval with conditions	8-30-18	• Items to be addressed by the applicant prior to Final Site Plan approval

MOTION SHEET

Approval – Preliminary Site Plan

In the matter of Novi Corporate Campus Parcel 1 JSP18-43, motion to **approve** the Preliminary Site Plan based on and subject to the following:

a. Waiver from Section 5.5.3.C.(3) of the Zoning Ordinance for not providing 8 perimeter trees along the western island due to a conflict with an existing water main, which is hereby granted;
b. Revised submittal of the Traffic Impact Study to adequately address the comments in the traffic consultant's review letter at the time of Final Site Plan;
c. The findings of compliance with Ordinance standards in the staff and consultant review letters and the conditions and the items listed in those letters being addressed on the Final Site Plan; and
d. (additional conditions here if any)

(This motion is made because the plan is otherwise in compliance with Article 3, Article 4, and Article 5 of the Zoning Ordinance and all other applicable provisions of the Ordinance.)

– AND –

Approval – Stormwater Management Plan

In the matter of Novi Corporate Campus Parcel 1 JSP18-43, motion to **approve** the Stormwater Management Plan based on and subject to the following:

a. The findings of compliance with Ordinance standards in the staff and consultant review letters, and the conditions and items listed in those letters being addressed on the Final Site Plan; and
b. *(additional conditions here if any)*

(This motion is made because the plan is otherwise in compliance with Chapter 11 of the Code of Ordinances and all other applicable provisions of the Ordinance.)

– OR –

Denial – Preliminary Site Plan

In the matter of Novi Corporate Campus Parcel 1 JSP18-43, motion to **deny** the Preliminary Site Plan…*(because the plan is not in compliance with Article 3, Article 4, and Article 5 of the Zoning Ordinance and all other applicable provisions of the Ordinance.)*

-AND-

Denial – Stormwater Management Plan

In the matter of Novi Corporate Campus Parcel 1 JSP18-43, motion to **deny** the Stormwater Management Plan…*(because the plan is not in compliance with Chapter 11 of the Code of Ordinances and all other applicable provisions of the Ordinance.)*

MAPS

Location

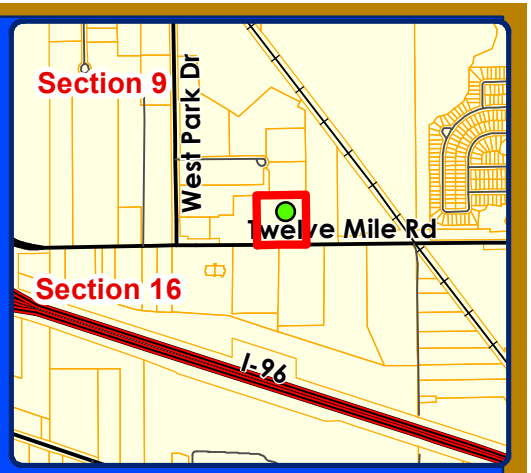
Zoning

Future Land Use

Natural Features

NOVI CORPORATE CAMPUS PARCEL 1: JSP18-43

LOCATION



LEGEND

Subject Property

City of Novi
Dept. of Community Development
City Hall / Civic Center
45175 W Ten Mile Rd
Novi, MI 48375
cityofnovi.org

Map Author: Lindsay Bell
Date: 11/2/2018
Project: NOVI CORP CAMPUS #1 JSP18-43
Version #: 1

Feet
0 80 160 320 480

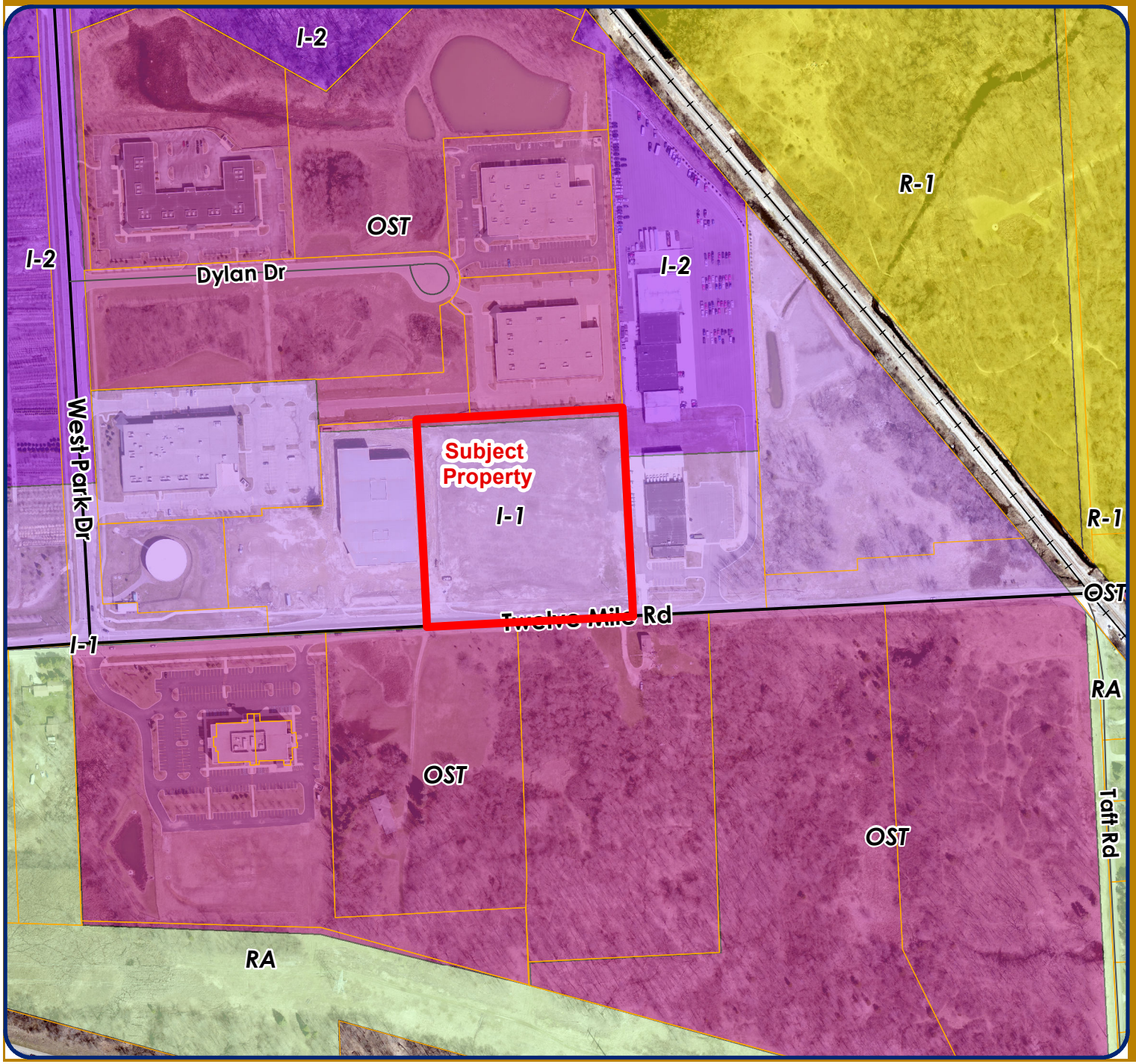
1 inch = 371 feet

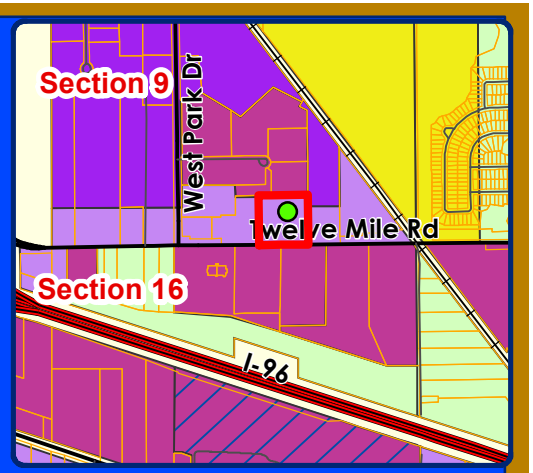
MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.

NOVI CORPORATE CAMPUS PARCEL 1: JSP18-43

ZONING





LEGEND

- R-A: Residential Acreage
- R-1: One-Family Residential District
- EXO: OST District with EXO Overlay
- I-1: Light Industrial District
- I-2: General Industrial District
- OST: Office Service Technology
- Subject Property

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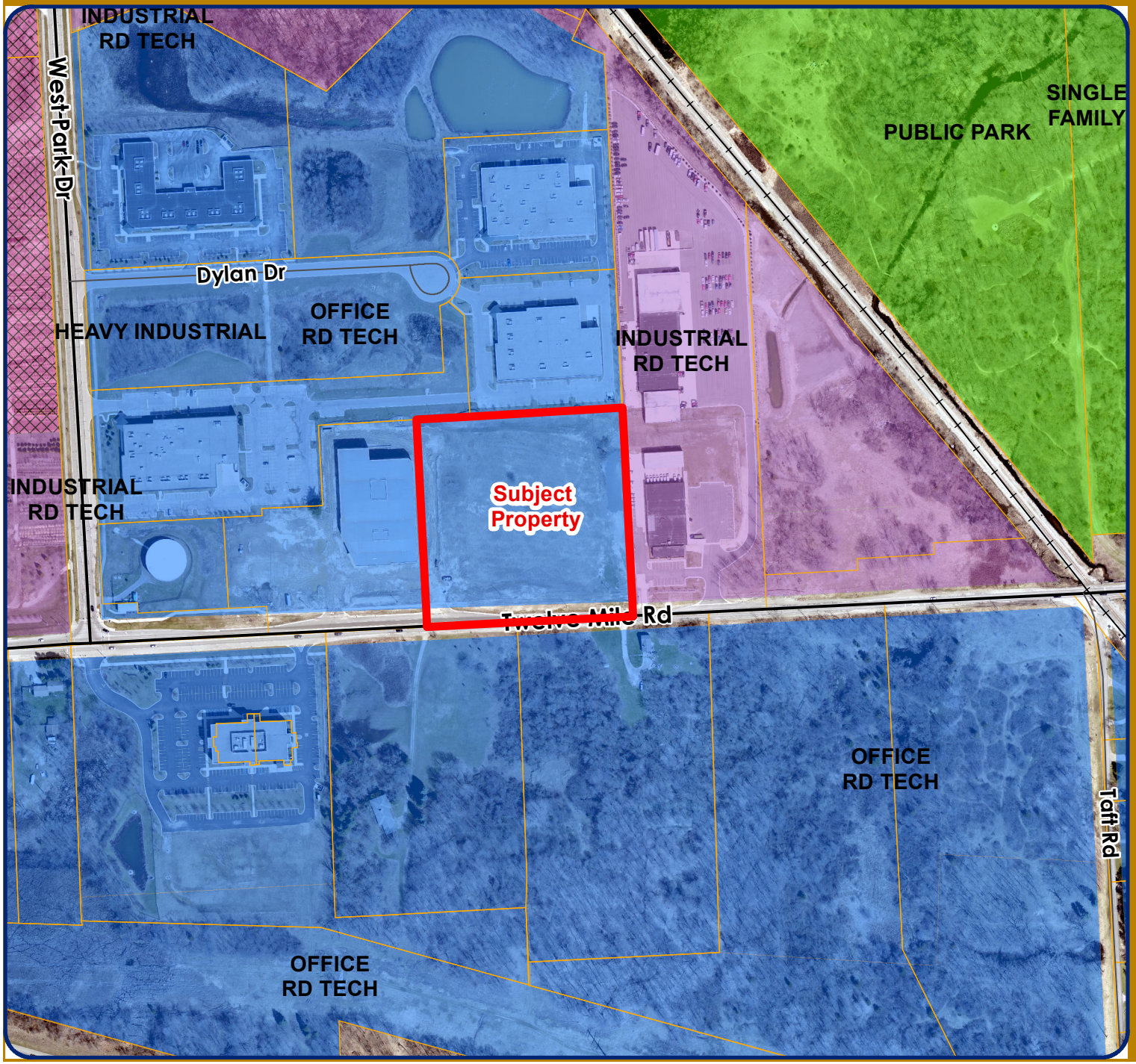
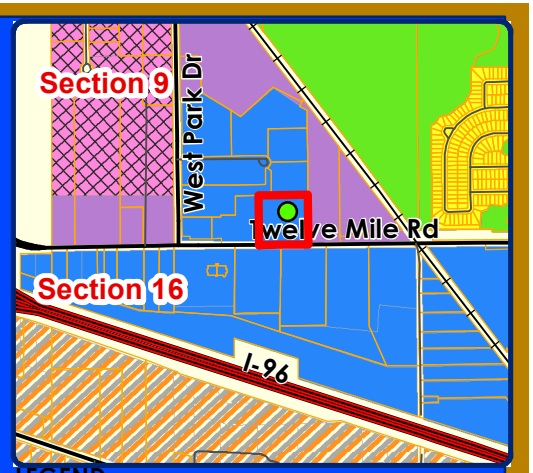
NOVI CORPORATE CAMPUS PARCEL 1: JSP18-43

FUTURE LAND USE





LEGEND

- Single Family
- Multiple Family
- Office Research Development Technology
- Industrial Research Development Technology
- Heavy Industrial
- City West
- Public Park
- Subject Property

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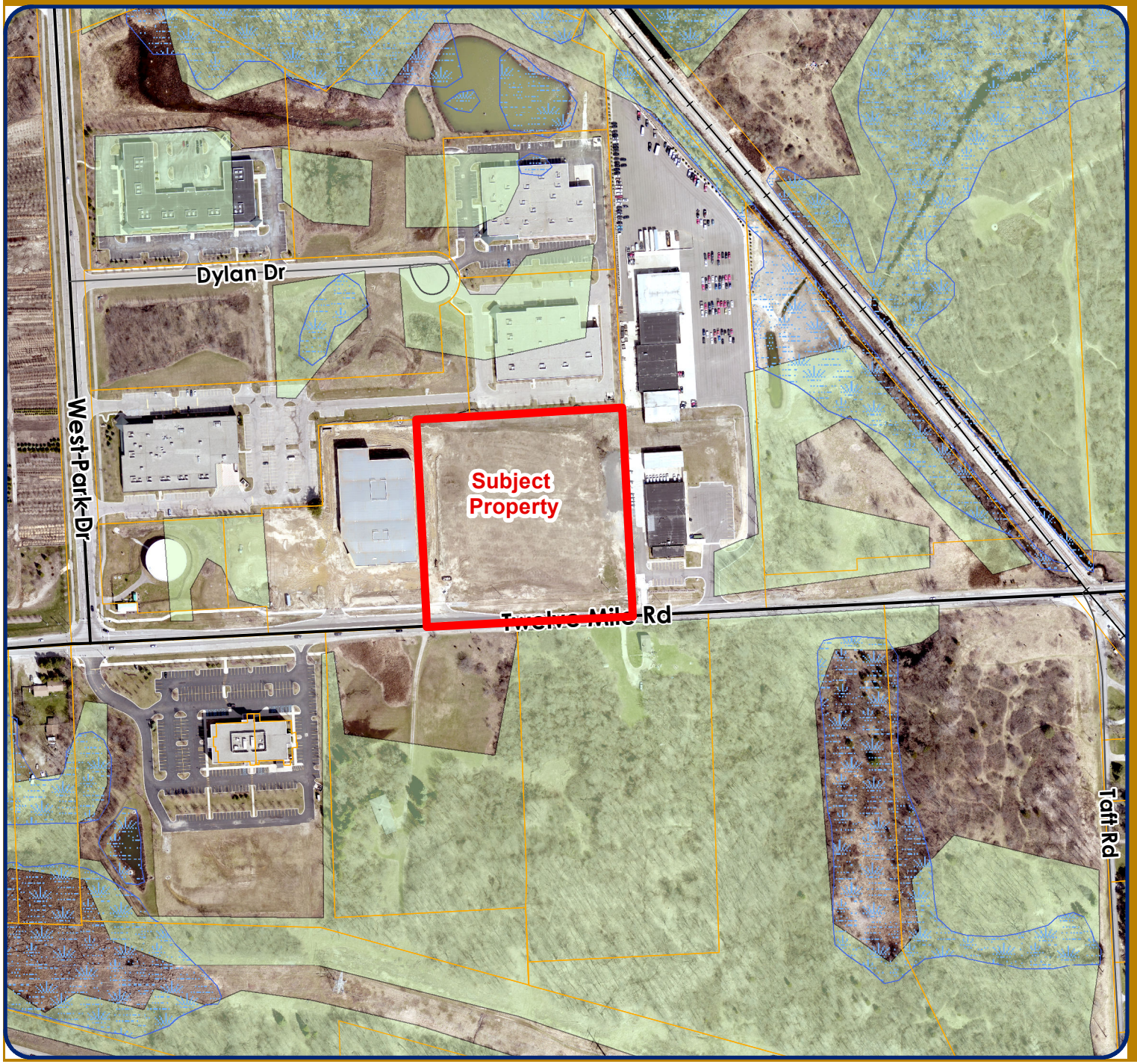
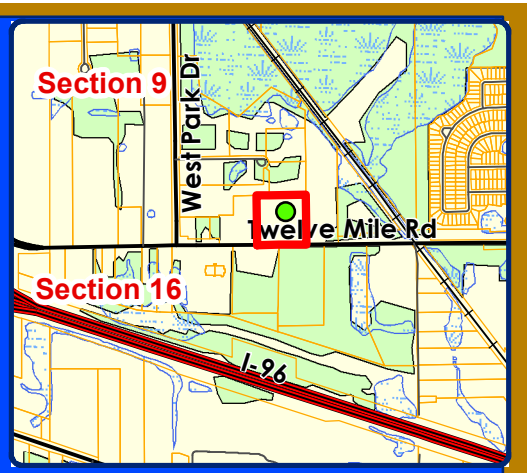
NOVI CORPORATE CAMPUS PARCEL 1: JSP18-43

LOCATION





LEGEND

- WETLANDS
- WOODLANDS
- Subject Property

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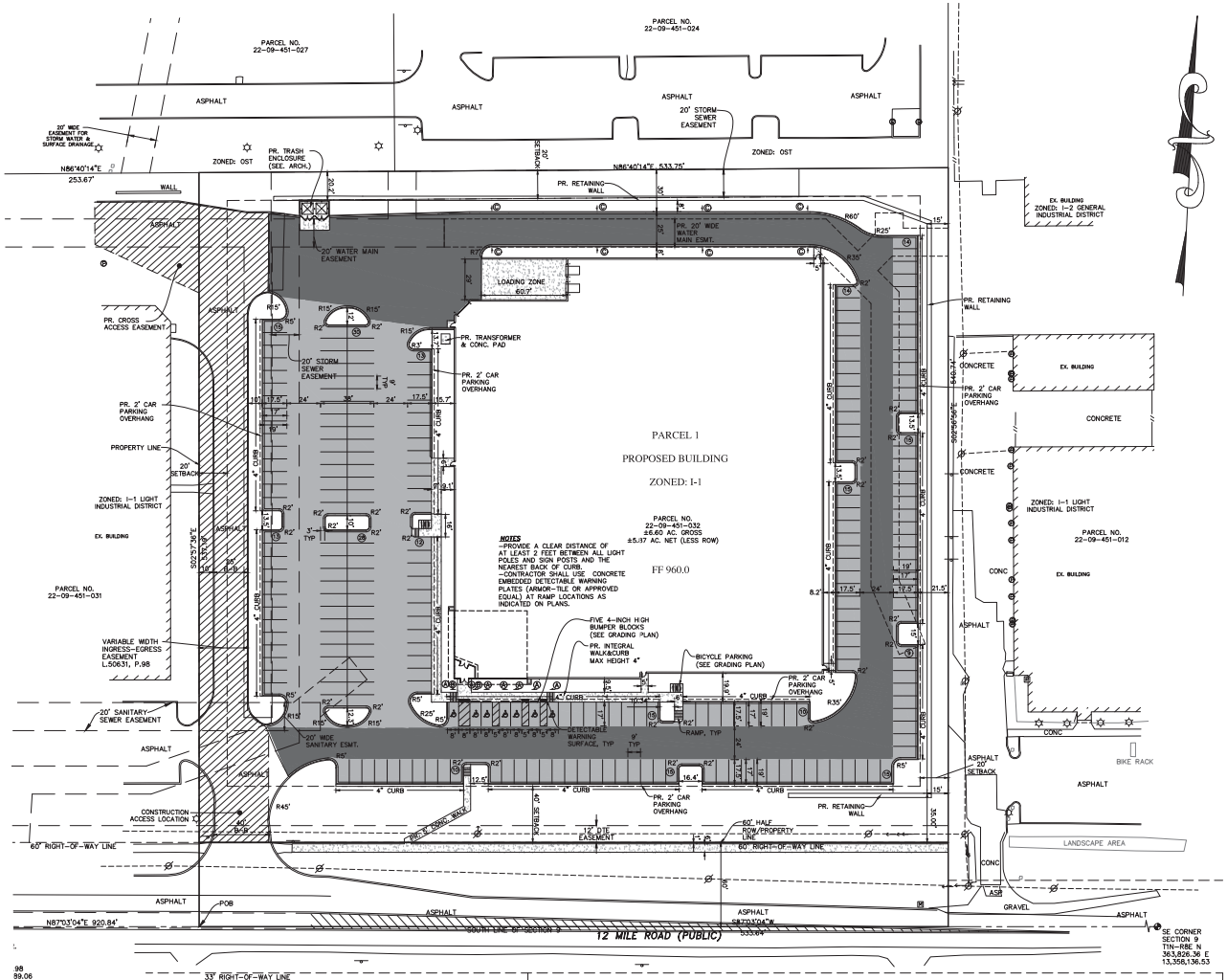
SITE PLAN
(Full plan set available for viewing at the Community Development Department.)



SITE DATA:

SITE AREA: 5.87 ACRES (NET, LESS ROW), 6.60 ACRES (GROSS)

EXISTING/PROPOSED ZONING: I-1 LIGHT INDUSTRIAL

PROPOSED SPECULATIVE BUILDING SHELL:
19,725 S.F. FIRST FLOOR OFFICE
17,295 S.F. SECOND FLOOR OFFICE
56,300 S.F. INDUSTRIAL/RESEARCH
93,320 S.F. GROSS FLOOR AREA

REQUIRED BUILDING SETBACKS: 40' FRONT MINIMUM
20' EACH SIDE MINIMUM
20' REAR MINIMUM

REQUIRED PARKING:
OFFICE: 37,020 S.F. x 95% GROSS LEASABLE FLOOR AREA / 222 S.F.
= 158.4 SPACES
INDUSTRIAL/RESEARCH: 56,300 S.F. GROSS x 80% USABLE
= 45,040 S.F. USABLE FLOOR AREA / 700 S.F.
= 64.3 SPACES
223 TOTAL SPACES REQUIRED
232 TOTAL PARKING SPACES PROVIDED
(INCLUDES 7 B.F. SPACES)

REQUIRED BICYCLE PARKING:
REQUIRED: 5% OF REQUIRED AUTO SPACES
= 223 x .05= 11 BICYCLE PARKING SPACES
PROVIDED: 11 BICYCLE PARKING SPACES

SOUTHERN YARD PARKING CALCULATIONS:

PARKING OCCUPANCY REQUIRED: LESS THAN 50%

PARKING OCCUPANCY PROPOSED:
SOUTHERN YARD PARKING SPACE AREA: 13,816 S.F.
SOUTHERN YARD AREA: 41,686 S.F.
SOUTHERN YARD PARKING OCCUPANCY: 33%

NOTE:
THE BUILDING IS DESIGNED AS A SPECULATIVE INDUSTRIAL SHELL WITH NO PROPOSED OCCUPANT AT PRESENT. AT THE TIME OF POTENTIAL TENANT OCCUPANCY, THE TENANTS CURRENT AND FUTURE (IF APPLICABLE) EMPLOYEE COUNT WILL BE USED TO VERIFY IF THE SITE HAS ADEQUATE PARKING TO ACCOMMODATE THE TENANTS NEEDS AND MEET THE CITY OF NOVI'S OFF THE STREET PARKING REQUIREMENTS.

HOURS OF OPERATION:

SINCE THE BUILDING IS PROPOSED AS A SPECULATIVE SHELL WITH NO POTENTIAL OCCUPANTS AT PRESENT A DEFINED HOURS OF OPERATION CAN NOT BE DETERMINED AND IS UNKNOWN. HOWEVER, THE BUILDING IS INTENDED TO BE OCCUPIED MAINLY BY BUSINESS USERS, THEREFORE ASSUMED HOURS OF OPERATION FROM 8:00 A.M. TO 5:00 P.M. FOR STANDARD BUSINESS PRACTICE CAN BE APPLIED

FIRE DEPARTMENT NOTES:

1. WATER MAINS AND FIRE HYDRANTS SHALL BE INSTALLED PRIOR TO CONSTRUCTION ABOVE FOUNDATION.

2. THE BUILDING ADDRESS IS TO BE POSTED FACING THE STREET THROUGHOUT CONSTRUCTION. THE ADDRESS IS TO BE AT LEAST 3" HIGH ON A CONTRASTING BACKGROUND.

3. FIRE APPARATUS ACCESS DRIVES TO AND FROM BUILDINGS THROUGH PARKING LOTS SHALL HAVE A MINIMUM FIFTY (50) FEET OUTSIDE TURNING RADIUS AND DESIGNED TO SUPPORT A MINIMUM OF THIRTY-FIVE (35) TONS.

4. IMMEDIATE ACCESS TO FIRE DEPARTMENT CONNECTIONS SHALL BE MAINTAINED AT ALL TIMES AND WITHOUT OBSTRUCTION BY FENCES, BUSHES, TREES, WALLS OR ANY OTHER OBJECT FOR A MINIMUM OF 3 FEET.

5. IN ANY BUILDING OR STRUCTURE REQUIRED TO BE EQUIPPED WITH A FIRE DEPARTMENT CONNECTION, THE CONNECTION SHALL BE LOCATED WITHIN ONE HUNDRED (100) FEET OF A FIRE HYDRANT.

GENERAL SITE NOTES:

1. ALL WORK SHALL CONFORM TO THE CURRENT CITY OF NOVI STANDARDS AND SPECIFICATIONS.

2. STORM WATER TREATMENT AND DETENTION WILL BE ACCOMMODATED IN THE NOVI CORPORATE CAMPUS BASIN.

3. ROOFTOP EQUIPMENT MUST BE SCREENED PER ORDINANCE REQUIREMENTS.

4. EXTERIOR LIGHTING MUST COMPLY WITH SECTION 2511 OF THE CITY OF NOVI CODE.

5) RIGHT OF WAY PERMIT IS REQUIRED FROM THE ROAD COMMISSION FOR OAKLAND COUNTY AND CITY OF NOVI FOR ANY WORK IN THE 12 MILE ROAD RIGHT-OF-WAY.

6. ALL SIGNS SHALL CONFORM TO ALL APPLICABLE CODES AND ORDINANCES (CHAPTER 28) OF THE CITY OF NOVI, AND WHERE REQUIRED SHALL BE RENEWED AND APPROVED BY THE DEPARTMENT OF BUILDING AND SAFETY AND A PERMIT ISSUED. NO SIGNS (OTHER THAN TYPICAL TRAFFIC CONTROL SIGNS) ARE APPROVED AS PART OF THIS SITE PLAN APPROVAL. PRIOR TO INSPECTION OF A SIGN, AN APPLICATION AND APPROPRIATE SUBMISSIONS SHALL BE MADE TO THE BUILDING DEPARTMENT FOR REVIEW, APPROVAL AND ISSUANCE OF A SIGN PERMIT.

7. ALL PARKING AND TRAFFIC CONTROL SIGNS SHALL COMPLY WITH THE DESIGN AND PLACEMENT REQUIREMENTS OF THE "2011 MICHIGAN MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES" (2011 MMUTCD).

8. NOTIFY THE CITY OF NOVI A MINIMUM OF 48 HOURS PRIOR TO THE START OF CONSTRUCTION.

9. CALL MISS DIG (811) A MINIMUM OF 72 HOURS PRIOR TO THE START OF CONSTRUCTION.

10. ALL SOIL EROSION AND SILT MUST BE CONTROLLED AND CONTAINED ON-SITE.

11. ALL EXCAVATION UNDER OR WITHIN A 1 ON 1 INFLUENCE OF PUBLIC PAVEMENT, EXISTING OR PROPOSED, SHALL BE BACKFILLED AND COMPACTED WITH SAND (CLASS II MDOT).

12. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO EXISTING UTILITIES.

13. PRIOR TO ISSUANCE OF AN OCCUPANCY PERMIT, ENGINEERING SITE INSPECTION IS REQUIRED.

14. IF DEWATERING IS ANTICIPATED OR ENCOUNTERED DURING CONSTRUCTION THE CONTRACTOR IS REQUIRED TO SUBMIT A DEWATERING PLAN TO THE CITY ENGINEERING DIVISION FOR REVIEW.

15. DIMENSIONS OF PARKING STALLS (LENGTH AS WELL AS WIDTH) ABUTTING A CURB OR SIDEWALK ARE TO THE FACE OF CURB OR WALK. ALL OTHER DIMENSIONS ARE TO BACK OF CURB UNLESS OTHERWISE INDICATED.

16. ONLY NECESSARY LIGHTING FOR SECURITY PURPOSES AND LIMITED OPERATIONS SHALL BE USED AFTER THE SITE'S HOURS OF OPERATION.

17. NO FLASHING LIGHTING WILL BE USED ON THE SITE.

18. NO OUTSIDE STORAGE SHALL BE PERMITTED.

19. NO TRUCKS WILL BE CLEANED OR SERVICED OUTSIDE THE BUILDING. LONG TERM DELIVERY TRUCK PARKING IS NOT ALLOWED ON-SITE.

20. AS REQUIRED BY THE CITY OF NOVI, SOUND LEVELS OF BUILDING OCCUPANT OPERATIONS, INCLUDING THE OPERATION OF ROOFTOP MECHANICAL EQUIPMENT, SHALL NOT EXCEED 55 DECIBELS DURING NIGHT TIME HOURS AND 60 DECIBELS DURING DAY TIME HOURS. VERIFICATION OF THE CONFORMANCE MAY BE REQUIRED AT THE TIME OF OCCUPANCY.

NOTICE:

CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

NOTE:

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AS DISCLOSED BY AVAILABLE UTILITY COMPANY RECORDS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE COMPANY. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES. THE CONTRACTOR SHALL NOTIFY THE DESIGN ENGINEER IMMEDIATELY IF A CONFLICT IS APPARENT.

TRAFFIC SIGNING REQUIREMENTS

ITEM	MMUTCD CODE	QUANTITY	SIZE	DESCRIPTION
(A)	R7-8	7	12"x18"	RESERVED PARKING ONLY
(B)	R7-8P	2	12"x6"	VAN ACCESSIBLE
(C)	R7-9A MOD	8	12"x18"	NO PARKING FIRE LANE

TRAFFIC SIGNING AND STRIPING REQUIREMENTS

1. ALL PERMANENT AND TEMPORARY TRAFFIC SIGNAGE & STRIPING SHALL COMPLY WITH THE 2011 MMUTCD.

2. SIGNS SHALL BE MOUNTED ON 1 1/2" SQUARE GALVANIZED STEEL POST, WALL OR FENCE MOUNTED AS INDICATED ON THE PLANS, LOCATE AND INSTALL IN ACCORDANCE WITH ALL APPLICABLE STANDARDS AND REGULATIONS.

3. STRIPING FOR HANDICAPPED PARKING SPACES SHALL BE BLUE AND MARKINGS FOR NON-HANDICAPPED PARKING SPACES SHALL BE WHITE. WHERE A HANDICAPPED PARKING SPACE ABUTS A NON-HANDICAPPED SPACE, THE TWO SPACES SHALL BE SEPARATED BY ABUTTING BLUE AND WHITE STRIPES.

4. AN END PARKING SPACE ABUTTING A CURB OR WALK SHOULD BE 8 FEET WIDE IF DESIGNATED A HANDICAPPED SPACE OR 9 FEET WIDE IF NOT. PER GENERAL SITE NOTE 15, THESE WIDTHS ARE REFERENCED TO THE FACE OF CURB OR WALK.

5. EACH INTERNATIONAL SYMBOL OF ACCESSIBILITY (WHEELCHAIR) TO BE PAINTED ON THE PAVEMENT SHALL BE WHITE.

6. SOLID ARROWS INDICATE WHERE ARROWS ARE PROPOSED AS PART OF THE STRIPING PLAN; HOLLOW ARROWS ARE PROVIDED TO DENOTE TRAFFIC FLOW DIRECTION.

7. SEE SHEETS 4 AND 16 FOR BARRIER FREE SIGNAGE DETAILS.

ALLOWABLE USES:

THE POTENTIAL TENANT SHOULD CHECK WITH COMMUNITY DEVELOPMENT REGARDING ALLOWED USES PRIOR TO OCCUPANCY. ANY USES THAT ARE NOT PERMITTED BY RIGHT AS LISTED IN THE ORDINANCE WOULD NEED PLANNING COMMISSION APPROVAL.

LEGAL DESCRIPTION:

PART OF THE SOUTHEAST 1/4 OF SECTION 9, T1N-R8E, CITY OF NOVI, OAKLAND COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING AT THE SOUTH 1/4 CORNER OF SAID SECTION 9; THENCE N87°03'04"E 920.84 FEET ALONG THE CENTERLINE OF 12 MILE ROAD (VARIABLE WIDTH) AND THE SOUTH LINE OF SAID SECTION 9 TO THE POINT OF BEGINNING; THENCE N02°57'36"W 537.19 FEET; THENCE N86°40'14"E 533.75 FEET; THENCE S02°56'56"E 540.74 FEET; THENCE S87°03'04"W 533.64 FEET ALONG THE CENTERLINE OF SAID 12 MILE ROAD AND THE SOUTH LINE OF SAID SECTION 9 TO THE POINT OF BEGINNING, CONTAINING 6.60 ACRES OF LAND, MORE OR LESS

PARCEL ID: 50-22-09-451-032

PAVING LEGEND

- ON-SITE STANDARD PAVING
- ON-SITE HEAVY DUTY PAVING
- CONCRETE

COMMERCIAL
SITE PLANNING
SITE ENGINEERING
INDUSTRIAL PARK LAYOUT
LAND SURVEYING
CONSTRUCTION LAYOUT

SURVEYING
ALTA SURVEYS
BOUNDARY SURVEYS
TOPOGRAPHIC SURVEYS
PARCEL SPLITS

RESIDENTIAL
SUBDIVISIONS
SITE CONDOMINIUM
PLANNING
PILOT PLANS
CONSTRUCTION LAYOUT

46892 WEST ROAD
NOVI, MICHIGAN 48377
(248) 926-3701 (BUS)
(248) 926-3785 (FAX)
WWW.ALPINE-ENG.COM

ALPINE ENGINEERING, INC.
CIVIL ENGINEERS & LAND SURVEYORS

811 Know what's below Call before you dig.

CLIENT: DEMBS DEVELOPMENT, INC.

PRELIMINARY SITE PLAN

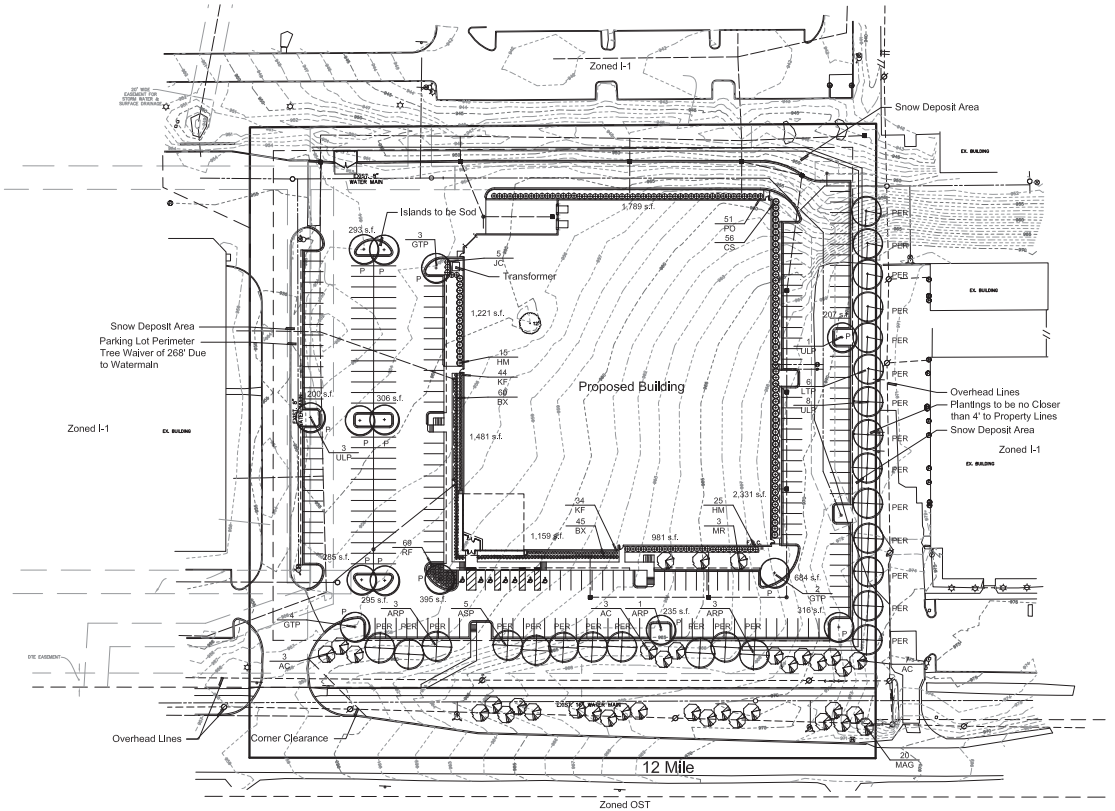
NOVI CORPORATE CAMPUS – PARCEL 1 (45900 TWELVE MILE RD.)
TOWNSHIP: 1N RANGE: 8E
SECTION: 9
CITY OF NOVI
OAKLAND COUNTY
MICHIGAN

REVISED
2018-08-21 PRE-APP. SUBMITTAL

DATE: 2018-08-03
DRAWN BY: TG
CHECKED BY: SD/TG
0 20 40
FBK:
CHF:
SCALE HOR 1"= 40 FT. VER 1"= FT.

18-330

ALLEN DESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE
557 CARPENTER • NORTHVILLE, MI 48167
248.467.4668 • Fax 248.349.0559
Email: jca@wideopenwest.com



Landscape Summary

Existing Zoning	I-1
Parking Lot Landscaping	
Vehicular Use Area	92,043 s.f.
Landscape Area Required	2,710 s.f.
50,000 s.f. x 5% = 2,500 s.f.	
42,043 s.f. x 0.5% = 210 s.f.	
Landscape Area Shown	3,216 s.f.
Canopy Trees Required	14 Trees (2,710 / 200)
Canopy Trees Shown	14 Trees
Parking Lot Perimeter	
Perimeter	1,154 l.f.
Less Watermain Conflict	268'
Net Perimeter	886 l.f.
Trees Required	25 Trees (886 l.f. / 35')
Trees Shown	25 Trees
Building Foundation Landscaping	
Perimeter of Building	1,103 l.f. (1,121' less 18' of Doors)
Landscape Area Required	8,824 s.f. (1,103 l.f. x 8')
Landscape Area Shown	8,962 s.f.
Greenbelt Plantings	
Street Frontage	447 l.f. (533' - 86' drive openings)
Trees Required	11 Trees (447 l.f. / 40')
Trees Shown	11 Trees
Sub-Canopy Trees Required	13 Trees (447 l.f. / 35')
Sub-Canopy Trees Shown	13 Trees
Street Lawn	
Street Frontage	447 l.f. (533' - 186' drive openings)
Trees Required	10 Trees (447 l.f. / 45')
Trees Shown	10 Trees (20 Ornamental Trees at 2:1 Ratio)

Notes:
1. Soils Information is Found on the Preliminary Storm Water Management Plan.
2. Trees Shall be Planted no Closer than 10' Utility Structure Including Hydrants.
3. Trees Shall not be Planted within 4' of Property Lines.
4. Utility Boxes Shall be Screen per Detail on Sheet L-2.

Requested Waiver:
1. Sec. 5.5.1.C.iv. - Parking Lot Perimeter Trees. An Existing Water Line is Located within Parking Lot Perimeter. A Walver of 268' and 8 Trees Is Requested.

Plant List

sym.	qty.	botanical name	common name	caliper	spacing	root	height	price	total
Greenbelt									
MAG	20	Malus 'Adirondack'	Adirondack Crab	2.5"	as shown	B&B		$ 250.00	$ 5,000.00
Parking Lot and Perimeter Trees									
ARP	7	Acer rubrum 'October Glory'	October Glory Red Maple	3.0"	as shown	B&B		$ 400.00	$ 2,800.00
ASP	5	Acer saccharum 'Green Mountain'	Green Mountain Sugar Maple	3.0"	as shown	B&B		$ 400.00	$ 2,000.00
GTP	9	Gleditsia triacanthos var. Imermis	Honey Locust	3.0"	as shown	B&B		$ 400.00	$ 3,600.00
LTP	6	Liriodendron tulpifera	Tulip Tree	3.0"	as shown	B&B		$ 400.00	$ 2,400.00
ULP	12	Ulmus 'Frontier'	Fontier Elm					$ 400.00	$ 4,800.00
	39	Trees Provided							
General Landscaping									
AC	13	Amelanchier canadensis 'Autumn Brilliance'	Autumn Brilliance Serviceberry	2.5	as shown	B&B		$ 250.00	$ 3,250.00
BX	105	Buxus x. Green Velvet'	Green Velvet Boxwood		as shown		24"	$ 50.00	$ 5,250.00
CS	56	Cornus sericea	Red-osier Dogwood		as shown		36"	$ 50.00	$ 2,800.00
HM	40	Hydrangea m. 'Endless Summer'	Endless Summer Hydrangea		as shown		36"	$ 50.00	$ 2,000.00
JC	5	Juniperus ch. "Keteleer"	Keteleer Juniper		as shown	B&B	6'	$ 50.00	$ 250.00
KF	78	Calamagrostis x. a. 'Karl Forester'	Karl Forester Grass		as shown		#2 cont.	$ 15.00	$ 1,170.00
MR	3	Malus 'Royal Raindrops'	Royal Raindrops Crab	2.5"	as shown	B&B		$ 250.00	$ 750.00
PO	51	Physocarpus opulifolius 'Coppertina'	Coppertina Ninebark		as shown		36"	$ 50.00	$ 2,550.00
RF	69	Rudbeckia fulgida speciosa 'Goldsturm'	Black Eyed Susan		as shown		#2 cont.	$ 15.00	$ 1,035.00
	260	Sod (s.y.)						$ 6.00	$ 1,560.00
	2,278	Seed (s.y.)						$ 2.50	$ 5,695.00
Mulch									
	75	s.y. 4" Deep Shredded Hardwood Bark Mulch						$35/s.y.	$ 2,625.00
Irrigation									$ 16,000.00
							Total		$ 65,535.00

Seal:

Title:
Landscape Plan

Project:
NCC Parcel 1
Novi, Michigan

Prepared for:
Alpine Engineering
46892 West Road
Novi, Michigan 48377
248.926.3701

Revision:	Issued:
Submission	August 13, 2018

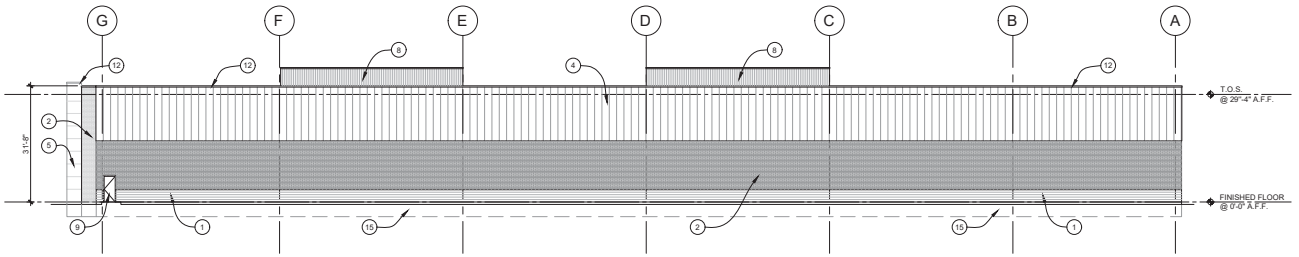
Job Number:
18-016

Drawn By: jca Checked By: jca

0' 25' 50'
NORTH
1"=50'

Sheet No.
L-1

811 Know what's below. Call before you dig

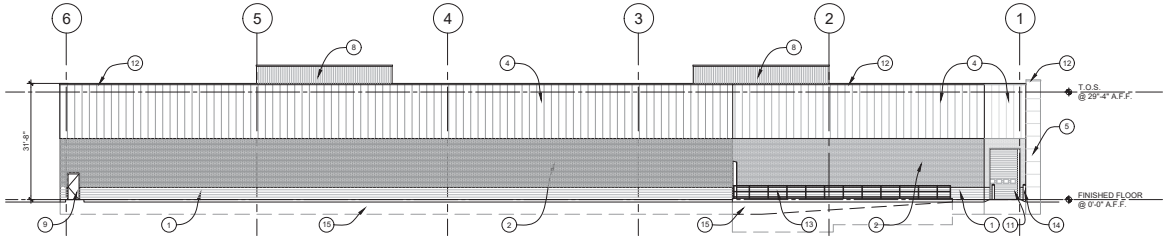


BUILDING FACADE MATERIAL BREAKDOWN

TOTAL MATERIAL SQUARE FOOTAGE:	9,970 S.F.	
(EXCLUDES VISION GLASS & OPENINGS)		
THRU-WALL BRICK:	4,057 S.F.	= 40.7%
SPLIT-FACE BLOCK:	975 S.F.	= 9.8%
ACM	129 S.F.	= 1.3%
METAL PANELS/FLUSH METAL:	4,809 S.F.	= 48.2%

PROPOSED EAST ELEVATION 4

SCALE: 1/16"=1'-0"

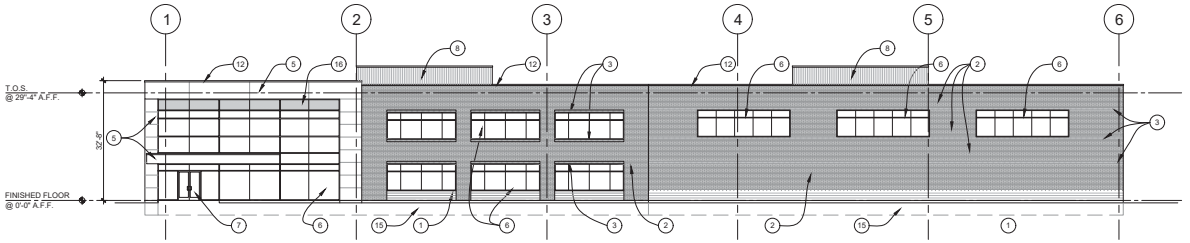


BUILDING FACADE MATERIAL BREAKDOWN

TOTAL MATERIAL SQUARE FOOTAGE:	8,576 S.F.	
(EXCLUDES VISION GLASS & OPENINGS)		
THRU-WALL BRICK:	3,399 S.F.	= 39.6%
SPLIT-FACE BLOCK:	815 S.F.	= 9.5%
ACM	129 S.F.	= 1.5%
METAL PANELS/FLUSH METAL:	4,233 S.F.	= 49.4%

PROPOSED NORTH ELEVATION 3

SCALE: 1/16"=1'-0"

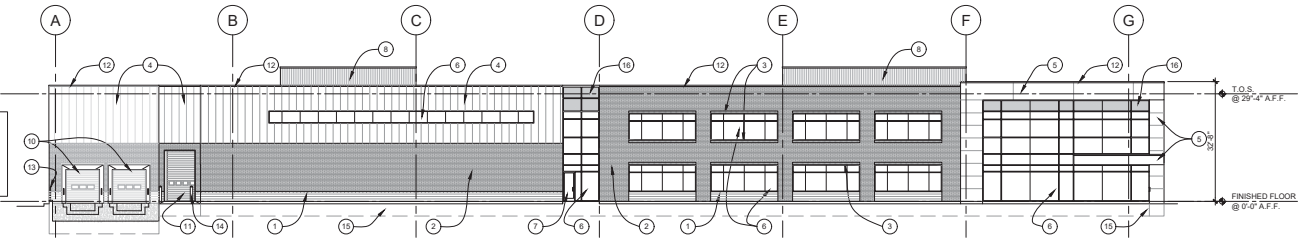


BUILDING FACADE MATERIAL BREAKDOWN

TOTAL MATERIAL SQUARE FOOTAGE:	6,243 S.F.	
(EXCLUDES VISION GLASS & OPENINGS)		
THRU-WALL BRICK:	4,622 S.F.	= 74.0%
SPLIT-FACE BLOCK:	496 S.F.	= 7.9%
ACM	647 S.F.	= 10.4%
METAL PANELS/FLUSH METAL:	344 S.F.	= 5.5%
SPANDREL:	137 S.F.	= 2.2%

PROPOSED SOUTH ELEVATION 2

SCALE: 1/16"=1'-0"



BUILDING FACADE MATERIAL BREAKDOWN

TOTAL MATERIAL SQUARE FOOTAGE:	7,635 S.F.	
(EXCLUDES VISION GLASS & OPENINGS)		
THRU-WALL BRICK:	3,384 S.F.	= 44.3%
SPLIT-FACE BLOCK:	483 S.F.	= 6.3%
ACM	613 S.F.	= 8.1%
METAL PANELS/FLUSH METAL:	2,973 S.F.	= 38.9%
SPANDREL:	182 S.F.	= 2.4%

PROPOSED WEST ELEVATION 1

SCALE: 1/16"=1'-0"

EXTERIOR MATERIAL SCHEDULE

1	SPLITFACE CMU STAINED FINISH
2	THRU-WALL BRICK - FIELD COLOR COLOR: TBD
3	BRICK ACCENT - SOLIDER COURSE COLOR: TBD
4	FLUSH METAL PANEL SIDING
5	ALUMINUM COMPOSITE METAL PANEL SYSTEM (ACM)
6	1" TINTED LOW 'E' INSUL. GLAZING IN CLEAR ANOD. ALUM. THERMAL BREAK FRAMES.
7	CLEAR ANOD. ALUM. ENTRY DOOR W/ GRAY TINTED TEMPERED GLASS
8	FLUSH METAL PANEL SIDING (RTU SCREENING)
9	H.M. DOOR AND FRAME
10	9'x10' SECTIONAL INSULATED OVERHEAD TRUCK DOCK DOOR (MANUAL CHAIN OPERATED) w/ DOCK LEVELER, & SHELTER/SEAL
11	12'x14' SECTIONAL INSULATED OVERHEAD GRADE DOOR w/ MOTOR OPERATED OPENER
12	PREFINISHED METAL COPING
13	1½" dia. PAINTED STEEL PIPE GUARDRAIL
14	6" DIA. CONC. FILLER STEEL GUARD POST
15	CONC. TRENCH FOOTING BELOW
16	1" LOW 'E' INSUL. GRAY TINTED SPANDREL GLAZING IN CLEAR ANOD. ALUM. THERMAL BREAK FRAMES.

FAUDIE ARCHITECTURE
Designs by Imagine
26261 Evergreen Rd., Suite #123
Southfield, MI 48076 | 248.819.2354
www.faudiearchitecture.com

Cunningham Limp

PROJECT NAME:
PROPOSED BUILDING FOR PARCEL #1
PARCEL #1, 12 MILE RD, NOVI, MI

ISSUED FOR:
SITE PLAN APPROVAL

DATE:
8-21-18

DRAWING DATE:
8-20-18

PROJECT NUMBER:
18045

SHEET NUMBER:
PE-2

Proposed Material Board for:
Parcel #1 Spec Building

FAUDIE ARCHITECTURE
Design to Inspire

DEMBS

PLANNING REVIEW

PLAN REVIEW CENTER REPORT

September 18, 2018

Planning Review

Novi Corporate Campus Parcel 1

JSP 18-43

PETITIONER

Dembs Development

REVIEW TYPE

Preliminary Site Plan

PROPERTY CHARACTERISTICS

Section	9	
Site Location	North of Twelve Mile, East of West Park Road; 22-09-451-032	
Site School District	Novi Community School District	
Site Zoning	I-1: Light Industrial District	
Adjoining Zoning	North	OST: Office Service Technology
	East	I-1: Light Industrial District
	West	I-1: Light Industrial District
	South	OST: Office Service Technology
Current Site Use	Vacant	
Adjoining Uses	North	Light Industrial
	East	Light Industrial
	West	Light Industrial
	South	
Site Size	6.6 acres	
Plan Date	August 21, 2018	

PROJECT SUMMARY

The applicant is proposing a new 93,320 square foot Research/Development/Office building on a 6.6 acre vacant parcel. The parcel is on the north side of Twelve Mile Road, east of West Park Drive. The proposed speculative building does not have an identified tenant at this time. The site is zoned for Light Industrial use, and the future land use map indicates Office Research Development Technology.

RECOMMENDATION

Approval of the ***Preliminary Site Plan is recommended***. The plan mostly conforms to the requirements of the Zoning Ordinance, with a few deviations to be addressed in subsequent Site Plan submittals. All reviews recommend approval, however a Traffic Impact Study is required due to the estimated number of trips generated. As soon as the TIS is submitted the project will be scheduled for Planning Commission. **Planning Commission's approval for Preliminary Site Plan and Storm Water Management Plan is required.**

ORDINANCE REQUIREMENTS

This project was reviewed for conformance with the Zoning Ordinance with respect to Article 3 (Zoning Districts), Article 4 (Use Standards), Article 5 (Site Standards), and any other applicable provisions of the Zoning Ordinance**. Please see the attached charts for information pertaining to ordinance requirements.** Items in **bold** below must be addressed and incorporated as part of the Final Site Plan submittal:

1. Accessory Structures (Sec 4.19.2.A): A transformer is shown in the side yard west of the building. A transformer is considered an accessory structure and should be located in the rear yard. Location must meet the 10 ft. setback requirement and screening is required. **The applicant should consider relocation of proposed transformer and provide proper screening, OR must request a Zoning Board of Appeals variance for transformer location in the exterior side yard.**

2. Lighting and Photometric Plan (Sec. 5.7.2): **Complete the Statistics chart and include notes that address the Ordinance requirements. Adjust lighting levels at the main entrance to meet the 1.0 fc minimum. See chart for additional details.**

3. Plan Review Chart: There are additional minor clarifications requested in the Plan review chart. Please refer to the chart for additional details.

4. Other Reviews:
   a. Engineering Review: Additional comments to be addressed with Final Site Plan. Engineering recommends approval.
   b. Landscape Review: Landscape recommends approval with comments to be addressed in Final Site Plan Submittal. Refer to review letter and chart for more comments.
   c. Wetlands Review: No impacts to regulated Wetlands are proposed. Wetland Review is not necessary.
   d. Woodlands Review: No impacts to regulated Woodlands are proposed. Woodland Review is not necessary.
   e. Traffic Review: **Trip generation estimates indicate a Traffic Impact Study is required.** Additional comments to be addressed with Final Site Plan.
   f. Facade Review: Façade consultant recommends approval. The proposed design is in full compliance with façade ordinance. See letter for additional details.
   g. Fire Review: Fire recommends conditional approval. Additional comments to be addressed with Final Site Plan.

NEXT STEP: PLANNING COMMISSION MEETING

A Traffic Impact Statement (TIS) is required for this project. Once the TIS is submitted this Site Plan will be scheduled to go before Planning Commission for consideration.

FINAL SITE PLAN SUBMITTAL

After receiving Planning Commission's approval of the Preliminary Site Plan, and the Zoning Board of Appeals' action on your variance request (if needed), please follow the Final Site Plan Checklist and submit for approval:

1. Five copies of Final Site Plan sets addressing all comments from Preliminary review,
2. Response letter addressing ALL comments from ALL the review letters and **refer to sheet numbers where the change is reflected.**
3. Final Site Plan Application

ELECTRONIC STAMPING SET SUBMITTAL AND RESPONSE LETTER

After receiving Final Site Plan approval, plans addressing the comments in all of the staff and consultant review letters should be submitted electronically for informal review and approval prior to printing Stamping Sets**.** A letter from either the applicant or the applicant's representative addressing comments in this and other review letters and associated charts is to be submitted with the electronic stamping set. This letter should address all comments in ALL letters and ALL charts and **refer to sheet numbers where the change is reflected.**

STAMPING SET APPROVAL

Stamping sets are still required for this project. After having received all of the review letters from City staff the applicant should make the appropriate changes on the plans and submit **10 size 24" x 36" copies with original signature and original seals on the cover sheet (subsequent pages may use electronic seal with signature),** to the Community Development Department for final Stamping Set approval.

If required, drafts for all legal documents with a legal transmittal are to be submitted along with stamping sets.

SIGNAGE

Exterior Signage is not regulated by the Planning Division or Planning Commission. Sign permit applications that relate to construction of a new building or an addition to an existing building may submitted, reviewed, and approved as part of a site plan application. Proposed signs shall be shown on the preliminary site plan. Alternatively, an applicant may choose to submit a sign application to the Building Official for administrative review. Following preliminary site plan approval, any application to amend a sign permit or for a new or additional sign shall be submitted to the Building Official. Please contact the Ordinance Division 248.735.5678 for information regarding sign permits.

PRE-CONSTRUCTION MEETING

A Pre-Construction meeting is required for this project. Prior to the start of any work on the site, Pre-Construction (Pre-Con) meetings must be held with the applicant's contractor and the City's consulting engineer. Pre-Con meetings are generally held after Stamping Sets have been issued and prior to the start of any work on the site. There are a variety of requirements, fees and permits that must be issued before a Pre-Con can be scheduled. If you have questions regarding the checklist or the Pre-Con itself, please contact Sarah Marchioni [248.347.0430 or smarchioni@cityofnovi.org] in the Community Development Department.

CHAPTER 26.5

Chapter 26.5 of the City of Novi Code of Ordinances generally requires all projects be completed within two years of the issuance of any starting permit. Please contact Sarah Marchioni at 248-347-0430 for additional information on starting permits. The applicant should review and be aware of the requirements of Chapter 26.5 before starting construction.

If the applicant has any questions concerning the above review or the process in general, do not hesitate to contact me at 248.347.0484 or lbell@cityofnovi.org.

Lindsay Bell

Lindsay Bell – Planner

PLANNING REVIEW CHART

Review Date: September 18, 2018
Review Type: Preliminary Site Plan
Project Name: Novi Corporate Campus Parcel 1, JSP18-43
Location: 45900 Twelve Mile; North of Twelve Mile Road, East of West Park Drive
Plan Date: 8/21/18
Prepared by: Lindsay Bell, Planner
E-mail: lbell@cityofnovi.org **Phone:** 248.347.0484

Bold	To be addressed with the next submittal
Underline	To be addressed with final site plan submittal
Bold and Underline	Requires Planning Commission and/or City Council Approval
Italics	To be noted

Item	Required Code	Proposed	Meets Code	Comments
Zoning and Use Requirements				
Master Plan *(adopted August 25, 2010)*	Office Research Development and Technology	Office, Research & Development	Yes	
Area Study	N/A		NA	
Zoning *(Effective December 25, 2013)*	I-1: Light Industrial District	No Change	Yes	
Uses Permitted (Sec 3.1.18.C)	R&D treated as Special Land Use when adjacent to residential, otherwise as Principle Permitted Use	R&D, not adj to residential	Yes	
Non-Residential Open Storage *(Sec3.14.1.B.iv)*	Permitted as Special Land Use when conducted in conjunction with and accessory to otherwise permitted use in I-1	Not proposed	NA	
Height, bulk, density and area limitations *(Sec 3.1.18)*				
Frontage on a Public Street. *(Sec. 5.12)*	Frontage on a Public Street is required	Frontage on Twelve Mile Road	Yes	
Access to Major Thoroughfare *(Sec. 5.13)*	Vehicular access shall be provided only to an existing or planned major thoroughfare or freeway service drive *OR* access driveway on other street type is not across street from existing or planned single-family uses	Access from Twelve Mile, shared drive with adjacent parcel to the west	Yes	

Item	Required Code	Proposed	Meets Code	Comments
Minimum Zoning Lot Size for each Unit in Ac *(Sec 3.6.2.D)*	Except where otherwise provided in this Ordinance, the minimum lot area and width, and the maximum percent of lot coverage shall be determined on the basis of off-street parking, loading, greenbelt screening, yard setback or usable open space	5.87 acres net, 6.6 acres gross	Yes	
Minimum Zoning Lot Size for each Unit: Width in Feet			NA	
Open Space Area	----	----	----	----
Maximum % of Lot Area Covered (By All Buildings)	*(Sec 3.6.2.D)*		Yes	
Building Height *(Sec. 3.1.18.D)*	40 ft.	32' 8"	Yes	
Building Setbacks *(Sec 3.1.18.D)*				
Front (south)	40 ft.	75 ft.	Yes	**Show building setback measurements on plans from lot lines**
Rear (north)	10 ft.	63 ft.	Yes	
Side (east)	10 ft.	88.7 ft.	Yes	
Side (west)	10 ft.	180 ft.	Yes	
Parking Setback *(Sec 3.1.18.D)& Refer to applicable notes in Sec 3.6.2*				
Front (south)	40 ft. (See 3.6.2.E)	42 ft.	Yes	**Show parking setback measurements on plans from lot lines**
Rear (north)	10 ft.	48 ft.	Yes	
Side (east)	10 ft.	21.5 ft.	Yes	
Side (west)	10 ft.	45 ft.	Yes	
Note To District Standards *(Sec 3.6.2)*				
Exterior Side Yard Abutting a Street *(Sec 3.6.2.C)*	All exterior side yards abutting a street shall be provided with a setback equal to front yard.	No exterior side yard	NA	
Off-Street Parking in Front Yard *(Sec 3.6.2.E)*	Off-street parking is allowed in front yard if: - the site is a minimum 2 acre site, - does not extend into the minimum required front yard setback of the district, - cannot occupy more than 50% of the area between min. front yard setback & bldg. setback, - must be screened by brick wall or landscaped berm 2.5 ft tall - lighting compatible with surrounding neighborhood	Parking proposed in front yard -Meets (5.87 acres) -Provided -Provided, 33% -Landscape screening shown -Yes	Yes	**See landscape letter for comments**

Item	Required Code	Proposed	Meets Code	Comments
Off-Street Parking in Side and Rear Yards *(Sec 3.6.2.F)*	Off-street parking is allowed in side and rear yards if the site does not abut residential. If it does, additional conditions apply: i. shall not occupy more than 50% of side yard area abutting residential ii. parking setback no less than 100 ft from res district	Not adjacent to residential	NA	
Setback from Residential District - Building *(Sec 3.6.2.H)*	I-1 and I-2 districts, five (5) feet of horizontal setback for each foot of building height, or one-hundred (100) feet, whichever is greater.		NA	
Wetland/ Watercourse Setback *(Sec 3.6.2.M)*	A setback of 25 ft. from wetlands and from high watermark course shall be maintained		NA	
Additional Height *(Sec 3.6.2.O)*	Additional heights for selected building is allowed based on conditions listed in Sec 3.6.2.O	Applicant not requesting	NA	
Parking setback screening *(Sec 3.6.2.P)*	Required parking setback area shall be landscaped per Sec 5.5.3.		Yes	**See Landscaping comments**
Modification of parking setback requirements *(Sec 3.6.2.Q)*	The Planning Commission may modify parking setback requirements based on conditions listed in Sec 3.6.2.Q		NA	
Parking and Loading Requirements				
Number of Parking Spaces Industrial or research Establishments & related offices *(Sec.5.2.12.E)*	Office: 1 space for each 222 ft usable floor area R&D: One space for each 700 sf usable floor area OR 5 spaces plus 1 for each 1.5 employees on largest shift 37,020 sf Office x 95% usable: 35,169/222 = 158 spaces 56,300 sf Industrial/Research * 80% usable: 45,040/700 = 64 spaces **Required Parking: 223 Spaces**	Total Parking Proposed = 232 spaces (243 spaces shown on the plan)	Yes	**Revise the parking data table on sheet 2.**

Item	Required Code	Proposed	Meets Code	Comments
Parking Space Dimensions and Maneuvering Lanes *(Sec. 5.3.2)*	- 90° Parking: 9 ft. x 19 ft. - 24 ft. two way drives - 9 ft. x 17 ft. parking spaces allowed along 7 ft. wide interior sidewalks as long as detail indicates a 4" curb at these locations and along landscaping	24 ft. drives min proposed 9 ft. x 17 ft. spaces proposed with 4" curbs	Yes	
Parking stall located adjacent to a parking lot entrance(public or private) *(Sec. 5.3.13)*	Shall not be located closer than twenty-five (25) feet from the street right-of-way (ROW) line, street easement or sidewalk, whichever is closer	Minimum distance is maintained	Yes	
End Islands *(Sec. 5.3.12)*	- End Islands with landscaping and raised curbs are required at the end of all parking bays that abut traffic circulation aisles. - The end islands shall generally be at least 8 feet wide, have an outside radius of 15 feet, and be constructed 3' shorter than the adjacent parking stall as illustrated in the Zoning Ordinance	Appears to comply	Yes	**See traffic review letter for further review**
Barrier Free Spaces *Barrier Free Code*	For 222 spaces, 7 barrier free required	7 barrier free shown	Yes	
Barrier Free Space Dimensions *Barrier Free Code*	- 8' wide with an 8' wide access aisle for van accessible spaces - 8' wide with a 5' wide access aisle for regular accessible spaces	2 van accessible shown 5 regular BF shown	Yes	
Barrier Free Signs *Barrier Free Code*	One sign for each accessible parking space.	Shown	Yes	
Minimum number of Bicycle Parking *(Sec. 5.16.1)*	5% of required auto spaces, min 2 spaces 222 required auto = 11 spaces	12 proposed	Yes	
Bicycle Parking General requirements *(Sec. 5.16)*	- No farther than 120 ft. from the entrance being served - When 4 or more spaces are required for a building with multiple entrances, the spaces shall be provided in multiple locations	Proposed Two locations to serve main, south, and west entrances	Yes Yes	**Label both bicycle parking areas on sheet 2**

Item	Required Code	Proposed	Meets Code	Comments
	- Spaces to be paved and the bike rack shall be inverted "U" design - Shall be accessible via 6 ft. paved access from street	Design shown on sheet 4	Yes Yes	
Bicycle Parking Lot layout *(Sec 5.16.6)*	Parking space width: 6 ft. One tier width: 10 ft. Two tier width: 16 ft. Maneuvering lane width: 4 ft. Parking space depth: 2 ft. single, 2 ½ ft. double	Layout shown	Yes	
Loading Spaces *(Sec. 5.4.3)*	Loading area in the rear yard, unless abutting residential or interior side yard if adjacent to I, EXPO or EXO district	Truck well on rear corner of building, accessed from west (side) yard	Yes	
Accessory Structures				
Dumpster *(Sec 4.19.2.F)*	- Located in rear yard - Attached to the building or no closer than 10 ft. from building if not attached - Not located in parking setback - If no setback, then it cannot be any closer than 10 ft, from property line. - Away from Barrier free Spaces	Dumpster enclosure in rear/side (west) yard outside of parking setback	Yes	
Dumpster Enclosure *(Sec. 21-145. (c)*	- Screened from public view - A wall or fence 1 ft. higher than height of refuse bin - And no less than 5 ft. on three sides - Posts or bumpers to protect the screening - Hard surface pad - Screening Materials: Masonry, wood or evergreen shrubbery	Details included in plans – Sheet PFP-3	Yes	
Roof top equipment and wall mounted utility equipment *(Sec. 4.19.2.E.ii)*	All roof top equipment must be screened and all wall mounted utility equipment must be enclosed and integrated into the design and color of the building	Screening indicated	Yes	
Roof top appurtenances screening	Roof top appurtenances shall be screened in accordance with applicable facade regulations, and shall not be visible from any street, road or adjacent property.	Provided	Yes	See Façade review

Item	Required Code	Proposed	Meets Code	Comments
Transformer/ Generator *(Sec 4.19.2.A)*	Provide location of any proposed transformers/ generators etc.	Transformer pad shown in side yard at NW corner of the building – landscape screening proposed	**No**	***Accessory structures to be located in the rear yard – ZBA variance will be required for this location or consider relocating***
I-1 District Required Conditions *(Sec 3.14)*				
Outdoor Storage of above ground storage tanks *(Sec. 3.14.1.B.ii)*	Outdoor placement of above-ground storage tanks of not more than 600 capacity per tank and accessory to an otherwise permitted use. Additional conditions apply.	Not Proposed	NA	
Outdoor Storage of recreational equipment *(Sec. 3.14.1.B.iii)*		Not Proposed	NA	*Note #18 included on sheet 2*
Other *(Sec 3.14.2)*	Unless otherwise provided, dealing directly with consumer at retail, is prohibited.		**No**	**Add note on plan**
Adjacent to Freeway ROW *(Sec 3.14.4)*	Where a permitted use abuts a freeway right-of way, special conditions listed in section 3.14.4 apply	Not adjacent to freeway ROW	NA	
Planning Commission findings for permitted uses *(Sec 3.14.3)*				
Protecting current and future residential uses from adverse impact *Sec 3.14.3.A*	The scale, size, building design, façade materials, landscaping and activity of the use is such that current and future residential uses will be protected from adverse impacts.	Not adjacent to residential	NA	
Long term truck parking *Sec 3.14.3.B*	No long term delivery truck parking on site	Note #19 on sheet 2	Yes	
Performance standards *Sec 3.14.3.C*	The lighting, noise, vibration, odor and other possible impacts are in compliance with standards and intent of the article and performance standards of Section 5.14	Note on plan	Yes	
Storage and/use of material *Sec 3.14.3.D*	The storage and/or use of any volatile, flammable or other materials shall be fully identified in application and	Hazardous Materials checklist provided	Yes	**Add note to the plan indicating tenants shall comply and submit updated Hazardous**

Item	Required Code	Proposed	Meets Code	Comments
	shall comply with any city ordinances regarding toxic or hazardous materials.			**Materials checklist to Fire Marshal**
Hazardous material checklist *Sec 3.14.3.E*	Compliance of City's hazardous materials checklist	Checklist provided	Yes	
Sidewalks and Pathways				
ARTICLE XI. OFF-ROAD NON-MOTORIZED FACILITIES *Sec. 11-256. Requirement. (c)* & Sub. Ord. Sec. 4.05,	- In the case of new streets and roadways to be constructed as part of the project, a sidewalk shall be provided on both sides of the proposed street or roadway. - Sidewalks along arterials and collectors shall be 6 feet or 8 feet wide as designated by the "Bicycle and Pedestrian Plan," but not along industrial service streets per Subdivision Ordinance. - Whereas sidewalks along local streets and private roadways shall be five (5) feet wide.	NA 6 ft sidewalk proposed in 12 Mile ROW NA	Yes	
Pedestrian Connectivity	- Whether the traffic circulation features within the site and parking areas are designed to assure safety and convenience of both vehicular and pedestrian traffic both within the site and in relation to access streets - Building exits must be connected to sidewalk system or parking lot.	5' sidewalk from 12 Mile to parking lot; 7' sidewalks along portion of south and west of building	Yes	
Lighting and Photometric Plan (Sec. 5.7)				
Intent *(Sec. 5.7.1)*	Establish appropriate minimum levels, prevent unnecessary glare, reduce spillover onto adjacent properties & reduce unnecessary transmission of light into the night sky	Provided	Yes	
Lighting Plan *(Sec. 5.7.A.i)*	Site plan showing location of all existing & proposed buildings, landscaping, streets,	Mostly provided – no landscaping shown; light pole	Yes	**See landscaping letter for any conflicts with light placement**

Item	Required Code	Proposed	Meets Code	Comments
	drives, parking areas & exterior lighting fixtures	locations shown on landscape plan		
Building Lighting *(Sec. 5.7.2.A.iii)*	Relevant building elevation drawings showing all fixtures, the portions of the walls to be illuminated, illuminance levels of walls and the aiming points of any remote fixtures.	Not shown	**No**	**Show lighting on building elevation drawings**
Lighting Plan *(Sec.5.7.2.A.ii)*	Specifications for all proposed & existing lighting fixtures	Provided	Yes	
	Photometric data	Provided	Yes	
	Fixture height	Provided	Yes	
	Mounting & design	Provided	Yes	
	Glare control devices *(Also see Sec. 5.7.3.D)*	Provided	Yes	
	Type & color rendition of lamps	Provided	Yes	
	Hours of operation	Provided	Yes	
	Photometric plan illustrating all light sources that impact the subject site, including spill-over information from neighboring properties	Provided	Yes	
Maximum Height *(Sec. 5.7.3.A)*	Height not to exceed maximum height of zoning district (40 ft.) (or 25 ft. where adjacent to residential districts or uses)	25 foot max indicated	Yes	
Standard Notes *(Sec. 5.7.3.B)*	- Electrical service to light fixtures shall be placed underground - Flashing light shall not be permitted - Only necessary lighting for security purposes & limited operations shall be permitted after a site's hours of operation	Notes mostly provided	Yes?	**Provide note on plans: "Electrical service to light fixtures shall be placed underground."**
Security Lighting *(Sec. 5.7.3.H)* Lighting for security purposes shall be directed only onto the area to be secured.	- All fixtures shall be located, shielded, and aimed at the areas to be secured. - Fixtures mounted on the building and designed to illuminate the facade are preferred.	Notes not provided	**No**	**Provide notes on plans to verify conformance**
Average Light Levels *(Sec.5.7.3.E)*	Average light level of the surface being lit to the lowest light of the surface being lit	Does not exceed, 3.0:1 shown	Yes	

Item	Required Code	Proposed	Meets Code	Comments
	shall not exceed 4:1			
Type of Lamps *(Sec. 5.7.3.F)*	Use of true color rendering lamps such as metal halide is preferred over high & low pressure sodium lamps	LED proposed	Yes	
Min. Illumination *(Sec. 5.7.3.k)*	Parking areas: 0.2 min	0.9 fc min shown	Yes	**Include walkways, loading area, parking and building entrances as rows in Statistics table** **Address main entrance light levels to provide 1.0 fc minimum**
	Loading/unloading areas: 0.4 min	1.4 fc min shown	Yes	
	Walkways: 0.2 min	0.9 fc min shown	Yes	
	Building entrances, frequent use: 1.0 min	0.7 fc shown at main entrance	**No**	
	Building entrances, infrequent use: 0.2 min	0.7 min shown	Yes	
Max. Illumination adjacent to Non-Residential *(Sec. 5.7.3.K)*	When site abuts a non-residential district, maximum illumination at the property line shall not exceed 1 foot candle	Does not exceed	Yes	
Cut off Angles *(Sec. 5.7.3.L)*	When adjacent to residential districts - All cut off angles of fixtures must be 90° - maximum illumination at the property line shall not exceed 0.5 foot candle		NA	
Other Requirements				
Design and Construction Standards Manual	Land description, Sidwell number (metes and bounds for acreage parcel, lot number(s), Liber, and page for subdivisions).	Provided	Yes	
General layout and dimension of proposed physical improvements	Location of all existing and proposed buildings, proposed building heights, building layouts, (floor area in square feet), location of proposed parking and parking layout, streets and drives, and indicate square footage of pavement area (indicate public or private).	Provided	Yes	
Economic Impact Information	- Total cost of the proposed building & site improvements - Number of anticipated jobs created (during construction & after building is occupied, if known).	Not provided	**No**	**Please provide estimates for Planning Commission consideration**
Development and Street Names	Development and street names must be approved by the Street Naming Committee	Name approval for business not required	NA	

Item	Required Code	Proposed	Meets Code	Comments
	before Preliminary Site Plan approval			
Development/ Business Sign	Signage if proposed requires a permit. Can be considered during site plan review process or independently.	None shown	NA	For sign permit information contact Maureen Underhill 248-735-5602.

NOTES:

1. This table is a working summary chart and not intended to substitute for any Ordinance or City of Novi requirements or standards.
2. The section of the applicable ordinance or standard is indicated in parenthesis. Please refer to those sections in Article 3, 4, and 5 of the zoning ordinance for further details.
3. Please include a written response to any points requiring clarification or for any corresponding site plan modifications to the City of Novi Planning Department with future submittals.

ENGINEERING REVIEW

PLAN REVIEW CENTER REPORT

September 17, 2018

Engineering Review

Novi Corporate Campus Parcel 1
JSP18-0043

Applicant
Dembs Development, Inc.

Review Type
Preliminary Site Plan

Property Characteristics

- Site Location: North of Twelve Mile, East of West Park Drive
- Site Size: 5.87 acres
- Plan Date: 08/21/2018
- Design Engineer: Alpine Engineering, Inc.

Project Summary

- Construction of an approximately 93,320 square-foot office/industrial/research building and associated parking. Site access would be provided from an existing curb cut off Twelve Mile Road.
- Water service would be provided by an 8-inch extension from the existing 8-inch water main stub on the site. A 2-inch domestic lead and a 8-inch fire lead would be provided to serve the building, along with additional hydrants on the site.
- Sanitary sewer service would be provided by a sanitary sewer lead tie-in to existing sanitary sewer on the site.
- Storm water would be collected by a single storm sewer collection system and discharged to existing storm water basin for the corporate park.

Recommendation
Approval of the Preliminary Site Plan and Preliminary Storm Water Management Plan is recommended.

Comments:
The Preliminary Site Plan meets the general requirements of the design and construction standards as set forth in Chapter 11 of the City of Novi Codified Ordinance, the Storm Water Management Ordinance and the Engineering Design Manual with the following items to be addressed at the time of Final Site Plan submittal (further engineering detail will be required at the time of the final site plan submittal):

Additional Comments (to be addressed upon Final Site Plan submittal)**:**

General

1. Dedication of the master planned sixty-foot half right-of-way width for Twelve Mile Road is requested with the project. The additional right-of-way width to be dedicated along Twelve Mile Road is labeled as "proposed" right-of-way on the plans.
2. A six-foot pedestrian pathway is proposed along the Twelve Mile Road frontage, in accordance with the Bicycle and Pedestrian Master Plan.
3. Provide a construction materials table on the Utility Plan listing the quantity and material type for each utility (water, sanitary and storm) being proposed.
4. Provide a construction materials table on the Paving Plan listing the quantity and material type for each pavement cross-section being proposed.
5. Provide the City's standard detail sheets for water main (5 sheets-rev. 02/16/2018), sanitary sewer (3 sheets- rev. 02/16/2018), storm sewer (2 sheets-rev. 02/16/2018), and paving (2 sheets-rev. 03/05/2018 at the time of the printed Stamping Set submittal. These details can be found on the City's website at this location: http://cityofnovi.org/Government/City-Services/Public-Services/Engineering-Division/Engineering-Standards-and-Construction-Details.aspx
6. A letter from either the applicant or the applicant's engineer must be submitted with the Final Site Plan submittal highlighting the changes made to the plans and addressing the comments in this review.

Water Main

7. Provide a profile of all water main 8-inch and larger.
8. Provide three (3) signed and sealed sets of utility plans along with the MDEQ permit application (06/12 rev.) for water main construction. The Streamlined Water Main Permit Checklist should be submitted to the Engineering Division for review, assuming no further design changes are anticipated. Utility plan sets shall include only the cover sheet, any applicable utility sheets and the standard detail sheets.

Sanitary Sewer

9. Include a sanitary sewer basis of design on the utility plan.

Storm Sewer

10. A minimum cover depth of 3 feet shall be maintained over all storm sewers.

11. Provide storm sewer profiles and label the 10-year HGL on the profiles, and ensure the HGL remains at least 1-foot below the rim of each structure.
12. Provide a schedule listing the casting type and other relevant information for each proposed storm structure on the utility plan. Round castings shall be provided on all catch basins except curb inlet structures.

Storm Water Management Plan

13. The Storm Water Management Plan for this development shall be designed in accordance with the Storm Water Ordinance and Chapter 5 of the new Engineering Design Manual.
14. The condition of the existing basin should be evaluated and any sediment build up in the bottom of the basin should be removed to restore the pond to the original design. The existing basin inlets and outlet and should also be inspected and restored to design conditions as needed.
15. A Storm Drain Facility Maintenance Easement Agreement will be required on the last structure containing the oil/gas separator. Also include an access easement to the structure from the public road right-of-way.

Paving & Grading

16. Refer to City standard paving details for standard minimum pavement cross sections. Remove any redundant or conflicting details from the plan set.
17. Provide a note on the Grading Plan stating the right-of-way pathway will match existing grades at both ends.
18. No more than ¼" vertical obstacle shall be allowed at each transition between the pathway and the drive approach.
19. Detectable warning plates are not required at the ramps at accessible parking spaces south of the building.
20. Permits for the construction of each retaining wall exceeding 48 inches in height (measured from bottom of the footing to top of the wall) must be obtained from the Community Development Department

Soil Erosion and Sediment Control

21. A SESC permit is required. The review checklist detailing all SESC requirements is attached to this letter. An informal review will be completed with the Final Site Plan if SESC plans are included in the submittal.

Off-Site Easements

22. Any off-site easements anticipated must be executed **prior to final approval of the plans**.

The following must be submitted at the time of Final Site Plan submittal:

23. An itemized construction cost estimate must be submitted to the Community Development Department at the time of Final Site Plan submittal for the determination of plan review and construction inspection fees. This estimate

should only include the civil site work and not any costs associated with construction of the building or any demolition work. ***The cost estimate must be itemized*** for each utility (water, sanitary, storm sewer), on-site paving, right-of-way paving (including proposed right-of-way), grading, and the storm water basin (basin construction, control structure, pretreatment structure and restoration).

24. Draft copies of any off-site utility easements, a recent title search, and legal escrow funds must be submitted to the Community Development Department for review and approved by the Engineering Division and the City Attorney prior to getting executed.

The following must be submitted at the time of Stamping Set submittal:

25. A draft copy of the maintenance agreement for the storm water facilities, as outlined in the Storm Water Management Ordinance, must be submitted to the Community Development Department with the Final Site Plan. Once the form of the agreement is approved, this agreement must be approved by City Council and shall be recorded in the office of the Oakland County Register of Deeds.

26. A draft copy of the 20-foot wide easement for the water main to be constructed on the site must be submitted to the Community Development Department.

27. A draft copy of the 20-foot wide easement for the sanitary sewer monitoring manhole access on the site must be submitted to the Community Development Department.

28. A 20-foot wide easement where storm sewer or surface drainage crosses lot boundaries must be shown on the Exhibit B drawings of the Master Deed. Provide copy of existing documentation, or draft of any necessary revisions.

29. A draft copy of the warranty deed for additional right-of-way to be dedicated along Twelve Mile Road.

30. Executed copies of any required off-site easements must be submitted to the Community Development Department.

The following must be addressed prior to construction:

31. A pre-construction meeting shall be required prior to the commencement of any site work. Please contact Sarah Marchioni in the Community Development Department to setup a meeting (248-347-0430).

32. A City of Novi Grading Permit will be required prior to any grading on the site. This permit will be issued at the pre-construction meeting (no application fee).

33. A Soil Erosion Control Permit must be obtained from the City of Novi. Contact Sarah Marchioni in the Community Development Department (248-347-0430) for forms and information.

34. If the disturbed area exceeds 5 acres, an NPDES permit must be obtained from the MDEQ. The MDEQ requires an approved plan to be submitted with the Notice of Coverage.

35. A permit for work within the right-of-way of Twelve Mile Road must be obtained from the City of Novi. The application is available from the City Engineering Division and should be filed at the time of Final Site Plan submittal. Please contact the Engineering Division at 248-347-0454 for further information.

36. A permit for work within the right-of-way of Twelve Mile Road must be obtained from the Road Commission for Oakland County. Please contact the RCOC (248-858-4835) directly with any questions. The applicant must forward a copy of this permit to the City. Provide a note on the plans indicating all work within the right-of-way will be constructed in accordance with the Road Commission for Oakland County standards.

37. A permit for water main construction must be obtained from the MDEQ. This permit application must be submitted through the Water and Sewer Senior Manager after the water main plans have been approved.

38. Construction Inspection Fees, to be determined once the construction cost estimate is submitted, must be paid prior to the pre-construction meeting.

39. A street sign financial guarantee in an amount to be determined ($400 per traffic control sign proposed) must be posted with Community Development.

40. Permits for the construction of each retaining wall exceeding 48 inches in height (measured from bottom of the footing to top of the wall) must be obtained from the Community Development Department (248-347-0415).

To the extent this review letter addresses items and requirements that require the approval of or a permit from an agency or entity other than the City, this review shall not be considered an indication or statement that such approvals or permits will be issued.

Please contact Darcy Rechtien at (248) 735-5695 with any questions.

Darcy N. Rechtien

Darcy N. Rechtien, P.E.

cc: George Melistas, Engineering
Sri Komaragiri, Community Development

LANDSCAPE REVIEW

PLAN REVIEW CENTER REPORT

September 11, 2018

Preliminary Site Plan - Landscaping

Novi Corporate Campus #1

Review Type

Preliminary Landscape Review

Property Characteristics

- Site Location: 45900 Twelve Mile Road
- Site Acreage: 5.9 acres
- Site Zoning: I-1
- Adjacent Zoning: North, East, West: I-1, South: OST
- Plan Date: 8/21/2018

Ordinance Considerations

This project was reviewed for conformance with Chapter 37: Woodland Protection, Zoning Article 5.5 Landscape Standards, the Landscape Design Manual and any other applicable provisions of the Zoning Ordinance. Items in **bold** below must be addressed and incorporated as part of the revised Preliminary/Final Site Plan submittal. Please follow guidelines of the Zoning Ordinance and Landscape Design Guidelines. This review and the accompanying Landscape Chart are summaries and are not intended to substitute for any Ordinance.

LANDSCAPE WAIVER:

Waiver to not provide 8 perimeter trees along the western island due to a conflict with an existing water main. *Supported by staff.*

Recommendation

This project is **recommended for approval.** There are some corrections that need to be made, but they can be made in Final Site Plans. The waiver requested is supported by staff.

Ordinance Considerations

Existing Soils (Preliminary Site Plan checklist #10, #17)

Provided

Existing and proposed overhead and underground utilities, including hydrants.(LDM 2.e.(4))

1. Provided.
2. There is an overhead utility line along Twelve Mile Road.

Existing Trees (Sec 37 Woodland Protection, Preliminary Site Plan checklist #17 and LDM 2.3 (2))

1. No woodland trees exist on the site.
2. One 12" tree at the center of the site is being removed. No replacements are required.

Adjacent to Residential - Buffer (Zoning Sec. 5.5.3.B.ii and iii)

Property is not adjacent to Residential.

Adjacent to Public Rights-of-Way – Berm (Wall) & Buffer (Zoning Sec. 5.5.3.B.ii and iii)

1. The required greenbelt width is provided.
2. **Based on the frontage, less the width of the access way, the applicant should provide**

one more canopy and subcanopy tree.

3. The required undulating berm, with a 3 foot minimum height and 3' crest, is not provided. **Please provide the berm.**

Street Tree Requirements (Zoning Sec. 5.5.3.E.i.c and LDM 1.d.)

1. Based on the frontage, 10 canopy trees are required. 20 subcanopy trees are provided.
2. Since there are overhead wires, subcanopy trees are correctly used, but the requirement is only 1.5 subcanopy trees per canopy tree, so the total number of trees provided may be reduced to 15 if desired.
3. Please get approval from the Road Commission for Oakland County for the street trees. If they disallow any of them, please provide us a copy of their denial.

Parking Lot Landscaping (Zoning Sec. 5.5.3.C.)

1. Based on the vehicular use areas, 2,710 sf of islands and 14 trees are required. 3,216 sf of islands and 14 trees are provided.
2. **Please add additional trees to all endcap islands and interior islands used to break up parking lots into bays of 15 or fewer spaces.**
3. **Each tree must have 200 sf of area in an island. Please move trees as necessary to meet this requirement.**
4. **If proposed utility lines create conflicts with required trees, the utilities should be re-aligned to remove the conflict.**

Parking Lot Perimeter Canopy Trees (Zoning Sec. 5.5.3.C.(3) Chart footnote)

1. Based on parking lot perimeter, 24 trees are required and 25 trees, including 11 greenbelt trees within 15 feet of the parking lot, which are double-counted as allowed by the ordinance, are provided.
2. Parking lot perimeter trees are also required along the 510lf north side of the north access drive. **Please provide the required 15 trees along that driveway.**
3. A Planning Commission landscape waiver is requested for the 8 perimeter trees that aren't provided along the western island due to a conflict with an existing water main**.** *While the applicant is in effect creating their own hardship with the layout, to avoid that water main would chew up a lot of real estate. As it is internal to the site, the landscape waiver is supported by staff, but trees need to be added to the endcap islands for those parking bays.*

Loading Zone screening (Zoning Sec. 3.14, 3.15, 4.55, 4.56, 5.5)

The loading zone is completely screened from Twelve Mile Road by the building and landscaping.

Building Foundation Landscape (Zoning Sec 5.5.3.D.)

1. Based on the building perimeter, less access areas, 8,824 sf of foundation landscape area is required, and 8,962 sf is provided.
2. **Please provide something other than grass for the large area in front of the HMs at the northwest corner of the building.**
3. Over 90% of the building facing Twelve Mile Road is landscaped, exceeding the 60% requirement.

Plant List (LDM 2.h. and t.)

Please add additional tree species to meet the Landscape Design Manual's (Sec 4) standards for diversity (25% for a genus, 15% for a species).

Planting Notations and Details (LDM)

Please revise the notes provided per the instructions on the landscape chart.

Storm Basin Landscape (Zoning Sec 5.5.3.E.iv and LDM 1.d.(3)

1. The site's storm water will be treated by an existing storm water detention basin. If no changes are required to the basin, no additional landscaping is required.
2. Please check the basin for Phragmites. **If any is found, please provide a plan for the removal of that Phragmites, and put it into effect so the Phragmites is completely eradicated.**

Irrigation (LDM 1.a.(1)(e) and 2.s)

The proposed landscaping must be provided with sufficient water to become established and survive over the long term. Please note how this will be accomplished if an irrigation plan is not provided.

Proposed topography. 2' contour minimum (LDM 2.e.(1))

1. Provided.
2. Large retaining walls are proposed on the north and east sides, as well as the southeast corner of the site.

Snow Deposit (LDM.2.q.)

Please indicate areas for snow deposits that won't harm landscaping.

Proposed trees to be saved (Sec 37 Woodland Protection 37-9, LDM 2.e.(1))

No woodlands exist on the site and no trees are proposed to be saved.

Corner Clearance (Zoning Sec 5.9)

1. Provided.
2. **Please add the clearance triangle per the RCOC requirements and keep all trees outside of it.**

If the applicant has any questions concerning the above review or the process in general, do not hesitate to contact me at 248.735.5621 or rmeader@cityofnovi.org.

Rick Meader – Landscape Architect

LANDSCAPE REVIEW SUMMARY CHART - Preliminary Site Plan

Review Date: September 10, 2018
Project Name: JSP18 – 0043: NOVI CORPORATE CAMPUS #1
Plan Date: August 21, 2018
Prepared by: Rick Meader, Landscape Architect E-mail: rmeader@cityofnovi.org; Phone: (248) 735-5621

Items in **Bold** need to be addressed by the applicant before approval of the Preliminary Site Plan.
Underlined items need to be addressed for Final Site Plan.

LANDSCAPE WAIVER:
Waiver to not provide perimeter trees along the western island due to a conflict with an existing water main.
Supported by staff.

Item	Required	Proposed	Meets Code	Comments
Landscape Plan Requirements (LDM (2)				
Landscape Plan *(Zoning Sec 5.5.2, LDM 2.e.)*	▪ New commercial or residential developments ▪ Addition to existing building greater than 25% increase in overall footage or 400 SF whichever is less. ▪ 1"=20' minimum with proper North. Variations from this scale can be approved by LA ▪ Consistent with plans throughout set	Scale: 1"=50'	Yes	
Project Information *(LDM 2.d.)*	Name and Address	Yes	Yes	
Owner/Developer Contact Information *(LDM 2.a.)*	Name, address and telephone number of the owner and developer or association	Yes	Yes	
Landscape Architect contact information *(LDM 2.b.)*	Name, Address and telephone number of RLA	Yes	Yes	
Sealed by LA. *(LDM 2.g.)*	Requires original signature	Yes	Yes	Need for Final Site Plans
Miss Dig Note (800) 482-7171 *(LDM.3.a.(8))*	Show on all plan sheets	Yes	Yes	
Zoning *(LDM 2.f.)*	Include all adjacent zoning	Parcel: I-1 North, East, West: I-1 South: OST	Yes	

Item	Required	Proposed	Meets Code	Comments
Survey information *(LDM 2.c.)*	▪ Legal description or boundary line survey ▪ Existing topography	Sheet 3	Yes	
Existing plant material Existing woodlands or wetlands *(LDM 2.e.(2))*	▪ Show location type and size. Label to be saved or removed. ▪ Plan shall state if none exists.	One 12" tree is shown in center of site that will be removed.	Yes	No replacements are required.
Soil types *(LDM.2.r.)*	▪ As determined by Soils survey of Oakland county ▪ Show types, boundaries	Sheet 6: Marlette Sandy Loam	Yes	
Existing and proposed improvements *(LDM 2.e.(4))*	Existing and proposed buildings, easements, parking spaces, vehicular use areas, and R.O.W	Yes	Yes	
Existing and proposed utilities *(LDM 2.e.(4))*	▪ Overhead and underground utilities, including hydrants ▪ Include all light poles.	Yes	Yes	Overhead lines are shown along 12 Mile Road.
Proposed grading. 2' contour minimum *(LDM 2.e.(1))*	Provide proposed contours at 2' interval	• Sheet 4. • Retaining walls and TW/BW elevations are shown along southeast corner, east and north sides of site. • No berm is proposed along 12 Mile Road	Yes	
Snow deposit *(LDM.2.q.)*	Show snow deposit areas on plan	No	No	**Please indicate snow deposit areas that won't harm landscaping.**
LANDSCAPING REQUIREMENTS				
Parking Area Landscape Requirements LDM 1.c. & Calculations (LDM 2.o.)				
General requirements *(LDM 1.c)*	▪ Clear sight distance within parking islands ▪ No evergreen trees	Yes	Yes	
Name, type and number of ground cover (LDM 1.c.(5))	As proposed on planting islands	Sod is indicated on islands.	Yes	
General *(Zoning Sec 5.5.3.C.ii)*				
Parking lot Islands *(a, b. i)*	▪ A minimum of 200 SF to qualify ▪ A minimum of 200sf unpaved area per tree planted in an	Yes	Yes	1. **Please dimension widths of islands.** 2. **Please increase area of islands as necessary to provide**

Item	Required	Proposed	Meets Code	Comments
	island ▪ 6" curbs ▪ Islands minimum width 10' BOC to BOC			**proper space for trees, utilities, light poles.** 3. **Please provide at least 200sf per tree on each island with a tree.**
Curbs and Parking stall reduction *(c)*	Parking stall can be reduced to 17' and the curb to 4" adjacent to a sidewalk of minimum 7 ft.	Yes	Yes	
Contiguous space limit *(i)*	Maximum of 15 contiguous spaces	15 is maximum bay length	Yes	**1. Endcap islands and islands used to break up bays must be landscaped with a deciduous canopy tree.** 2. There are 8 interior or endcap islands that need trees. **3. Please add trees as necessary and enlarge island planting area if necessary to accommodate them.** **4. One tree on islands with less than 400sf and 2 trees can be moved to fulfill some of this requirement.**
Plantings around Fire Hydrant *(d)*	No plantings with matured height greater than 12' within 10 ft. of fire hydrants	No	Yes	1. No new or existing plantings are shown near existing hydrants. 2. **Island on east side of east parking lot with hydrant needs a tree. Island will probably need to be widened to accommodate both the hydrant and tree**.
Landscaped area *(g)*	Areas not dedicated to parking use or driveways exceeding 100 sq. ft. shall be landscaped	Yes	Yes	
Clear Zones (LDM 2.3.(5))	25 ft corner clearance required. Refer to Zoning Section 5.5.9	No	No	**1. Please indicate clear vision zone per RCOC regulations for**

Item	Required	Proposed	Meets Code	Comments
				12 Mile road entry **2. Remove any shrubs taller than 30" or trees from the zone.** **3.** If RCOC does not allow some or all of the 12 Mile Road street trees, the disallowed trees do not need to be planted, but documentation of that ruling must be provided.
Category 1: For OS-1, OS-2, OSC, OST, B-1, B-2, B-3, NCC, EXPO, FS, TC, TC-1, RC, Special Land Use or non-residential use in any R district *(Zoning Sec 5.5.3.C.iii)*				
A = Total square footage of vehicular use areas up to 50,000sf x 7.5%	• A = x sf * 7.5 % = A sf • 50,000 * 7.5% = sf	NA	Yes	
B = Total square footage of additional paved vehicular use areas (not including A or B) over 50,000 SF) x 1 %	• B = x sf * 1% = B sf • (xxx – 50000) * 1% = xx sf	NA	Yes	
Category 2: For: I-1 and I-2 (Zoning Sec 5.5.3.C.iii)				
A. = Total square footage of vehicular use area up to 50,000 sf x 5%	A = 50000 sf * 5% = 2500 sf	Yes		
B = Total square footage of additional paved vehicular use areas over 50,000 SF x 0.5%	B = 42043 sf *0.5% = 210 sf	Yes		
All Categories				
C = A+B Total square footage of landscaped islands	2500 + 210 = 2710 sf	3216 sf	Yes	
D = C/200 Number of canopy trees required	▪ 2710/200 = 14x Trees	14 trees	Yes	
Perimeter Green space	▪ 1 Canopy tree per 35 lf ▪ 825/35 = 24 trees (825lf does not include west 268lf)	▪ 25 provided ▪ Waiver requested for west perimeter due to water line conflict	Yes	*Waiver request to not provide 8 trees is supported by staff as water main is existing.*
Accessway perimeter	▪ 1 canopy tree per 35 lf	▪ Access way	No	**Please provide canopy**

Item	Required	Proposed	Meets Code	Comments
	on each side of road, less widths of access drives. ▪ (xx lf)/35 = xx trees	along north side of building needs trees along the north edge ▪ 510lf/35 = 15 trees		**trees along north drive perimeter**
Parking land banked	▪ NA	None		
Berms, Walls and ROW Planting Requirements				
Berms				
▪ All berms shall have a maximum slope of 33%. Gradual slopes are encouraged. Show 1ft. contours ▪ Berm should be located on lot line except in conflict with utilities. ▪ Berms should be constructed with 6" of top soil.				
Residential Adjacent to Non-residential (Sec 5.5.3.A) & (LDM 1.a)				
Berm requirements *(Zoning Sec 5.5.A)*	No berm is required because it does not abut residentially zoned property.	None		
Planting requirements *(LDM 1.a.)*	LDM Novi Street Tree List	NA		
Adjacent to Public Rights-of-Way (Sec 5.5.B) and (LDM 1.b)				
Berm requirements *(Zoning Sec 5.5.3.A.(5))*	An undulating berm a minimum of 3 feet high with a 3 foot wide crest is required along 12 Mile Road.	None	No	**1. Please provide the required berm along the 12 Mile Road frontage.** **2.** If the berm is not provided, a landscape waiver will be required with justification for it. *This waiver is not currently supported by staff.*
Cross-Section of Berms (LDM 2.j)				
Slope, height and width	▪ Label contour lines ▪ Maximum 33% ▪ Min. 3 feet flat horizontal area ▪ Minimum 3 feet high ▪ Constructed of loam with 6' top layer of topsoil.	No		**If the required berm is provided, please provide berm cross section.**
Type of Ground Cover		NA		
Setbacks from Utilities	Overhead utility lines and 15 ft. setback from edge of utility or 20 ft. setback from closest pole	Overhead lines are indicated along 12 Mile Road.	Yes	
Walls (LDM 2.k & Zoning Sec 5.5.3.vi)				

Item	Required	Proposed	Meets Code	Comments
Material, height and type of construction footing	Freestanding walls should have brick or stone exterior with masonry or concrete interior	• Retaining walls are proposed at southeast corner, and along east and north sides of the property. • TW/BW elevations are provided on Sheet 4	Yes	
Walls greater than 3 ½ ft. should be designed and sealed by an Engineer		No details provided		Retaining walls will need to be designed by engineer and approved in building plan review process.
ROW Landscape Screening Requirements *(Sec 5.5.3.B. ii)*				
Greenbelt width (2)(3) (5)	Parking: 20 ft. No Pkg: 25 ft	40 ft	Yes	
Min. berm crest width	None	No	No	
Minimum berm height (9)	None	No	No	
3' wall	(4)(7)	No		
Canopy deciduous or large evergreen trees Notes (1) (10)	▪ Adj to Parking: 1 tree per 40 lf ▪ (533-40)/40 = 12 trees	11 trees (11 parking lot perimeter trees within 15 feet of curb double-counted as greenbelt trees)	No	**Please provide one more canopy tree in greenbelt.**
Sub-canopy deciduous trees Notes (2)(10)	▪ Adj to Parking: 1 tree per 35 lf ▪ (533-40)/35 = 14 trees	13 trees	No	**Please provide one more subcanopy tree in greenbelt.**
Canopy deciduous trees in area between sidewalk and curb *(Novi Street Tree List)*	▪ Parking & No Parking: 1 tree per 45 lf ▪ (533-86)/45 = 10 trees	20 subcanopy trees under wires.	Yes	Only 15 subcanopy trees need to be provided as 2:1 requirement was lowered to 1.5:1.
Non-Residential Zoning Sec 5.5.3.E.iii & LDM 1.d (2) Refer to Planting in ROW, building foundation landscape, parking lot landscaping and LDM				
Interior Street to Industrial subdivision *(LDM 1.d.(2))*	▪ 1 canopy deciduous or 1 large evergreen per 35 l.f. along ROW ▪ No evergreen trees closer than 20 ft. ▪ 3 sub canopy trees per 40 l.f. of total linear frontage ▪ Plant massing for 25% of ROW	NA		
Screening of outdoor storage,	Loading zone should be completely screened	Loading area is completely	Yes	

Item	Required	Proposed	Meets Code	Comments
loading/unloading *(Zoning Sec. 3.14, 3.15, 4.55, 4.56, 5.5)*	from public roads.	screened from 12 Mile Road by building.		
Transformers/Utility boxes *(LDM 1.e from 1 through 5)*	▪ A minimum of 2ft. separation between box and the plants ▪ Ground cover below 4" is allowed up to pad. ▪ No plant materials within 8 ft. from the doors	Transformer at northwest corner of building is completely screened.	Yes	If other utility boxes are added to the site, screening shrubs per standard detail are required.
Building Foundation Landscape Requirements (Sec 5.5.3.D)				
Interior site landscaping SF	▪ Equals to entire perimeter of the building x 8 with a minimum width of 4 ft. ▪ A: (1121-18) lf x 8ft = 8824 sf	8962 sf	Yes	**1.** Large areas of lawn should not be included in area provided. **2. If the large area in front of the 15 HM at the northwest corner of the building is lawn, and is included in the area count, something other than lawn should dominate that square footage.**
Zoning Sec 5.5.3.D.ii. All items from (b) to (e)	If visible from public street a minimum of 60% of the exterior building perimeter should be covered in green space	236lf of 260lf frontage facing 12 Mile Road (91%) is landscaped.	Yes	
Detention/Retention Basin Requirements (Sec. 5.5.3.E.iv)				
Planting requirements *(Sec. 5.5.3.E.iv)*	▪ Clusters shall cover 70-75% of the basin rim area ▪ 10" to 14" tall grass along sides of basin ▪ Refer to wetland for basin mix	The site's storm water is going to a regional detention basin.		**1. If the pond needs to be enlarged for this site, then the changed area of the pond shall be landscaped per the requirement.** 2. If no change is required, no additional landscaping is necessary.
Phragmites Control (Sec 5.5.6.C)	▪ Any and all populations of Phragmites australis on site shall be included on tree survey.	None indicated	TBD	**1. Please survey the site and detention pond for any populations of Phragmites australis.**

Item	Required	Proposed	Meets Code	Comments
	▪ Treat populations per MDEQ guidelines and requirements to eradicate the weed from the site.			**2. If any is found, add plans for its removal to the plan. It should be 100% removed.** **3. If none is found, please indicate that on the survey.**
LANDSCAPING NOTES, DETAILS AND GENERAL REQUIREMENTS				
Landscape Notes – Utilize City of Novi Standard Notes				
Installation date *(LDM 2.l. & Zoning Sec 5.5.5.B)*	Provide intended date	Between Mar 15 and Nov 15.	Yes	
Maintenance & Statement of intent *(LDM 2.m & Zoning Sec 5.5.6)*	▪ Include statement of intent to install and guarantee all materials for 2 years. ▪ Include a minimum one cultivation in June, July and August for the 2-year warranty period.	Yes	Yes	
Plant source *(LDM 2.n & LDM 3.a.(2))*	Shall be northern nursery grown, No.1 grade.	Yes	Yes	
Irrigation plan *(LDM 2.s.)*	A fully automatic irrigation system or a method of providing sufficient water for plant establishment and survival is required on Final Site Plans.	No	No	1. Please add irrigation plan or information as to how plants will be watered sufficiently for establishment and long- term survival. 2. If xeriscaping is used, please provide information about plantings included.
Other information *(LDM 2.u)*	Required by Planning Commission	NA		
Establishment period *(Zoning Sec 5.5.6.B)*	**2 yr. Guarantee**	Yes	Yes	
Approval of substitutions. *(Zoning Sec 5.5.5.E)*	City must approve any substitutions in writing prior to installation.	Yes	Yes	
Plant List (LDM 2.h.) – Include all cost estimates				
Quantities and sizes	Refer to LDM suggested plant list	Yes	Yes	
Root type		Yes	Yes	
Botanical and common names		Yes	Yes	**Please add species to conform more closely to the diversity requirements of the**

Item	Required	Proposed	Meets Code	Comments
				Landscape Design Manual, Section 4.
Type and amount of lawn		Yes	Yes	
Cost estimate *(LDM 2.t)*	For all new plantings, mulch and sod as listed on the plan	Yes	Yes	
Planting Details/Info (LDM 2.i) – Utilize City of Novi Standard Details				
Canopy Deciduous Tree	Refer to LDM for detail drawings	Yes	Yes	
Evergreen Tree		Yes	Yes	
Shrub		Yes	Yes	
Perennial/ Ground Cover		Yes	Yes	
Tree stakes and guys. (Wood stakes, fabric guys)		Yes	Yes	
Tree protection fencing	Located at Critical Root Zone (1' outside of dripline)	NA		
Other Plant Material Requirements (LDM 3)				
General Conditions *(LDM 3.a)*	Plant materials shall not be planted within 4 ft. of property line	Yes	Yes	**Please add note near property lines stating this.**
Plant Materials & Existing Plant Material *(LDM 3.b)*	Clearly show trees to be removed and trees to be saved.	Yes	Yes	
Landscape tree credit *(LDM3.b.(d))*	Substitutions to landscape standards for preserved canopy trees outside woodlands/ wetlands should be approved by LA. Refer to Landscape tree Credit Chart in LDM	No		No trees outside of woodlands/wetlands are being saved.
Plant Sizes for ROW, Woodland replacement and others *(LDM 3.c)*	2.5" canopy trees 6' evergreen trees		TBD	
Plant size credit *(LDM3.c.(2))*	NA	No		
Prohibited Plants *(LDM 3.d)*	No plants on City Invasive Species List		TBD	
Recommended trees for planting under overhead utilities *(LDM 3.e)*	Label the distance from the overhead utilities	• Overhead lines are clearly indicated along 12 Mile Road • Subcanopy trees	Yes	

Item	Required	Proposed	Meets Code	Comments
		are used.		
Collected or Transplanted trees *(LDM 3.f)*		No		
Nonliving Durable Material: Mulch *(LDM 4)*	▪ Trees shall be mulched to 3"depth and shrubs, groundcovers to 2" depth ▪ Specify natural color, finely shredded hardwood bark mulch. Include in cost estimate. ▪ Refer to section for additional information	Yes	Yes	**Please change peat in Landscape Note #8 to compost.**

NOTES:

1. This table is a working summary chart and not intended to substitute for any Ordinance or City of Novi requirements or standards.
2. The section of the applicable ordinance or standard is indicated in parenthesis. For the landscape requirements, please see the Zoning Ordinance landscape section 5.5 and the Landscape Design Manual for the appropriate items under the applicable zoning classification.
3. Please include a written response to any points requiring clarification or for any corresponding site plan modifications to the City of Novi Planning Department with future submittals.

TRAFFIC REVIEW

AECOM
27777 Franklin Road
Southfield
MI, 48034
USA
aecom.com

Project name:
JSP18-0043 Novi Corporate Campus Parcel 1 Traffic Review

To:
Barbara McBeth, AICP
City of Novi
45175 10 Mile Road
Novi, Michigan 48375

From:
AECOM

Date:
September 15, 2018

CC:
Sri Komaragiri, Lindsay Bell, George Melistas, Darcy Rechtien, Hannah Smith

Memo

Subject: JSP18-0043 Novi Corporate Campus Parcel 1 Preliminary Traffic Review

The preliminary site plan was reviewed to the level of detail provided and AECOM **recommends approval** for the applicant to move forward with the condition that the comments provided below are adequately addressed to the satisfaction of the City.

GENERAL COMMENTS

1. The applicant, Dembs Development, Inc., is proposing a 93,320 SF building on 12 Mile Road, east of West Park Drive. The building will consist of three individual spaces:
    a. 19,725 SF first floor office
    b. 17,295 SF second floor office
    c. 56,300 SF industrial/research
2. 12 Mile Road is under the jurisdiction of the Road Commission for Oakland County (RCOC).
3. The site is currently zoned I-1, Light Industrial.
4. Summary of traffic-related waivers/variances:
    a. There are not any traffic-related waivers or variances require/requested by the applicant at this time.

TRAFFIC IMPACTS

1. AECOM performed an initial trip generation estimate based on the ITE Trip Generation Manual, 10th Edition, as follows.

    ITE Code: 710 (General Office), 760 (Research and Development Center)
    Development-specific Quantity: 37,020 SF, 56,300 SF
    Zoning Change: N/A

Trip Generation Summary				
	Estimated Trips (Office + Research)	**Estimated Peak-Direction Trips (Office + Research)**	**City of Novi Threshold**	**Above Threshold ?**
AM Peak-Hour Trips	61+24 =85	52+18 =70	100	No
PM Peak-Hour Trips	44+28 =72	37+24 =61	100	Yes
Daily (One-Directional) Trips	405+634 = 1039	N/A	750	Yes

2. The number of trips exceeds the City's threshold of more than 750 trips per day or 100 trips per either the AM or PM peak hour. AECOM recommends performing the following traffic impact study in accordance with the City's requirements.

Trip Impact Study Recommendation	
Type of Study:	**Justification**
Traffic Impact Study (TIS)	The number of trips exceeds the City's thresholds.

EXTERNAL SITE ACCESS AND OPERATIONS

The following comments relate to the external interface between the proposed development and the surrounding roadway(s).

1. The applicant is connecting to an existing driveway and is not proposing any external site modifications to the development.

INTERNAL SITE OPERATIONS

The following comments relate to the on-site design and traffic flow operations.

1. General Traffic Flow
    a. The applicant has indicated 24' aisles throughout the site.
    b. The applicant has provided dimensions for all of the radii and width of the proposed end islands throughout the site which are in compliance with City requirements as stated in Section 5.3.12 of the Zoning Ordinance.
        i. Note that all end islands adjacent to a travel way shall be constructed three (3) feet shorter than the adjacent parking space.
        ii. Six inch curbs are provided at the end islands.
    c. The applicant has proposed a trash receptacle on the northwest side of the site.
        i. The applicant should review the location of and accessibility to the trash receptacle to ensure that it is accessible to trash collection vehicles.
        ii. Additionally, the trash receptacle is positioned such that, when in use, may diminish access throughout the site, which is not in accordance with the City's Zoning Ordinance requirements as stated in section 5.4.4.
        iii. The applicant could consider alternate locations for the trash receptacle.
    d. The applicant has proposed a 1760 SF loading zone in the rear of the building.

        i. The applicant should provide truck travel patterns throughout the site to confirm accessibility to/from the loading zone.
2. Parking Facilities
    a. The applicant has indicated 17 foot long parking spaces abutting four inch curbs.
        i. The applicant has provided a 2' overhang when a 17' space is provided to accommodate the vehicle overhang.
    b. The width of the barrier-free parking spaces and aisles are in compliance.
    c. The applicant has indicated a four inch sidewalk in front of the barrier free parking spaces.
    d. The required parking per Section 5.2.12 of the City's Zoning Ordinance is 223 spaces.
        i. The applicant should revise the parking data table on sheet 2 to indicate 243 parking spaces are provided and not 232.
        ii. The applicant has provided seven accessible parking spaces and two of the spaces are van accessible.
    e. Eleven (11) bicycle parking spaces are provided which meets City requirements.
        i. The applicant should label both bicycle parking areas on sheet 2.
        ii. The design of the bicycle parking is in compliance with Section 5.16.1 of the City's Zoning Ordinance.
3. Sidewalk Requirements
    a. The applicant has proposed 7' sidewalks along the front and west side of the building which meets the minimum requirement of 5' wide plus 2' for vehicle overhang.
    b. The applicant has proposed a 5' side sidewalk connecting the existing sidewalk along 12 Mile Road to the site.
    c. The applicant has included the latest Michigan Department of Transportation (MDOT) side walk ramp detail and has labeled all ramps on the site.

SIGNING AND STRIPING

1. All on-site signing and pavement markings shall be in compliance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD). The following is a discussion of the proposed signing and striping.
2. All signing and striping details are required by the final site plan, but will be reviewed if provided earlier.
3. The applicant shall include parking space striping notes to indicate that the parking spaces shall be striped with four (4) inch white or blue stripes.
4. The applicant should provide a detail for the proposed international symbol for accessibility pavement markings that may be placed in the accessible parking spaces. The symbol shall be white or white with a blue background and white border with rounded corners. The applicant should mirror the symbol so that it faces the opposite direction on the plans. The pavement marking should be located adjacent to the drive aisle.
5. Callout number 7 on sheet 2 under the "Traffic Signing and Striping Requirements" should refer to sheet 7 and not sheets 4 and 16.
6. The applicant should indicate the proposed signing on site and provide notes and details related to the proposed signing, ,including but not limited to the notes below:
    a. Single signs with nominal dimensions of 12" x 18" or smaller in size shall be mounted on a galvanized 2 lb. U-channel post. Multiple signs and/or signs with nominal dimension greater than 12" x 18" shall be mounted on a galvanized 3 lb. or greater U-channel post as dictated by the weight of the proposed signs.
    b. The applicant should indicate a bottom height of 7' from final grade for all signs installed.
    c. The applicant should indicate that all signing shall be placed 2' from the face of the curb or edge of the nearest sidewalk to the near edge of the sign.
    d. Traffic control signs shall use the FHWA Standard Alphabet series.
    e. Traffic control signs shall have High Intensity Prismatic (HIP) sheeting to meet FHWA retroreflectivity requirements.

Should the City or applicant have questions regarding this review, they should contact AECOM for further clarification.

Sincerely,

AECOM

Maureen N. Peters, PE
Senior Traffic/ITS Engineer

Paula K. Johnson, PE
Senior Traffic Engineer

TRAFFIC IMPACT STUDY REVIEW

AECOM
27777 Franklin Road
Southfield
MI, 48034
USA
aecom.com

Project name:
JSP18-0043 Novi Corporate Campus Parcel 1 Traffic Impact Study Review Letter
From:
AECOM

Date:
November 7, 2018

To:
Barbara McBeth, AICP
City of Novi
45175 10 Mile Road
Novi, Michigan 48375

CC:
Sri Komaragiri, Lindsay Bell, George Melistas, Darcy Rechtien, Hannah Smith

Memo

Subject: JSP18-0043 Novi Corporate Campus Parcel 1 Traffic Impact Study Review Letter

The traffic impact study (TIS) for the Novi Corporate Campus Parcel 1 was reviewed to the level of detail provided and AECOM **recommends denial** of the TIS until the comments provided below are adequately addressed to the satisfaction of the City. However, the changes required to the TIS are not anticipated to alter the results of the TIS and therefore, the site plan is recommended for approval to move forward.

GENERAL COMMENTS

1. The traffic impact study did not include a description of the surrounding land uses or a description of requested use (only trip generation manual classifications).
2. The traffic impact study did not provide a map or reduced copy of the site plan at size 11” x 17” or describe the access point for the proposed development, just a satellite view of the land area without dimensions.
3. The traffic impact study did not address sight distances at the site driveway.
4. The aerial imagery of the site is not dated. Concerns exist over the adjacent building and shared driveway use and trips not included in these analyses.
5. The remainder of the memo will provide comments on a section-by-section basis following the format of the submitted report.

BACKGROUND DATA

1. The AADT values for the roadways were taken from the 2016 SEMCOG data, which can be considered acceptable since it is less than two years old.

2. The peak hour counts were collected on a Wednesday, October 10, 2018.

EXISTING CONDITIONS

1. Several entries in Table 1 are annotated with a * but there is no note associated with it to indicate that it refers to movements with no traffic. A note should be added for clarification.
2. The narrative makes repeated references to long vehicle queues on the WB and SB approaches and the EBL movement at Twelve Mile and W Park. This is never quantified in the body of the report, and examining the output files in the appendix show queues that are extending into upstream intersections. The applicant should determine

which metrics best quantify the queue length in a format that is easy to understand and provide this information in the body of the report, in each section, as with the delay tables.

EXISTING IMPROVEMENTS

1. The applicant should provide further clarification on the phasing of the proposed right-turn overlap for the SB approach.
2. In Table 2, the “Existing with Improvements” scenario is not SBL and SBTR but SBLT and SBR. The table should be reformatted to acknowledge the change in approaches/turning movements proposed as the improvements.
3. The applicant should acknowledge the increase in delay along the SBL turning movement in the narrative.

BACKGROUND OPERATIONS

1. No table of trip generations for background growth was provided. The applicant should provide source data for the background trip generation calculations as an appendix.
2. The applicant should provide justification as to why background trips generated for JSP14-0060 were not added to the shared site driveway, else they should redistribute trips to show the impact to this driveway.
3. The narrative states the intersection will continue to operate at LOS F during PM peak period. Table 1 listed the overall LOS as E for that time, which is consistent with the appendix value. The applicant should update the narrative to be consistent with the data.

BACKGROUND IMPROVEMENTS

1. The applicant should address the increase in delay for the WBT movement with the improvements in the background condition whereas it decreased for that same turning movement in the existing condition.

SITE TRIP GENERATION ANALYSIS

1. The applicant has indicated two proposed land uses:
    a. 37,020 square foot general office building
    b. 56,300 square foot research and development center
2. The ITE Land Use Codes used for trip generation are acceptable; however, the following comments apply to the trip generation estimates methodology:
    a. The applicant should indicate which type of trip generation was used for each estimate, fitted curve or weighted average.
    b. The applicant should review the vehicles per day for the research and development center, as the manual suggests fitted curve and weighted average was used.

FURUTE CONDITIONS

1. The applicant could consider providing upstream blockage time in tabular format in the body of the study.
2. As with other improvements tables, Table 8 should be updated to take into account changing approach configuration between scenarios.

CONCLUSIONS AND RECOMMENDATIONS

1. The applicant should quantify “long” vehicle queues, and provide a discussion of how the queues may impact up- or downstream intersections.

2. In summary, the impacts of the development (with the proposed mitigation measures) are not anticipated to degrade levels of services beyond those under existing conditions during either the AM or PM peak periods.

3. The applicant should update the study to address the comments contained herein and resubmit to the City for final review and approval.

4. The applicant should also coordinate with the City of Novi and the Road Commission for Oakland County regarding the proposed mitigation measures and determine if/what should be further considered to move forward with implementing.

Should the City or applicant have questions regarding this review, they should contact AECOM for further clarification.

Sincerely,

AECOM

Patricia A. Thompson, EIT
Traffic Engineer

Maureen N. Peters, PE
Senior Traffic/ITS Engineer

FAÇADE REVIEW

DRN & ASSOCIATES, ARCHITECTS, PC
Phone: (248) 880-6523
E-Mail: dnecci@drnarchitects.com
Web: drnarchitects.com
50850 Applebrooke Dr., Northville, MI 48167

Façade Review Status;
Approved, Full Compliance

September 11, 2014

City of Novi Planning Department
45175 W. 10 Mile Rd.
Novi, MI 48375-3024

Re: FACADE ORDINANCE - **Preliminary Site Plan**
Novi Corporate Campus Parcel 1, PSP18-0133
Façade Region: 1, Zoning District: I-1

Dear Ms. McBeth;

The following is the Facade Review for Preliminary Site Plan Approval of the above referenced project based on the drawings prepared by Faudie Architects, dated 8/21/18. The percentages of materials proposed for each façade are as shown below. Materials that are in violation of the Ordinance, if any, are shown on bold. A sample board was not provided at the time of this review.

	South (Front)	North	West	East	Façade Ordinance Section 2520 Maximum (Minimum)
Brick	74%	40%	44%	41%	100% (30% Min)
Split Faced CMU	8%	10%	6%	10%	10%
Spandrel Glass	2%	0%	2%	0%	50%
Flat Metal Panels (aluminum composite)	16%	50%	48%	49%	50%

As shown above the proposed facades are in full compliance with the Façade Ordinance. The 2 story building features primarily brick facades. The drawings indicate that the Brick is the "Thru-Wall" type. Because no sample board was provided the applicant should clarify that the Brick is natural fired clay type (as compared to C-Brick). The main entrance, located at the south west corner of the building and is defined by the flat composite aluminum panels and a 2-story high overhanging canopy. The proposed materials appear to be complementary and consistent with other buildings in the surrounding area.

The drawings indicate the dumpster facades to be 100% split faced block. The Façade Ordinance requires the dumpster enclosure be constructed of compliant materials matching the primary building, in this case brick.

Recommendation – This application is in full compliance with the Facade Ordinance, contingent upon the following revisions and clarifications;

1. A sample board illustrating harmonious colors should be provided at least 5 days before the Planning Commission meeting.

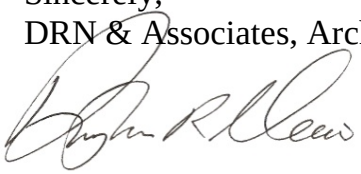
2. The dumpster should be revised to brick.

Inspections – The Façade Ordinance requires inspection(s) for all projects. Materials displayed on the approved sample board will be compared to materials delivered to the site. It is the applicant's responsibility to request the inspection of each façade material at the appropriate time. Inspections may be requested using the Novi Building Department's Online Inspection Portal with the following link. Please click on "Click here to Request an Inspection" under "Contractors", then click "Façade".

http://www.cityofnovi.org/Services/CommDev/OnlineInspectionPortal.asp.

If you have any questions regarding this project please do not hesitate to call.

Sincerely,
DRN & Associates, Architects PC



Douglas R. Necci, AIA

FIRE REVIEW

August 30,2018

TO: Barbara McBeth- City Planner
Sri Ravali Komaragiri- Plan Review Center
Lindsay Bell-Plan Review Center
Hannah Smith-Planning Assistant

RE: Novi Corporate Campus Parcel 1

PSP# 18-0133

Project Description:
Build a 93,320 S.Q.F.T. building off of Twelve Mile east of West Park Dr.

Comments:

- **All** fire hydrants **MUST** in installed and operational prior to any building construction begins.
- Fire hydrant spacing is 300' from hydrant to hydrant (NOT as the crow flies). **Novi City Ordinance 11-68(F)(1)c.**
- **MUST** provide water flow calculations to prove that the dead end fire hydrant on the east side of the building and the two leads into the structure (fire lead for sprinkler system and the domestic lead) will provide enough water supply. **Novi City Ordinance 11-68(a)(1).**
- **All** access roads **MUST** meet City of Novi weight requirements of 35 ton. **(Novi City Ordinance 15-17 503.2.3).**

Recommendation:
APPROVED WITH CONDITIONS

Sincerely,

Kevin S. Pierce-Fire Marshal
City of Novi – Fire Dept.

cc: file

Novi Public Safety Administration
45125 Ten Mile Road
Novi, Michigan 48375
248.348.7100
248.347.0590 fax

cityofnovi.org

APPLICANT RESPONSE LETTER

ALPINE ENGINEERING INC.
Civil Engineers and Land Surveyors

46892 West Road, Suite 109
Novi, Michigan 48377
Phone: (248) 926-3701
Fax: (248) 926-3765
Web: www.alpine-inc.net

November 6, 2018

Lindsay Bell
City of Novi Community Development Department
45175 West 10 Mile Road
Novi, Michigan 48375

Re: **Novi Corporate Campus Parcel 1**
Preliminary Site Plan Response Letter
City of Novi Review# JSP18-43

Dear Lindsay:

This letter is in response to the Plan Review Center Report received on September 19, 2018 for the above referred project. Alpine offers the below comments in response to the review comments:

Planning Chart Review dated September 18, 2018

1. Building setback dimensions will be provided on the final site plan.
2. Parking setback dimensions will be provided on the final site plan.
3. Parking data table will be revised on the final site plan.
4. Bicycle parking areas will be labeled on sheet 2 of the final site plan.
5. The transformer will be screened and located, as necessary, on the final site plan.
6. A note will be provided on the final site plan stating, "Unless otherwise provided, dealing directly with consumer at retail, is prohibited."
7. A note will be provided on the final site plan stating, "Tenant shall comply and submit updated Hazardous Materials checklist to Fire Marshal."
8. Lighting will be shown on the final site plan building elevations.
9. A note stating, "Electrical service to light fixtures shall be placed underground" will be provided on the final site plan.
10. Security lighting notes will be added to the final site plan.
11. Additional light level data will be provided on the final site plan.
12. Economic impact estimate will be provided by the applicant.

Engineering Review dated September 17, 2018

General

1. The master planned sixty-foot half right-of-way for Twelve Mile Road will be dedicated.
2. No comment.
3. Construction materials table for proposed utilities will be provided on the Utility Plan.
4. Construction materials table for proposed paving will be provided on the Final Site Plan.
5. City standard detail sheets will be included in the stamping set submittal.
6. Letter will be provided with the final site plan noting the changes made to the plans.

Water Main

7. A profile of all water main 8-inch and larger will be provided on the final site plan.
8. MDEQ Water main permit plans and applications will be provided during final site plan review.

Sanitary Sewer

9. Sanitary basis of design will be provided on the final site plan.

Storm Sewer

10. A minimum cover depth of 3 feet will be maintained over all storm sewers and detailed on the final site plan.
11. Storm sewer profiles with 10-year HGL labeled will be provided on the final site plan.
12. Storm sewer casting schedule will be provided on the final site plan.

Storm Water Management Plan

13. Comment noted.
14. Comment noted.
15. A storm drain facility maintenance easement agreement will be provided for the oil/gas separator.

Paving & Grading

16. City standard paving details will be referred to where applicable on the final site plan.
17. A note will be provided on the grading plan stating the right-of-way pathway will match existing grades at both ends.
18. Comment noted.
19. Detectable warning plates will be removed at the accessible parking spaces south of the building.
20. Permits for the retaining wall construction will be obtained, as necessary.

Soil Erosion and Sediment Control

21. An SESC permit will be obtained.

Off-Site Easements

22. Off-site easements are not required.

Final Site Plan Submittal Requirements

23. Cost estimate will be provided with the Final Site Plan submittal.
24. Off-site easements are not required.

Stamping Set Submittal Requirements

25. thru 30. Applicable easements and agreements will be submitted at time of Stamping Sets.

Items required prior to construction

31. thru 40. Applicable items will be provided, as necessary, prior to construction.

Landscape Review dated September 11, 2018

Please see response letter by Allen Design.

AECOM Traffic Review dated September 15, 2018

Internal Site Operations

1c. i., ii. and iii.: An alternate location for the trash enclosure will be considered at time of final site plan.
1d.i.: Truck circulation routes will be shown on the final site plan.
2.d.i.: Parking data table will be revised on the final site plan.

Signing and Striping

1. Comment noted.

2. Comment noted.
3. Parking stripe notes will be provided on the final site plan.
4. A detail for the international symbol for accessibility pavement marking will be added to the final site plan.
5. Callout number 7 on sheet 2 under the "Traffic Signing and Striping Requirements" will refer to correct sheet on the final site plan.
6. a. thru e.: The noted additional signing notes will be added to the final site plan.

DRN & Associates, Architects, PC Review dated September 11, 2018

1. A sample material board will be provided.
2. The dumpster will be revised to brick.

Fire Department review dated August 30, 2018

- Comment noted regarding all fire hydrants being installed and operational prior to any building construction.
- Hydrant spacing of 300' will be provided on the final site plan.
- Water flow calculations will be provided at final site plan stage.
- All access roads will meet City of Novi weight requirements of 35 ton.

If you have any questions, please feel free to call our office at (248) 926-3701.

Regards,
Alpine Engineering Inc.

Thomas Gizoni, PE

cc: Dembs Development, Inc.

ALLEN DESIGN
LAND PLANNING / LANDSCAPE ARCHITECTURE

November 6, 2018

Mr. Rick Meader, Landscape Architect
City of Novi Community Development
45175 West 10 Mile
Novi, MI 48375

RE: Novi Corporate Campus Parcel 1

Dear Mr. Meader:

Below are our responses to your review of plans dated August 13, 2018.

Landscape Comments:

- An additional tree will be added to the frontage landscaping.
- A 3' undulating berm will be shown along 12 Mile. A cross section will be provided as well.
- Additional parking lot perimeter trees will be added along the north parking lot edge.
- Trees will be added to the interior islands.
- Ground cover will be added in the NW corner of the building.
- The tree species will be revised to provide additional diversity.
- The landscape notes will be updated per the Landscape Design Manual.
- The detention pond will be inspected for phragmites. If it exists, a removal plan will be submitted.
- The snow deposit areas will be revised.
- The RCOC site triangle will be shown for 12 Mile.

If you have any questions or comments regarding this response, please contact me at your convenience.

Sincerely,

James C. Allen
Allen Design L.L.C.

557 CARPENTER • NORTHVILLE, MI 48167
248.467.4668 • Fax: 248.349.0559 • jca@wideopenwest.com

TRAFFIC IMPACT STUDY

NOVI CORPORATE CAMPUS MIXED-USE DEVELOPMENT TRAFFIC IMPACT STUDY

NOVI, MICHIGAN

OCTOBER 23, 2018

PREPARED FOR:

DEMBS Development Inc.

DEMBS DEVELOPMENT, INC.
27750 STANSBURY BLVD, SUITE 200
FARMINGTON HILLS, MI 48334

PREPARED BY:

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

FLEIS & VANDENBRINK
27725 STANSBURY BLVD, SUITE 195
FARMINGTON HILLS, MI 48334

#837530

Notice and Disclaimer

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Agency Review	Date	Comments

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1 INTRODUCTION

This report presents the results of the Traffic Impact Study (TIS) for the proposed mixed-use development in Novi, Michigan. The proposed site is located in the north side of Twelve Mile Road and east of W. Park Drive, the site location map is shown on **Figure 1**. The development is proposed to include 37,020 square foot of office space and 56,300 square foot of industrial/research space, with site access provided via Twelve Mile Road. The Road Commission for Oakland County (RCOC) has jurisdiction over Twelve Mile Road and the City of Novi has jurisdiction over W. Park Drive.

The purpose of this study is to evaluate the impact of the proposed development on the adjacent roadway network and provide recommendations for roadway and intersection geometry. Specific tasks undertaken for this study include the following:

1. **Study Area**: Provide a description of the study area including: surrounding land uses, intersection and roadway geometries, speed limits, functional classifications and traffic volume data (where available). In addition, a study area site map showing the site location and the study intersections will also be provided. Background information will be provided as described in the City of Novi's Site Plan and Development Manual.
2. **Proposed Land Use**: Obtain and review the proposed site plan which includes the proposed land uses, densities, and desired site access locations. A description of the current and proposed land use, including characteristics such as the type of operations, and gross floor area will be accompanied with a complete project site plan (with buildings identified as to proposed use).
3. **Existing Conditions**:
    a. Provide an analysis of the traffic-related impacts of the proposed development at the following study intersections:
        i. Twelve Mile Road and W. Park Drive
        ii. Twelve Mile Road and Site Driveway
    b. Collect AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak period turning movement counts at the study intersections.
    c. Identify the Existing AM and PM peak hour traffic volumes at the study intersections based on turning movement count data.
    d. Calculate the **Existing** vehicle delays, LOS, and vehicle queues at the study intersections during the AM and PM. The analysis will be performed at each of the study intersections. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.
    e. Identify improvements (if any) for the study road network that would be required to accommodate the existing traffic volumes.
4. **Future Background Growth**:
    a. If the planned completion date for the project or the last phase of the project is beyond one year of the study, an estimate of background traffic growth for the adjacent street network will be made and included in the analysis.
    b. Calculate the future background traffic volumes based on an appropriate traffic growth determined from local or statewide data to the project build-out year and/or any applicable background developments in the vicinity of this project.
5. **Background Conditions (No Build)**:
    a. Calculate the **Background *(without the proposed development)*** vehicle delays, LOS, and vehicle queues at the study intersections during the AM and PM peak periods. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.

b. The background analysis will be performed for the build-out year associated with the project.

c. Any state, local, or private transportation improvement projects in the project study area that will be underway in the build-out year and traffic that is generated by other proposed developments in the study area will be included as background conditions.

d. Identify improvements (if any) for the study road network that would be required to accommodate the background traffic volumes.

6. **Trip Generation**:

   a. Forecast the number of AM and PM peak hour trips that would be generated by the proposed development based on data published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 10th Edition*.

   b. A table will be provided in the report outlining the categories and quantities of land uses, with the corresponding trip generation rates or equations, and the resulting number of trips.

   c. The trip generation for the development will be summarized by total build-out new trips.

7. **Trip Distribution and Traffic Assignment:**

   a. Assign the trips that would be generated by the proposed development to the adjacent road network based on existing traffic patterns. The distribution of the estimated trip generation to the adjacent street network and nearby intersections shall be included in the report and the methodologies will be explained. The distribution percentages with the corresponding volumes will be provided in a graphical format.

   b. Combine the site-generated traffic assignments with the background traffic forecasts to establish the Future AM and PM peak hour traffic volumes for the development.

8. **Future Conditions**:

   a. Calculate the **Future (with the proposed development)** vehicle delays, LOS, and vehicle queues at the study intersections. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.

   b. The future analysis will be performed for the buildout year associated with the project.

   c. Identify improvements (if any) for the study road network that would be required to accommodate the site-generated traffic volumes.

9. Complete a technical report consistent with accepted standards and suitable for submission to City of Novi, which outlines the methodologies, analyses, results, and recommendations of the traffic study. All work will follow accepted traffic engineering practice and the standards documented by ITE, FHWA, the City of Novi Site Plan and Development Manual, and Road Commission of Oakland County.

The scope of the study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practice and methodologies published by the Institute of Transportation Engineers (ITE). Additionally, F&V solicited input regarding the scope of work from RCOC and MDOT.

Sources of data for this study include traffic counts conducted by F&V subconsultant Traffic Data Collection, Inc. (TDC), information provided by RCOC, MDOT and ITE. All background information is provided in **Appendix A**.

2 BACKGROUND DATA

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided by Twelve Mile Road and W. Park Drive. Regional transportation is provided by I-96/275. The study intersection of Twelve Mile Road and W. Park Drive is signalized, and Twelve Mile Road and Site Driveway is a stop-controlled intersection on the minor approach. The lane use and traffic control at the study intersections are shown on **Figure 2** and the study roadways are further described below. For the purposes of this study, all minor streets and driveways are assumed to have an operating speed of 25 miles per hour (mph).

Twelve Mile Road runs generally in the east and west directions with a posted speed limit of 45 mph. Twelve Mile Road is under the jurisdiction of RCOC and is classified as a Principal Arterial with an annual average daily traffic (AADT) volume of approximately 16,200 vehicles per day (2016 SEMCOG). The study section of Twelve Mile Road has a typical 3-lane cross section, with one lane in each direction and a two-way center left-turn lane.

W. Park Drive runs in the north and south directions with a posted speed limit of 45 mph. W. Park Drive is under the jurisdiction of the City of Novi and is classified as a Minor Arterial with an AADT volume of approximately 11,500 vehicles per day (2016 SEMCOG). The study section of W. Park Drive has a typical 3-lane cross section, with one lane in each direction and a two-way center left-turn lane.

2.2 EXISTING TRAFFIC VOLUMES

The existing weekday turning movement traffic volume data were collected by F&V subconsultant Traffic Data Collection, Inc. (TDC) on Wednesday, October 10, 2018. Intersection turning movement counts were collected during the weekday AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods at the study intersections. F&V also collected an inventory of existing lane use and traffic controls at the study intersections and obtained existing traffic signal timing information from RCOC. The Twelve Mile Road and W Park Drive signalized intersection runs on RCOC SCATS, therefore the signal timings were optimized for each scenario studied. The existing AM and PM peak hour traffic volumes were identified based on the data collected.

These data were used as a baseline to establish the current peak hour traffic volumes for the analysis of existing traffic conditions. During collection of the turning movement counts, pedestrian data and commercial truck percentages were recorded and used in the traffic analysis. Peak Hour Factors (PHFs) were also calculated for each study intersection approach.

The peak hour volumes for each intersection were utilized for this study and the volumes were balanced upward through the study network. In general, the peak hours of existing network traffic were identified to occur between 7:45 AM to 8:45 AM and 4:30 PM to 5:30 PM.

The traffic volume data are included in **Appendix A** and the existing peak hour traffic volumes are summarized in **Figure 3**.

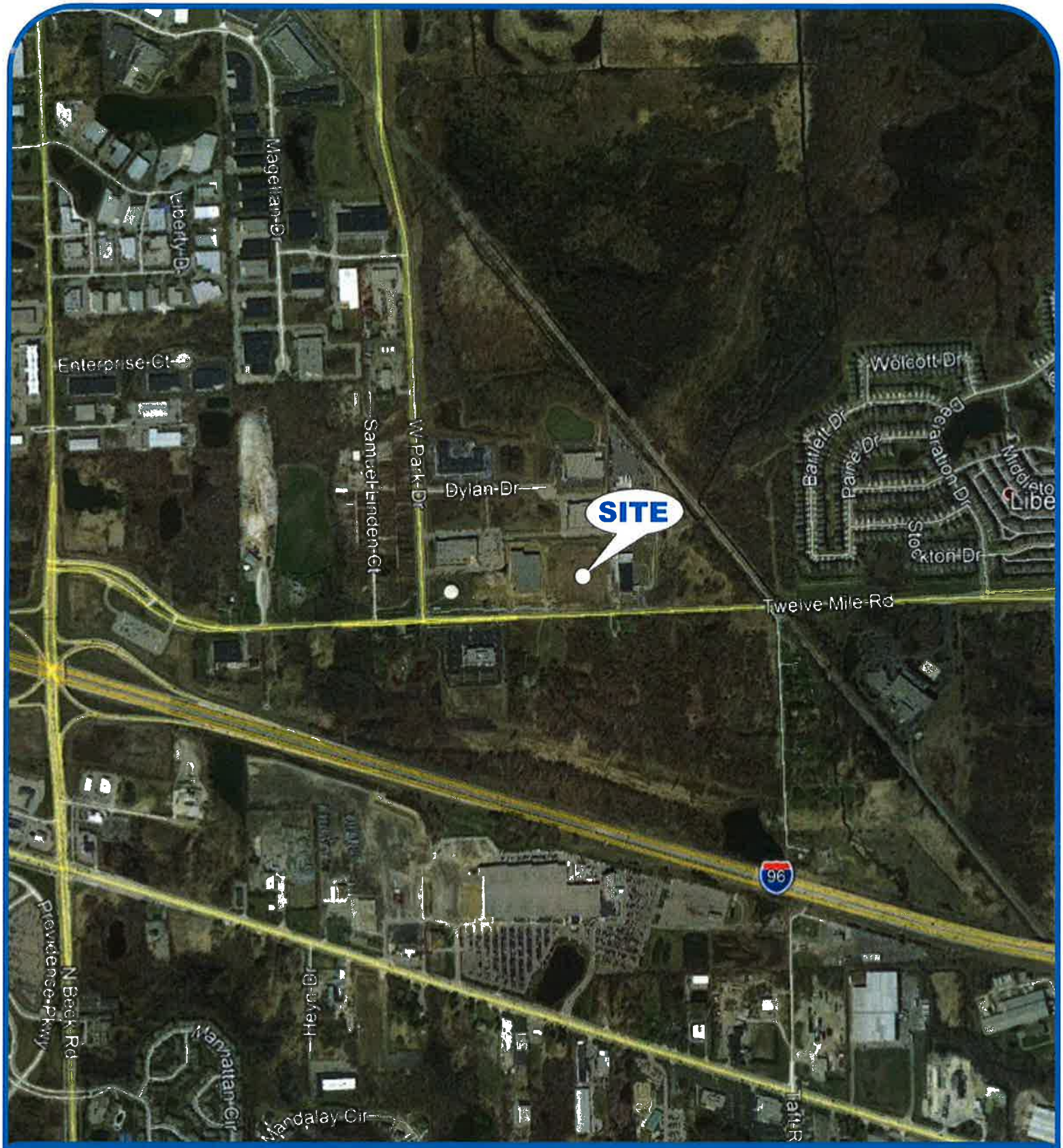

FIGURE 1
SITE LOCATION MAP

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

SITE SITE LOCATION

NORTH

SCALE: NOT TO SCALE

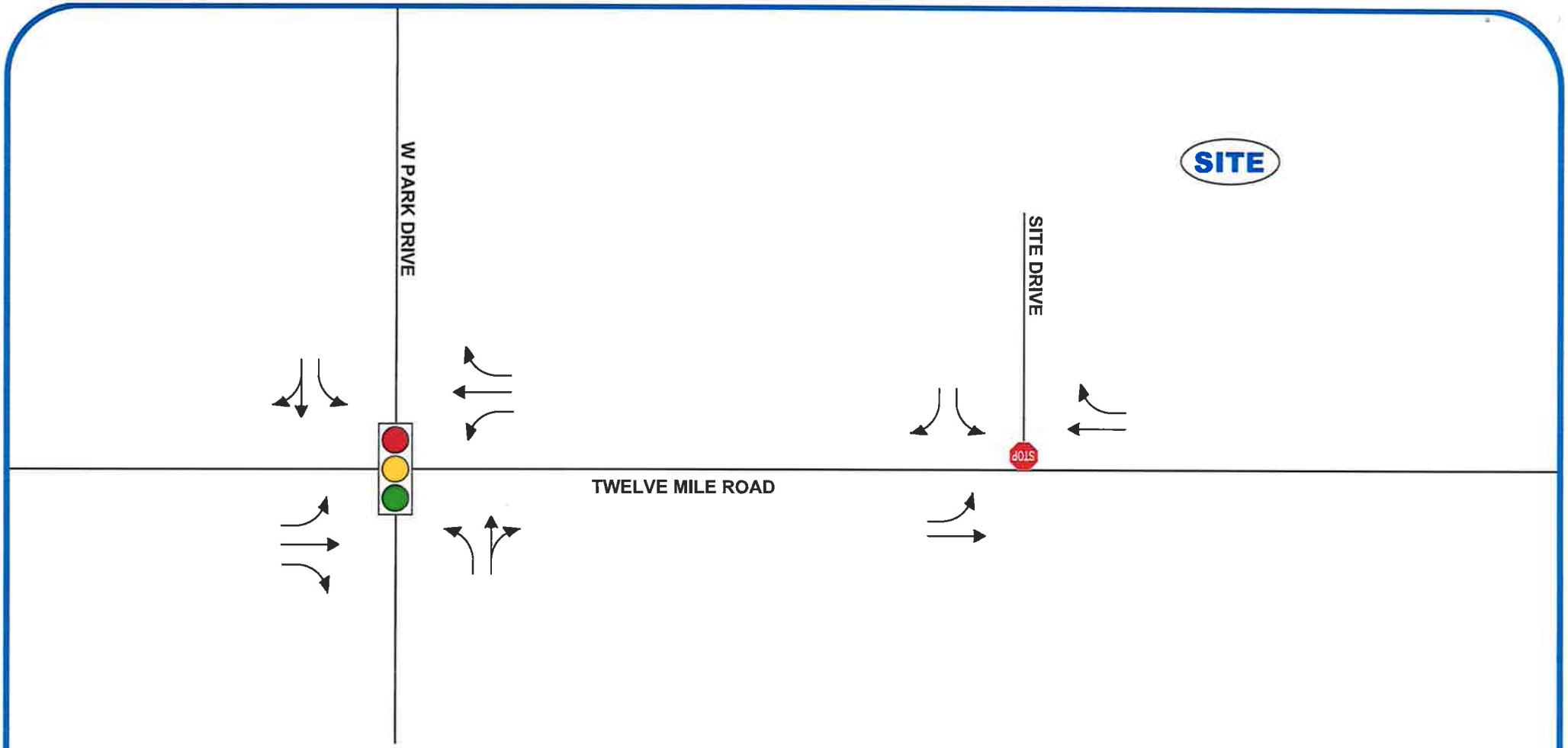

FIGURE 2
LANE USE AND TRAFFIC CONTROL

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

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

NORTH

SCALE: NOT TO SCALE

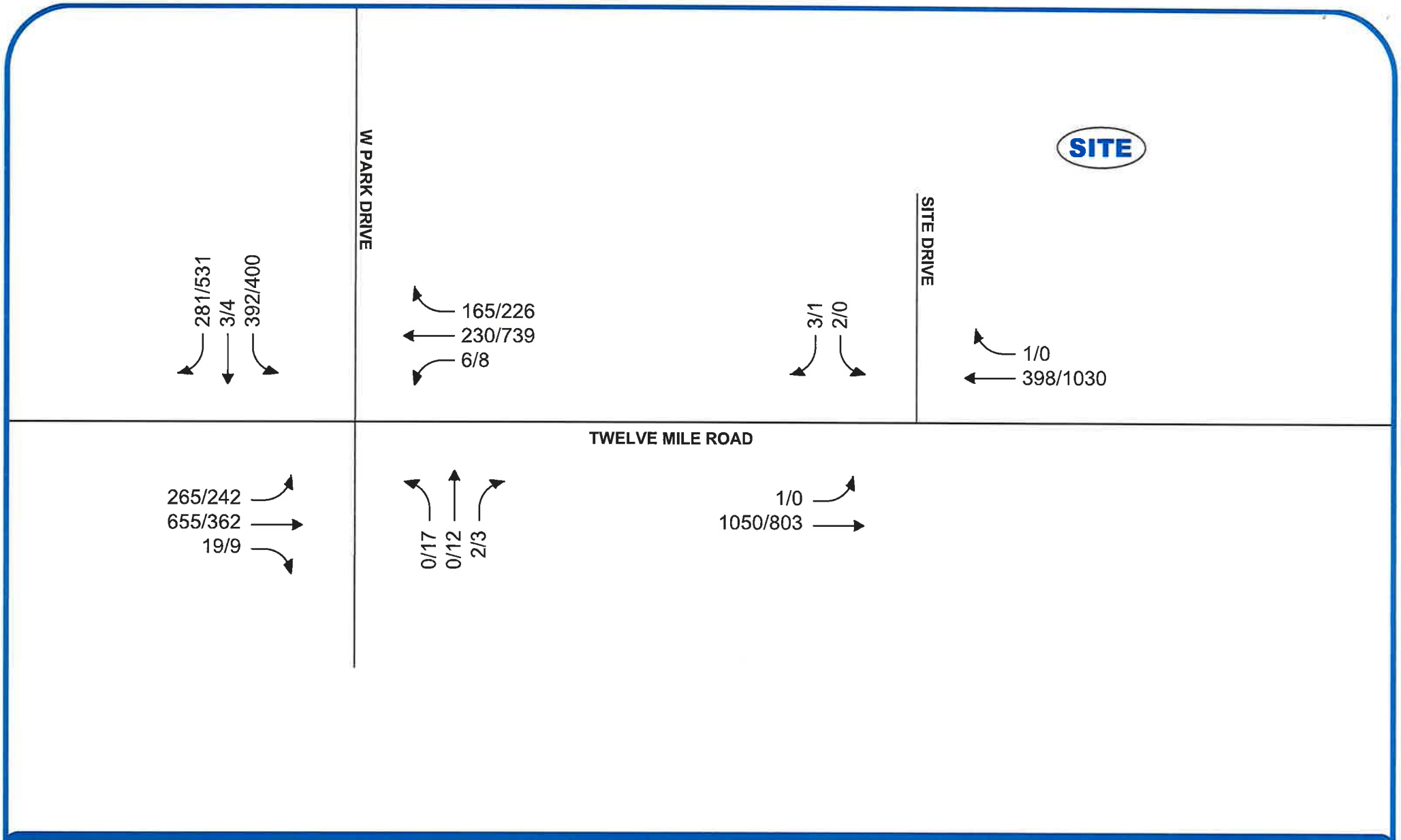

FIGURE 3
EXISTING TRAFFIC VOLUMES

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

PROPOSED ROADS

ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

3 ANALYSIS

3.1 EXISTING CONDITIONS

The existing AM, and PM peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 10) traffic analysis software. The results of the analysis of existing conditions were based on the existing lane use and traffic control shown on **Figure 2**, the existing traffic volumes provided in **Figure 3**, and the methodologies presented in the HCM.

Descriptions of LOS "A" through "F" as defined in the HCM are provided in **Appendix C** for signalized and unsignalized intersections. Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. The results of the analysis of existing conditions are presented in **Appendix B** and are summarized in **Table 1**.

Microsimulation was also conducted at the study intersections using SimTraffic to further evaluate the network performance. Multiple approaches and movements at the intersection of Twelve Mile Road and W. Park Drive currently operate at LOS E or F during the PM peak hour. The review of SimTraffic network simulations for the PM peak hour indicates long vehicle queues at the westbound and southbound approaches, and the eastbound left-turn movement at the intersection of Twelve Mile Road and W. Park Drive.

Table 1: Existing Intersection Operations

Intersection		Control	Approach	Existing			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	15.3	B	**89.8**	**F**
			EBT	26.1	C	16.3	B
			EBR	12.8	B	11.9	B
			WBL	20.2	C	16.5	B
			WBT	23.0	C	**56.0**	**E**
			WBR	22.4	C	21.2	C
			NBL	0.0*	A	52.2	D
			NBTR	23.3	C	24.6	C
			SBL	41.9	D	**63.9**	**E**
			SBTR	30.5	C	**171.4**	**F**
			Overall	**27.4**	**C**	**76.6**	**E**
2	Twelve Mile Road & Site Driveway	STOP (Minor)	EBL	8.3	A	0.0*	A
			WB	Free		Free	
			SBL	22.1	C	0.0*	A
			SBR	11.5	B	21.2	C

3.2 EXISTING IMPROVEMENTS

In order to improve traffic operations to a LOS D or better for all intersection approaches mitigation measures were investigated including signal timing adjustments, geometric improvements, and traffic control modifications. The proposed improvements and their impact to intersection operations are discussed below.

3.2.1 Twelve Mile Road and W. Park Drive

Signal timing adjustments were investigated at the intersection of Twelve Mile Road and W. Park Drive. However, it was determined that signal timing adjustments at this intersection alone would not address the operational deficiencies previously identified. In order to address the operational deficiencies at this intersection, geometric improvements were investigated.

The results of this analysis indicate widening Twelve Mile Road to provide additional through lanes in the WB direction would improve existing operations; however, this improvement is a regional improvement that is outside of the scope of this study. RCOC should consider improvements on Twelve Mile Road to increase the capacity of this regional route. Therefore, the recommended improvements at this intersection are limited to the following:

- Restripe the southbound approach to a shared through/left lane and a right-turn lane.
- Provide a right-turn overlap phase for the southbound approach.

3.2.2 Existing Conditions with Improvements

The existing intersection operations with the recommended mitigation measures are summarized in **Table 2.** They indicate that for the intersection of Twelve Mile Road and W. Park Drive the overall intersection approach will operate at a LOS D or better during the peak periods. Several intersection movements have shown improvement in delay and LOS, as shown in the table below. Review of the network simulations indicates improved operations at the intersection with reduced queues as compared to existing conditions without improvements.

Table 2: Existing Intersection Operations with Improvements

Intersection		Control	Approach	Existing				Existing (with Improvements)			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	15.3	B	**89.8**	**F**	15.4	B	**77.6**	**E**
			EBT	26.1	C	16.3	B	26.3	C	15.6	B
			EBR	12.8	B	11.9	B	12.8	B	11.4	B
			WBL	20.2	C	16.5	B	20.3	C	15.9	B
			WBT	23.0	C	**56.0**	**E**	23.2	C	50.3	D
			WBR	22.4	C	21.2	C	22.5	C	20.4	C
			NBL	0.0*	A	52.2	D	0.0*	A	52.2	D
			NBTR	23.3	C	24.6	C	23.2	C	25.3	C
			SBL	41.9	D	**63.9**	**E**	42.0	D	**74.0**	**E**
			SBTR	30.5	C	**171.4**	**F**	20.2	C	**57.9**	**E**
			Overall	**27.4**	**C**	**76.6**	**E**	**26.2**	**C**	**50.6**	**D**

3.3 BACKGROUND CONDITIONS

3.3.1 Background Growth

The proposed development is expected to be open and operational in 2019; therefore, no background growth rate was applied to evaluate background conditions **without the proposed development**. Therefore, the analysis of background conditions ***without the proposed development*** included the existing traffic conditions and background developments in the region identified by the City's consultant.

In addition to background growth, it is important to account for traffic that will be generated by approved developments within the vicinity of the study area that have yet to be constructed or are currently under construction. The developments identified by the City for consideration as background are as follows:

- JSP14-0060 (46200 Twelve Mile Road) (52,500 SF Office/Warehouse Facility)
- JSP15-0049 (45700 Twelve Mile Road) (61,538 SF Office/Warehouse Facility) - occupied
- JSP17-002 (45501 Twelve Mile Road) (124,418 SF Headquarters)

F&V obtained development information from the city planning department and one of the three identified developments was determined to be operational; for that reason, it was not added as background and considered existing condition. The background peak hour traffic volumes are shown in **Figure 4.**

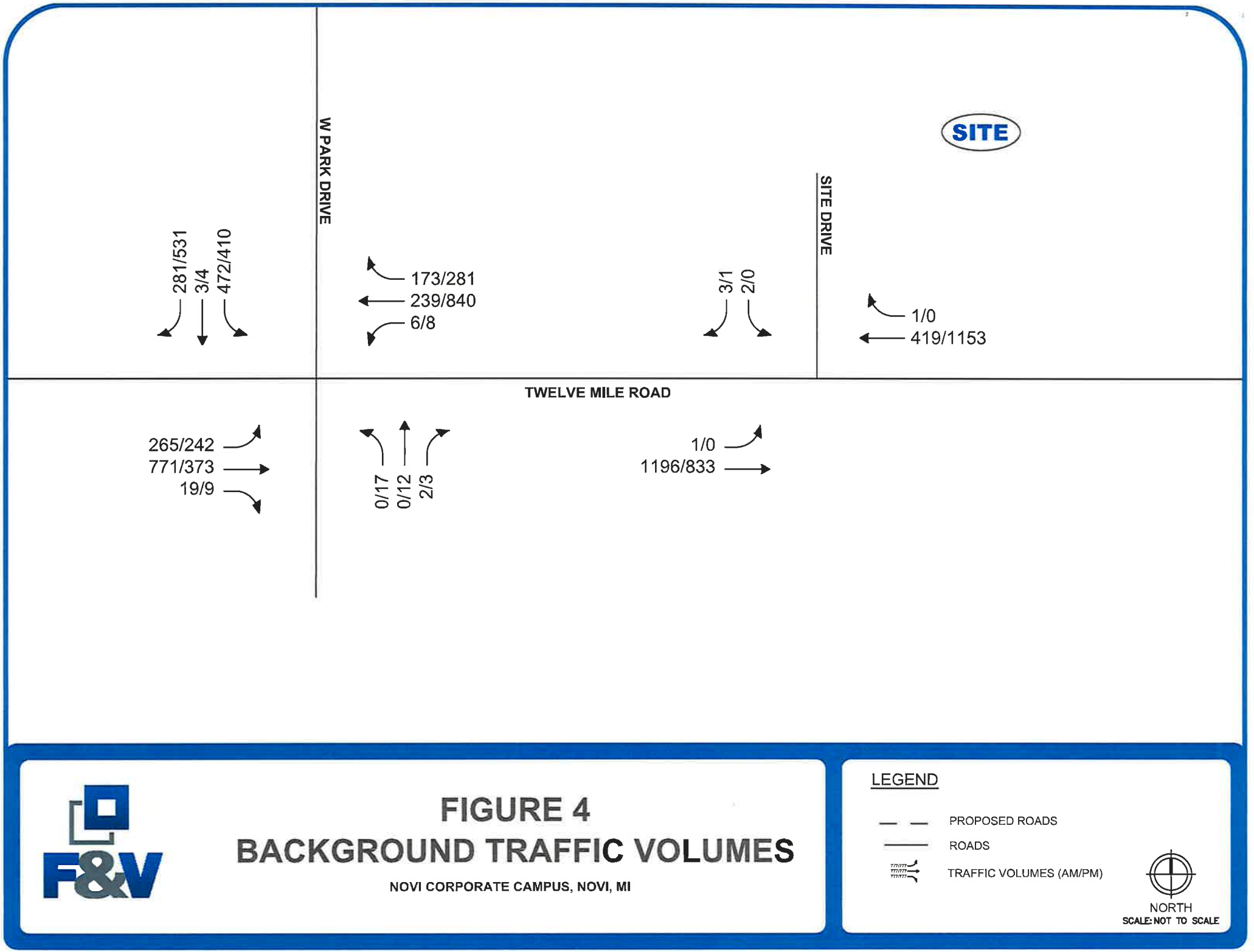

FIGURE 4
BACKGROUND TRAFFIC VOLUMES

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

PROPOSED ROADS

ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

3.3.2 Background Operations

Background peak hour vehicle delays and LOS without the proposed development were calculated based on the existing lane use and traffic control, the background traffic volumes, and the methodologies presented in the HCM. Additionally, SimTraffic simulations were reviewed to evaluate network operations and vehicle queues. The results of the analysis of existing conditions are presented in **Appendix C** and are summarized in **Table 3**.

The results of the background conditions analysis indicate that the intersection of Twelve Mile Road and W. Park Drive will continue to operate at LOS F during the PM peak period. Review of the network simulations indicates long vehicle queues that are present throughout the peak hour for the westbound and southbound approaches, and the eastbound left-turn movement at the signalized intersection of Twelve Mile Road and W. Park Drive.

Table 3: Background Intersection Operations

Intersection		Control	Approach	Existing				2019 Background			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	15.3	B	**89.8**	**F**	17.8	B	**164.5**	**F**
			EBT	26.1	C	16.3	B	48.4	D	15.1	B
			EBR	12.8	B	11.9	B	14.6	B	10.9	B
			WBL	20.2	C	16.5	B	26.0	C	14.3	B
			WBT	23.0	C	**56.0**	**E**	26.8	C	**61.8**	**F**
			WBR	22.4	C	21.2	C	25.9	C	19.5	B
			NBL	0.0*	A	52.2	D	0.0*	A	52.2	D
			NBTR	23.3	C	24.6	C	21.0	C	26.0	C
			SBL	41.9	D	**63.9**	**E**	48.8	D	**87.3**	**F**
			SBTR	30.5	C	**171.4**	**F**	27.0	C	**211.1**	**F**
			Overall	**27.4**	**C**	**76.6**	**E**	**37.5**	**D**	**94.4**	**F**
2	Twelve Mile Road & Site Driveway	STOP (Minor)	EBL	8.3	A	0.0*	A	8.4	A	0.0*	A
			WB	Free		Free					
			SBL	22.1	C	0.0*	A	25.2	D	0.0*	A
			SBR	11.5	B	21.2	C	11.7	B	24.6	C

3.4 Background Improvements

In order to improve traffic operations to a LOS D or better for all intersection approaches the same mitigation measures identified in existing conditions with improvements were applied to background conditions.

The background intersection operations with the recommended mitigation measures are summarized in **Table 4.** They indicate that for the intersection of Twelve Mile Road and W. Park Drive the overall intersection approach will improve from LOS F to LOS E during the PM peak period. The intersection movements have shown improvement in delay and LOS during both AM and PM peak periods. Review of the network simulations indicated improved operations at the intersection, however, long queues still occur on Twelve Mile Road.

Table 4: Background Intersection Operations with Improvements

Intersection		Control	Approach	2019 Background				2019 Background (With Improvements)			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	17.8	B	**164.5**	**F**	17.8	B	**101.3**	**F**
			EBT	48.4	D	15.1	B	48.4	D	15.1	B
			EBR	14.6	B	10.9	B	14.6	B	10.9	B
			WBL	26.0	C	14.3	B	26.0	C	15.3	B
			WBT	26.8	C	**61.8**	**F**	26.8	C	**77.4**	**F**
			WBR	25.9	C	19.5	B	25.9	C	21.0	C
			NBL	0.0*	A	52.2	D	0.0*	A	52.2	D
			NBTR	21.0	C	26.0	C	21.0	C	26.0	C
			SBL	48.8	D	**87.3**	**F**	49.5	D	**89.9**	**F**
			SBTR	27.0	C	**211.1**	**F**	17.5	B	**65.5**	**E**
			Overall	**37.5**	**D**	**94.4**	**F**	**36.5**	**D**	**64.1**	**E**

3.5 SITE TRIP GENERATION ANALYSIS

The number of AM and PM peak hour vehicle trips that would be generated by the proposed development was forecast based on data published by ITE in the *Trip Generation Manual, 10th Edition.* The site trip generation forecast is summarized in **Table 5**.

Table 5: 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
General Office Building	710	37,020	SF	405	52	9	61	7	37	44
Research and Development Center	760	56,300	SF	634	18	6	24	4	24	28
Total New Trips				**1,039**	**70**	**15**	**85**	**11**	**61**	**72**

3.6 SITE TRIP DISTRIBUTION

The vehicle trips that would be generated by the proposed development were assigned to the study road network based on existing peak hour traffic patterns and the methodologies published by ITE. This methodology indicates that new trips will return to their direction of origin. The site trip distributions used in the analysis are summarized in **Table 6**. The site-generated traffic volumes in **Table 5** were distributed to the adjacent roadway network based on the distribution shown below**.** The site generated traffic volumes are shown in **Figure 5**.

Table 6: Site Trip Distribution Summary

To/From	via	AM	PM
East	Twelve Mile Road	20%	31%
West	Twelve Mile Road	47%	50%
North	W. Park Drive	34%	19%
		100%	**100%**

The site generated traffic volumes were added to the background traffic volumes to calculate the future traffic volumes with the proposed development. Future traffic volumes are provided in **Figure 6.**

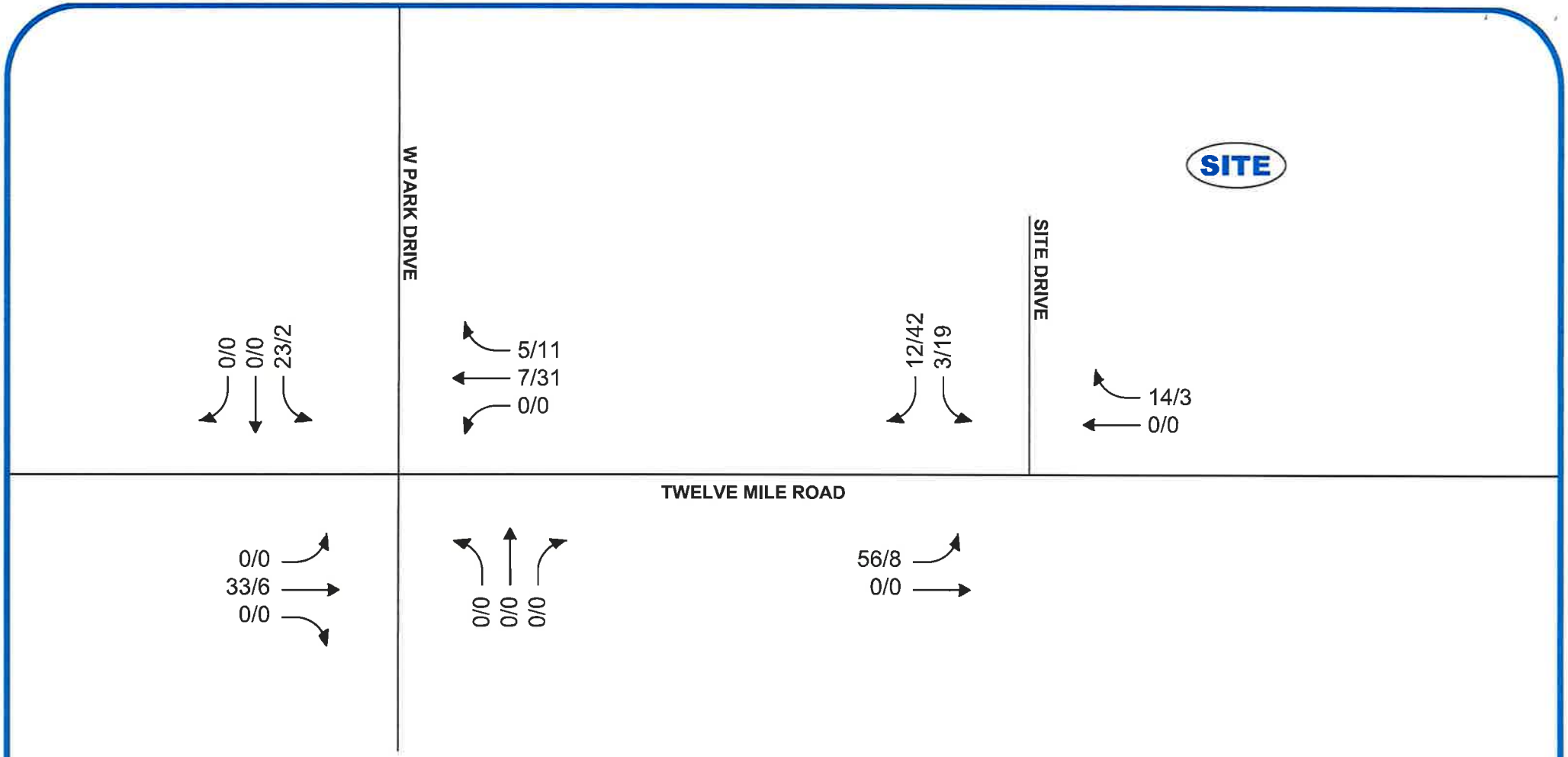

FIGURE 5
SITE-GENERATED TRAFFIC VOLUMES

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

PROPOSED ROADS

ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

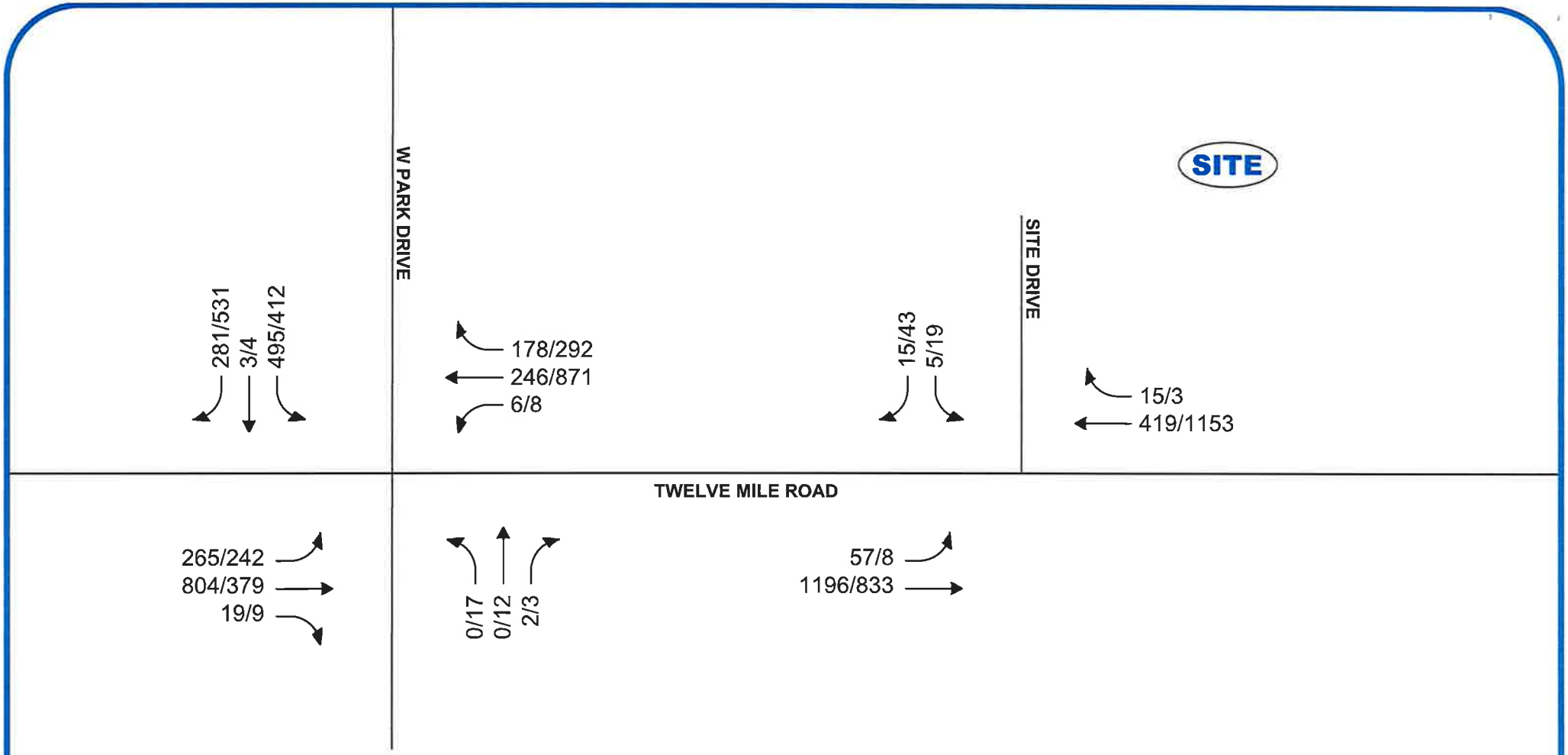

FIGURE 6
FUTURE TRAFFIC VOLUMES

NOVI CORPORATE CAMPUS, NOVI, MI

LEGEND

PROPOSED ROADS

ROADS

TRAFFIC VOLUMES (AM/PM)

NORTH

SCALE: NOT TO SCALE

3.7 FUTURE CONDITIONS

Future peak hour vehicle delays and LOS with the proposed development were calculated based on the existing lane use and traffic control, the future traffic volumes, the proposed site access plan, and the methodologies presented in the HCM. Additionally, SimTraffic simulations were utilized to evaluate network operations and vehicle queues. The results of the analysis of future conditions are presented in **Appendix D** and are summarized in **Table 7**.

The results of the future conditions analysis indicate that the intersection of Twelve Mile Road and W. Park Drive will continue to operate at LOS F during the PM peak period. Review of the network simulations indicates long vehicle queues that are present throughout the peak hour for the westbound and southbound approaches, and the eastbound left-turn movement at the signalized intersection of Twelve Mile Road and W. Park Drive.

Table 7: Future Intersection Operations

Intersection		Control	Approach	2019 Background				2019 Build-out			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	17.8	B	**164.5**	**F**	17.2	B	**164.5**	**F**
			EBT	48.4	D	15.1	B	52.0	D	15.2	B
			EBR	14.6	B	10.9	B	14.0	B	10.9	B
			WBL	26.0	C	14.3	B	26.3	C	14.4	B
			WBT	26.8	C	**61.8**	**F**	25.9	C	**73.1**	**F**
			WBR	25.9	C	19.5	B	25.1	C	19.7	B
			NBL	0.0*	A	52.2	D	0.0*	A	52.2	D
			NBTR	21.0	C	26.0	C	21.7	C	26.0	C
			SBL	48.8	D	**87.3**	**F**	62.5	E	**89.1**	**F**
			SBTR	27.0	C	**211.1**	**F**	28.0	C	**211.1**	**F**
			Overall	**37.5**	**D**	**94.4**	**F**	**41.7**	**D**	**97.3**	**F**
2	Twelve Mile Road & Site Driveway	STOP (Minor)	EBL	8.4	A	0.0*	A	8.6	A	11.8	B
			WB	Free		Free		Free		Free	
			SBL	25.2	D	0.0*	A	28.9	D	32.8	D
			SBR	11.7	B	24.6	C	11.9	B	30.9	D

3.8 FUTURE CONDITIONS IMPROVEMENTS

In order to improve traffic operations to a LOS D or better for all intersection approaches and movements under future conditions, mitigation measures that were identified under existing and background conditions were applied. These improvements included: adding a right-turn overlap phase for the southbound approach, and restriping the southbound approach lanes to through/left turn lane and right turn lane.

The results of the future conditions with improvements are presented in **Appendix D** and summarized in **Table 8**. They indicate that for the intersection of Twelve Mile Road and W. Park Drive the overall intersection approach will improve from LOS F to E during the PM peak period. Several approach movements will continue to operate at LOS E and F for the PM peak period, however, improvement in delay was observed. Review of the network simulations indicated that future operations with improvements will operate similar to background conditions with improvements.

Table 8: Future Intersection Operations with Improvements

Intersection		Control	Approach	2019 Build-out				2019 Build-out (with Improvements)			
				AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Twelve Mile Road & W. Park Drive	Signalized	EBL	17.2	B	**164.5**	**F**	17.2	B	**101.3**	**F**
			EBT	52.0	D	15.2	B	52.0	D	15.2	B
			EBR	14.0	B	10.9	B	14.0	B	10.9	B
			WBL	26.3	C	14.4	B	26.3	C	15.3	B
			WBT	25.9	C	**73.1**	**F**	25.9	C	**91.3**	**F**
			WBR	25.1	C	19.7	B	25.1	C	21.3	C
			NBL	0.0*	A	52.2	D	0.0*	A	52.2	D
			NBTR	21.7	C	26.0	C	21.7	C	26.0	C
			SBL	62.5	E	**89.1**	**F**	63.6	E	**91.8**	**F**
			SBTR	28.0	C	**211.1**	**F**	18.3	B	**65.5**	**E**
			Overall	**41.7**	**D**	**97.3**	**F**	**40.8**	**D**	**68.5**	**E**

3.9 TURN LANE WARRANTS

The City of Novi requirements for auxiliary turn lanes at proposed site driveway intersections was evaluated. The results of the analysis indicated that a right-turn taper only is required at site access point, which already exists. The existing center two-way left-turn lane will accommodate the left turns into the site. The results of the analysis is provided in **Appendix E**.

4 CONCLUSIONS

The conclusions of this TIS are as follows:

1. The results of the existing and future conditions analysis indicate that all study intersection approaches and movements currently operate acceptably at a LOS D or better with exception to the intersection of Twelve Mile Road and W. Park Drive during the PM peak period.
2. Review of the network simulations for the PM peak hour indicates long vehicle queues at the signalized intersection of Twelve Mile Road and W. Park Drive.
3. Review of the background and future network simulations indicates that the study intersections will operate in a manner similar to existing conditions.
4. With the addition of the recommended existing conditions improvements (right-turn overlap phasing and restriping of southbound approach) the background and future network simulations indicates improved traffic operations during the AM and PM peak periods.

5 RECOMMENDATIONS

The recommendations of this TIS are as follows:

1. The following improvements at the intersection of Twelve Mile Road and W. Park Drive are proposed to improve existing conditions operations:
    - Provide a right-turn overlap phase for the southbound approach
    - Restripe the southbound approach lanes to through/left lane and right-turn lane

Appendix A

BACKGROUND INFORMATION

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

Fleis & Vandenbrink

Project: Novi Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Rain PM Deg's 60's
Count By Miovision Video VCU 1US NE

File Name : TMC_1 12 Mile & West Park_10-10-18
Site Code : TMC_1
Start Date : 10/10/2018
Page No : 1

4 Hour traffic study was conducted during typical weekday (Tuesday-Thursday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was in session.

Groups Printed- Pass Cars - Single Units - Heavy Trucks - Peds

	West Park Drive Southbound					12 Mile Road Westbound					Office Building Driveway Northbound					12 Mile Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	56	1	71	0	128	20	34	0	0	54	0	0	0	0	0	2	115	41	0	158	340
07:15 AM	67	2	77	0	146	18	43	3	0	64	0	0	0	0	0	1	170	49	0	220	430
07:30 AM	68	0	97	0	165	28	51	2	0	81	0	0	0	1	1	2	152	46	0	200	447
07:45 AM	77	0	100	0	177	51	65	0	0	116	1	0	0	0	1	6	155	75	0	236	530
Total	268	3	345	0	616	117	193	5	0	315	1	0	0	1	2	11	592	211	0	814	1747
08:00 AM	70	0	96	0	166	48	62	1	0	111	1	0	0	0	1	4	158	64	0	226	504
08:15 AM	66	2	111	0	179	42	46	5	0	93	0	0	0	0	0	7	177	68	0	252	524
08:30 AM	68	1	85	0	154	24	57	0	0	81	0	0	0	0	0	2	165	58	0	225	460
08:45 AM	49	2	82	0	133	32	50	5	0	87	1	0	1	0	2	5	170	49	0	224	446
Total	253	5	374	0	632	146	215	11	0	372	2	0	1	0	3	18	670	239	0	927	1934
*** BREAK ***																					
04:00 PM	101	0	79	0	180	52	186	1	0	239	2	3	6	0	11	1	118	34	0	153	583
04:15 PM	74	1	71	0	146	76	209	1	0	286	0	1	9	1	11	4	112	34	0	150	593
04:30 PM	135	1	90	0	226	48	201	3	0	252	1	3	6	0	10	6	100	51	0	157	645
04:45 PM	122	2	107	0	231	55	186	2	0	243	0	4	3	0	7	1	99	68	0	168	649
Total	432	4	347	0	783	231	782	7	0	1020	3	11	24	1	39	12	429	187	0	628	2470
05:00 PM	114	0	95	0	209	54	182	3	0	239	1	1	3	0	5	2	78	54	0	134	587
05:15 PM	160	1	108	0	269	69	170	0	0	239	1	4	5	0	10	0	85	69	0	154	672
05:30 PM	103	0	96	0	199	74	173	1	0	248	1	3	3	0	7	0	89	46	0	135	589
05:45 PM	65	0	78	0	143	76	177	3	0	256	1	3	5	1	10	2	95	36	0	133	542
Total	442	1	377	0	820	273	702	7	0	982	4	11	16	1	32	4	347	205	0	556	2390
Grand Total	1395	13	1443	0	2851	767	1892	30	0	2689	10	22	41	3	76	45	2038	842	0	2925	8541
Apprch %	48.9	0.5	50.6	0		28.5	70.4	1.1	0		13.2	28.9	53.9	3.9		1.5	69.7	28.8	0		
Total %	16.3	0.2	16.9	0	33.4	9	22.2	0.4	0	31.5	0.1	0.3	0.5	0	0.9	0.5	23.9	9.9	0	34.2	
Pass Cars	1350	13	1428	0	2791	753	1856	29	0	2638	9	21	41	0	71	43	2002	820	0	2865	8365
% Pass Cars	96.8	100	99	0	97.9	98.2	98.1	96.7	0	98.1	90	95.5	100	0	93.4	95.6	98.2	97.4	0	97.9	97.9
Single Units	26	0	9	0	35	10	26	1	0	37	1	1	0	0	2	2	31	14	0	47	121
% Single Units	1.9	0	0.6	0	1.2	1.3	1.4	3.3	0	1.4	10	4.5	0	0	2.6	4.4	1.5	1.7	0	1.6	1.4
Heavy Trucks	19	0	6	0	25	4	10	0	0	14	0	0	0	0	0	0	5	8	0	13	52
% Heavy Trucks	1.4	0	0.4	0	0.9	0.5	0.5	0	0	0.5	0	0	0	0	0	0	0.2	1	0	0.4	0.6
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	3
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	100	3.9	0	0	0	0	0	0

TDC Traffic Comments: Signalized intersection with push button ped. signals for all quadrants. Video VCU camera was located within NE intersection quadrant. Note: Peds. are excluded from peak hour reports.

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Fleis & Vandenbrink

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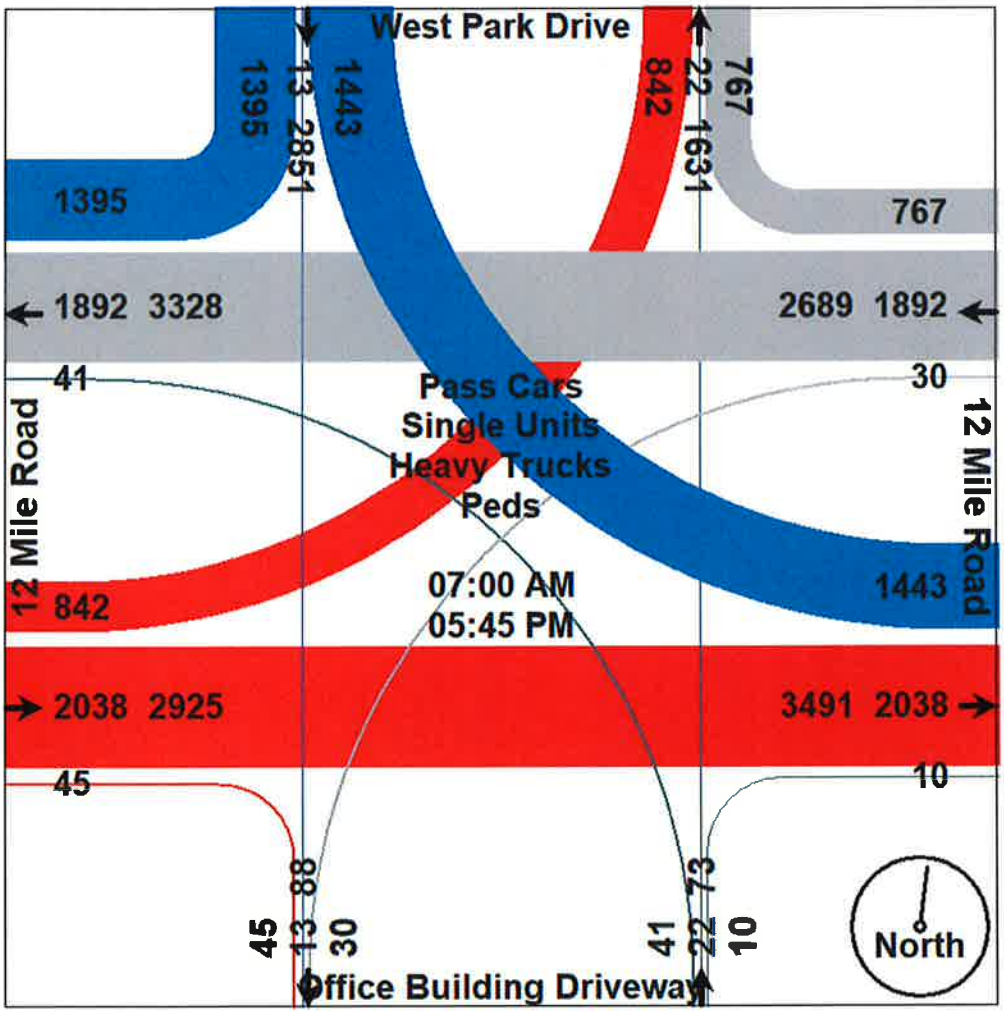
Count By Miovision Video VCU 1US NE

File Name : TMC_1 12 Mile & West Park_10-10-18
Site Code : TMC_1
Start Date : 10/10/2018
Page No : 2



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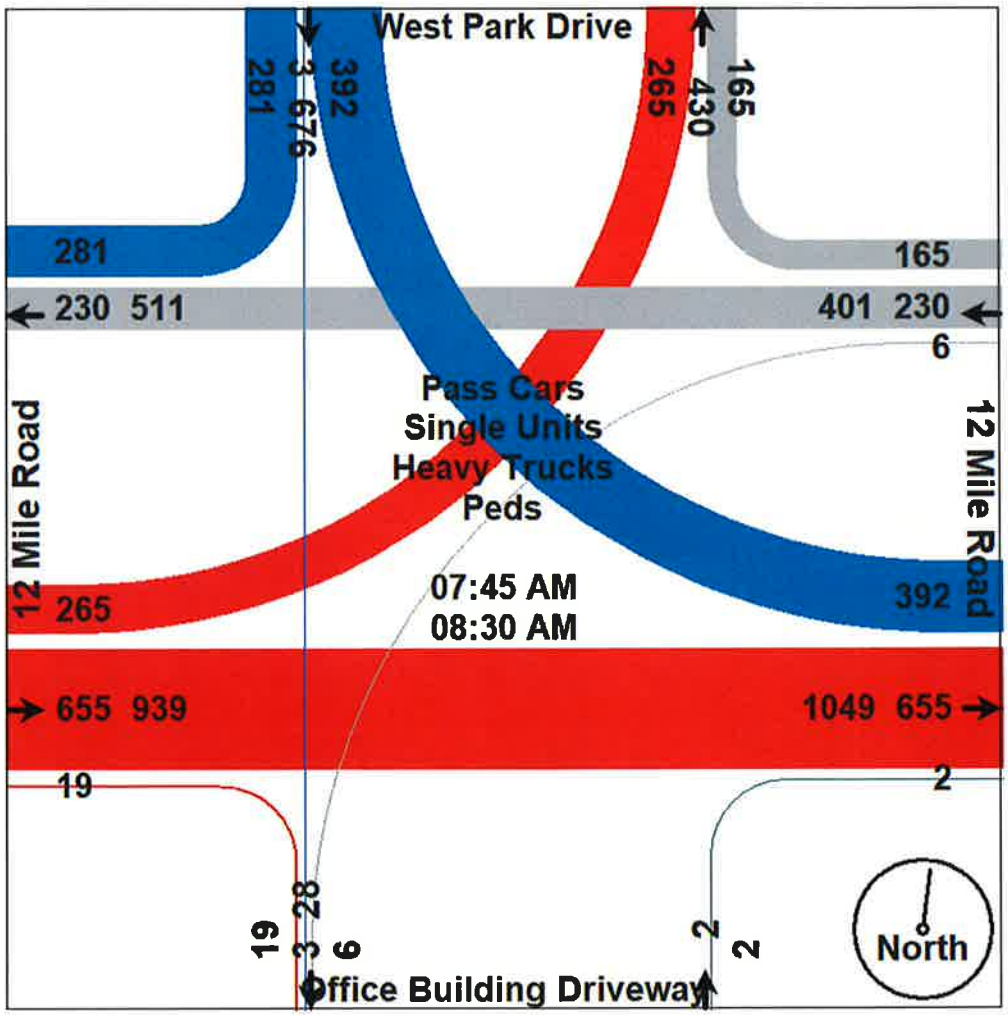
File Name : TMC_1 12 Mile & West Park_10-10-18
Site Code : TMC_1
Start Date : 10/10/2018
Page No : 3

	West Park Drive Southbound				12 Mile Road Westbound				Office Building Driveway Northbound				12 Mile Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	**77**	0	100	177	**51**	**65**	0	**116**	**1**	0	0	**1**	6	155	**75**	236	**530**
08:00 AM	70	0	96	166	48	62	1	111	1	0	0	1	4	158	64	226	504
08:15 AM	66	**2**	**111**	**179**	42	46	**5**	93	0	0	0	0	**7**	**177**	68	**252**	524
08:30 AM	68	1	85	154	24	57	0	81	0	0	0	0	2	165	58	225	460
Total Volume	281	3	392	676	165	230	6	401	2	0	0	2	19	655	265	939	2018
% App. Total	41.6	0.4	58		41.1	57.4	1.5		100	0	0		2	69.8	28.2		
PHF	.912	.375	.883	.944	.809	.885	.300	.864	.500	.000	.000	.500	.679	.925	.883	.932	.952
Pass Cars	267	3	386	656	162	223	6	391	1	0	0	1	19	641	255	915	1963
% Pass Cars	95.0	100	98.5	97.0	98.2	97.0	100	97.5	50.0	0	0	50.0	100	97.9	96.2	97.4	97.3
Single Units	10	0	4	14	3	6	0	9	1	0	0	1	0	12	10	22	46
% Single Units	3.6	0	1.0	2.1	1.8	2.6	0	2.2	50.0	0	0	50.0	0	1.8	3.8	2.3	2.3
Heavy Trucks	4	0	2	6	0	1	0	1	0	0	0	0	0	2	0	2	9
% Heavy Trucks	1.4	0	0.5	0.9	0	0.4	0	0.2	0	0	0	0	0	0.3	0	0.2	0.4
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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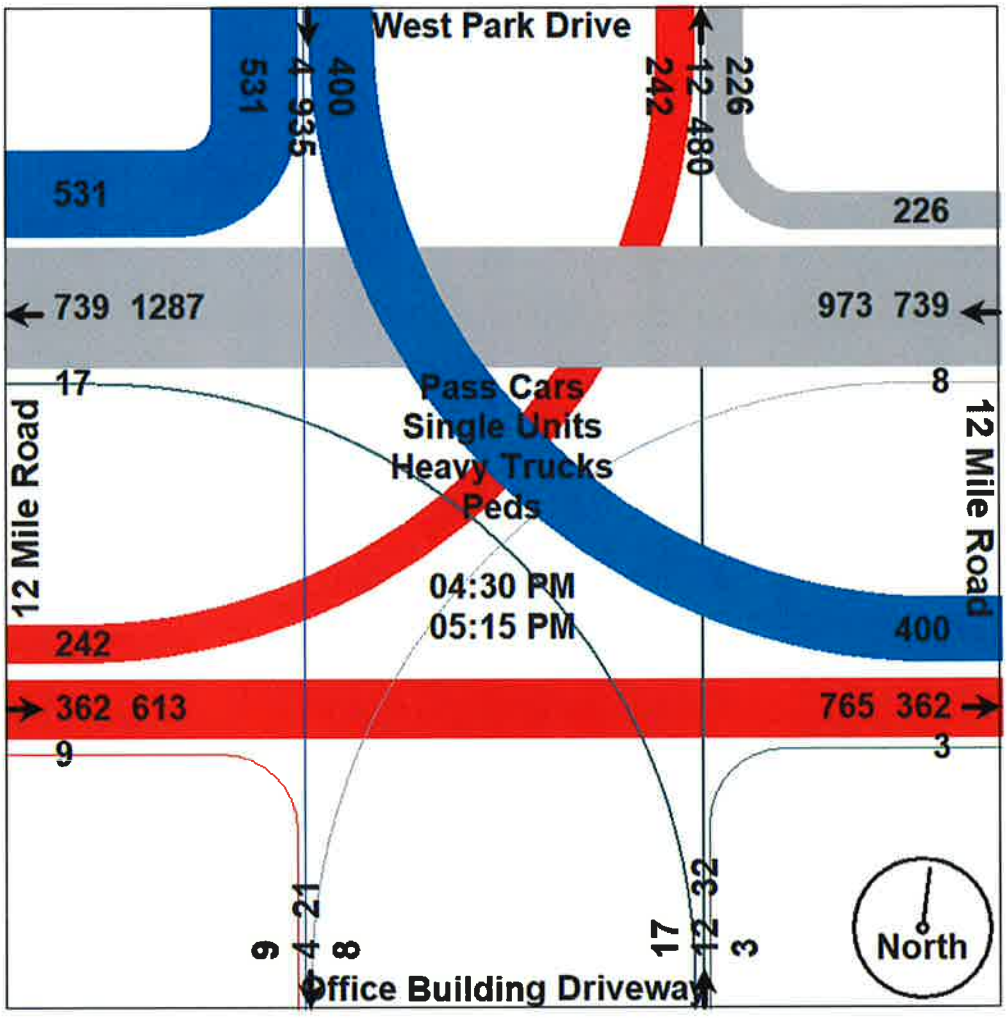
Page No : 4

	West Park Drive Southbound				12 Mile Road Westbound				Office Building Driveway Northbound				12 Mile Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	135	1	90	226	48	**201**	**3**	**252**	**1**	3	**6**	**10**	**6**	**100**	51	157	645
04:45 PM	122	**2**	107	231	55	186	2	243	0	**4**	3	7	1	99	68	**168**	649
05:00 PM	114	0	95	209	54	182	3	239	1	1	3	5	2	78	54	134	587
05:15 PM	**160**	1	**108**	**269**	**69**	170	0	239	1	4	5	10	0	85	**69**	154	**672**
Total Volume	531	4	400	935	226	739	8	973	3	12	17	32	9	362	242	613	2553
% App. Total	56.8	0.4	42.8		23.2	76	0.8		9.4	37.5	53.1		1.5	59.1	39.5		
PHF	.830	.500	.926	.869	.819	.919	.667	.965	.750	.750	.708	.800	.375	.905	.877	.912	.950
Pass Cars	524	4	397	925	221	730	8	959	3	12	17	32	9	361	236	606	2522
% Pass Cars	98.7	100	99.3	98.9	97.8	98.8	100	98.6	100	100	100	100	100	99.7	97.5	98.9	98.8
Single Units	2	0	1	3	4	7	0	11	0	0	0	0	0	1	3	4	18
% Single Units	0.4	0	0.3	0.3	1.8	0.9	0	1.1	0	0	0	0	0	0.3	1.2	0.7	0.7
Heavy Trucks	5	0	2	7	1	2	0	3	0	0	0	0	0	0	3	3	13
% Heavy Trucks	0.9	0	0.5	0.7	0.4	0.3	0	0.3	0	0	0	0	0	0	1.2	0.5	0.5
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Start Date : 10/10/2018
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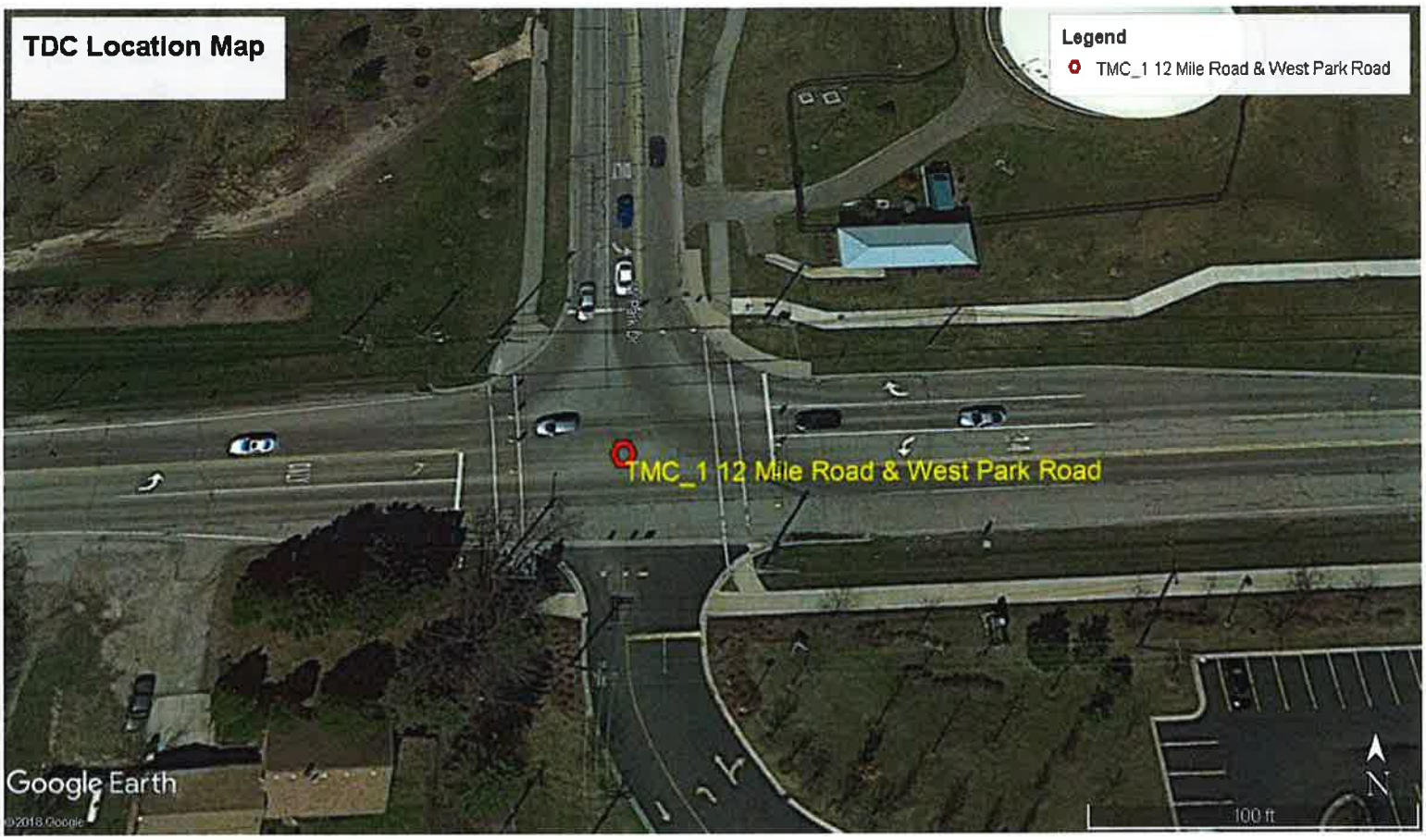
Aerial Photo



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Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Rain PM Deg's 60's
Count By Miovision Video VCU 5DW NE

File Name : TMC_2 12 Mile & Site Dw_10-10-18
Site Code : TMC_2
Start Date : 10/10/2018
Page No : 1

4 Hour traffic study was conducted during typical weekday (Tuesday-Thursday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was in session.

Groups Printed- Pass Cars - Single Units - Heavy Trucks - Peds

	Site Under Construction Southbound					12 Mile Road Westbound					Existing Driveway Northbound					12 Mile Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	5	52	0	0	57	0	0	0	0	0	0	188	0	0	188	245
07:15 AM	0	0	0	0	0	3	63	0	0	66	0	0	0	0	0	0	242	0	0	242	308
07:30 AM	2	0	0	0	2	0	81	0	0	81	0	0	0	0	0	0	256	0	0	256	339
07:45 AM	0	0	0	0	0	0	117	0	0	117	0	0	0	0	0	0	256	0	0	256	373
Total	2	0	0	0	2	8	313	0	0	321	0	0	0	0	0	0	942	0	0	942	1265
08:00 AM	1	0	1	0	2	0	112	0	0	112	0	0	0	0	0	0	252	1	0	253	367
08:15 AM	0	0	1	0	1	1	88	0	0	89	0	0	0	0	0	0	286	0	0	286	376
08:30 AM	1	0	0	0	1	1	79	0	0	80	0	0	0	0	0	0	251	0	0	251	332
08:45 AM	0	0	0	0	0	0	87	0	0	87	0	0	0	0	0	0	246	0	0	246	333
Total	2	0	2	0	4	2	366	0	0	368	0	0	0	0	0	0	1035	1	0	1036	1408
*** BREAK ***																					
04:00 PM	0	0	0	0	0	0	251	0	0	251	0	0	0	0	0	0	199	0	0	199	450
04:15 PM	0	0	0	0	0	0	286	0	0	286	0	0	0	0	0	0	191	0	0	191	477
04:30 PM	1	0	0	0	1	0	248	0	0	248	0	0	0	0	0	0	202	0	0	202	451
04:45 PM	0	0	0	0	0	0	245	0	0	245	0	0	0	0	0	0	211	0	0	211	456
Total	1	0	0	0	1	0	1030	0	0	1030	0	0	0	0	0	0	803	0	0	803	1834
05:00 PM	0	0	0	0	0	0	235	0	0	235	0	0	0	0	0	0	186	0	0	186	421
05:15 PM	0	0	0	0	0	0	242	0	0	242	0	0	0	0	0	0	199	0	0	199	441
05:30 PM	0	0	0	0	0	0	246	0	0	246	0	0	0	0	0	0	197	0	0	197	443
05:45 PM	0	0	0	0	0	0	262	0	0	262	0	0	0	0	0	0	172	0	0	172	434
Total	0	0	0	0	0	0	985	0	0	985	0	0	0	0	0	0	754	0	0	754	1739
Grand Total	5	0	2	0	7	10	2694	0	0	2704	0	0	0	0	0	0	3534	1	0	3535	6246
Apprch %	71.4	0	28.6	0		0.4	99.6	0	0		0	0	0	0		0	100	0	0		
Total %	0.1	0	0	0	0.1	0.2	43.1	0	0	43.3	0	0	0	0	0	0	56.6	0	0	56.6	
Pass Cars	4	0	2	0	6	10	2643	0	0	2653	0	0	0	0	0	0	3479	1	0	3480	6139
% Pass Cars	80	0	100	0	85.7	100	98.1	0	0	98.1	0	0	0	0	0	0	98.4	100	0	98.4	98.3
Single Units	1	0	0	0	1	0	35	0	0	35	0	0	0	0	0	0	45	0	0	45	81
% Single Units	20	0	0	0	14.3	0	1.3	0	0	1.3	0	0	0	0	0	0	1.3	0	0	1.3	1.3
Heavy Trucks	0	0	0	0	0	0	16	0	0	16	0	0	0	0	0	0	10	0	0	10	26
% Heavy Trucks	0	0	0	0	0	0	0.6	0	0	0.6	0	0	0	0	0	0	0.3	0	0	0.3	0.4
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TDC Traffic Comments: Non-signalized intersection, existing building under construction from the north. Video VCU camera was located within NE intersection quadrant. Note: Peds. are excluded from peak hour reports.

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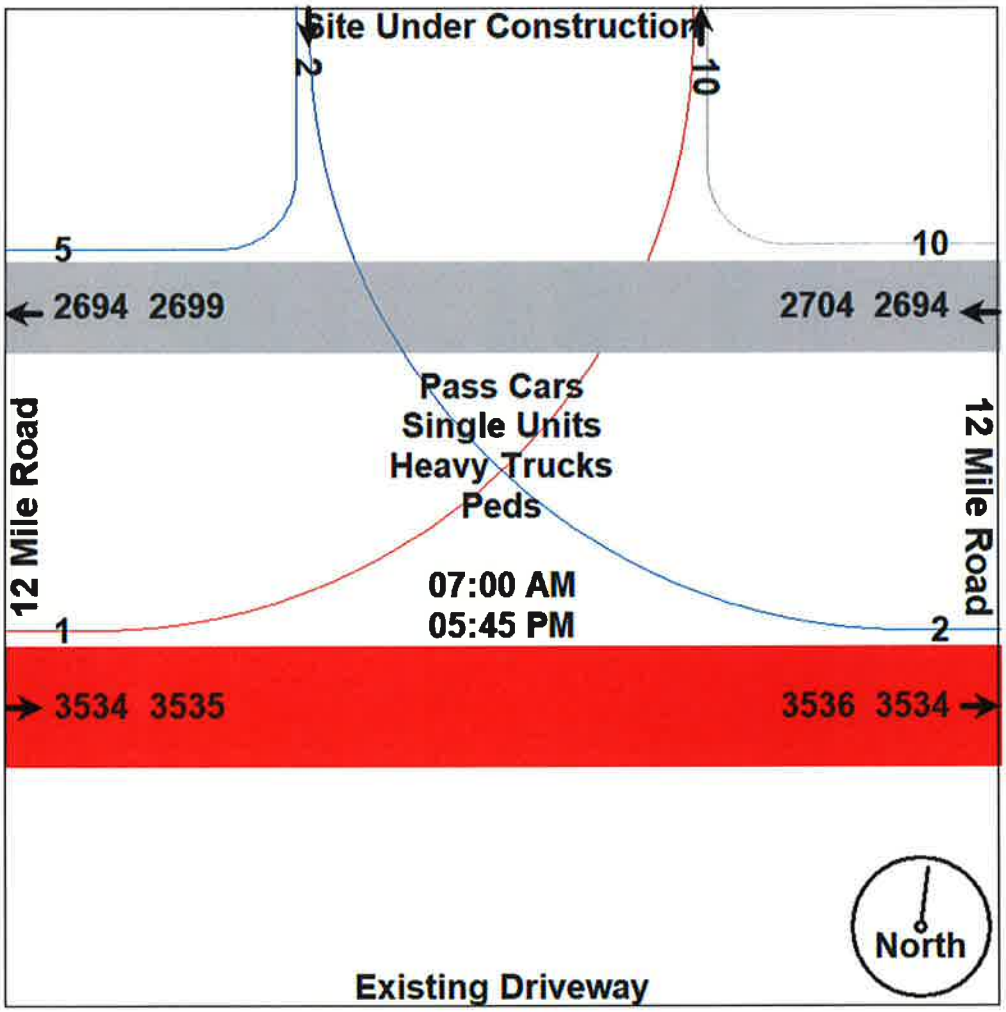
Traffic Study Performed For:

Fleis & Vandenbrink

Project: Novi Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Rain PM Deg's 60's
Count By Miovision Video VCU 5DW NE

File Name : TMC_2 12 Mile & Site Dw_10-10-18
Site Code : TMC_2
Start Date : 10/10/2018
Page No : 2



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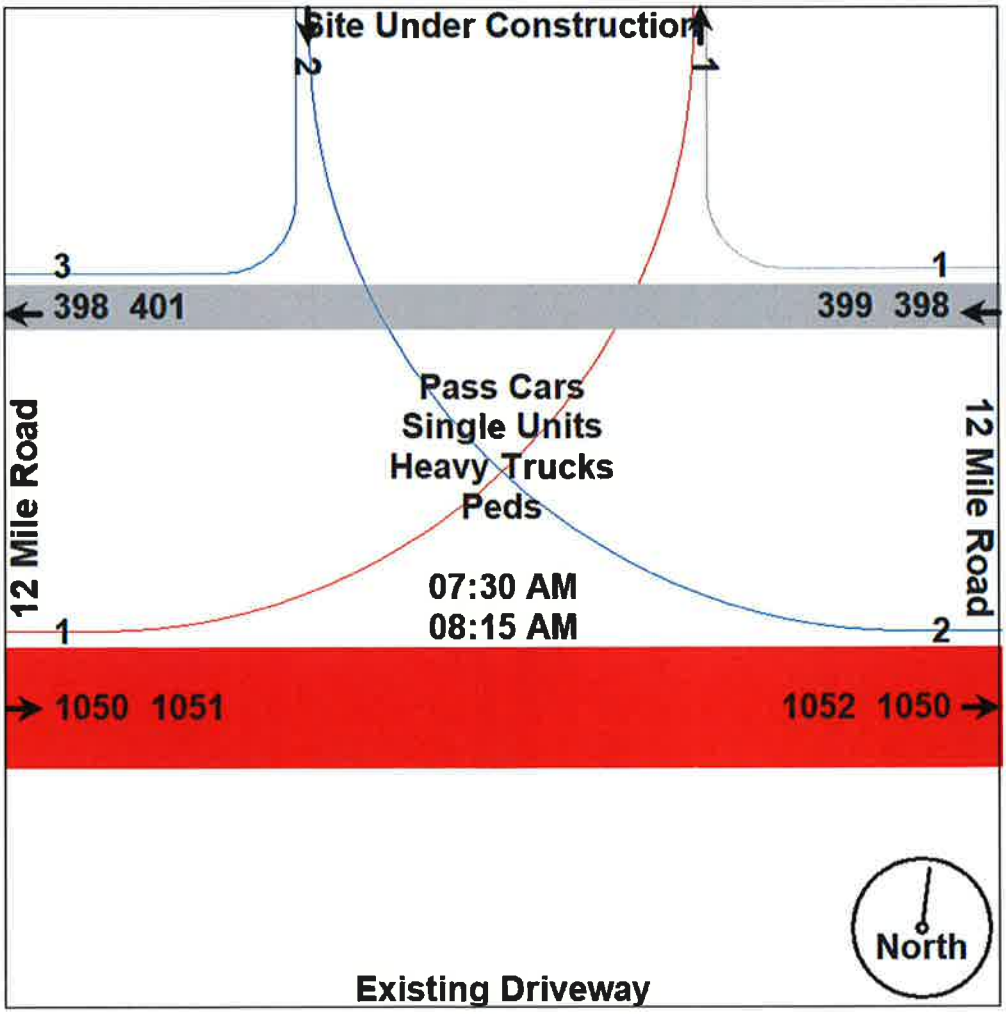
File Name : TMC_2 12 Mile & Site Dw_10-10-18
Site Code : TMC_2
Start Date : 10/10/2018
Page No : 3

	Site Under Construction Southbound				12 Mile Road Westbound				Existing Driveway Northbound				12 Mile Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	**2**	0	0	**2**	0	81	0	81	0	0	0	0	0	256	0	256	339
07:45 AM	0	0	0	0	0	**117**	0	**117**	0	0	0	0	0	256	0	256	373
08:00 AM	1	0	**1**	2	0	112	0	112	0	0	0	0	0	252	**1**	253	367
08:15 AM	0	0	1	1	**1**	88	0	89	0	0	0	0	0	**286**	0	**286**	**376**
Total Volume	3	0	2	5	1	398	0	399	0	0	0	0	0	1050	1	1051	1455
% App. Total	60	0	40		0.3	99.7	0		0	0	0		0	99.9	0.1		
PHF	.375	.000	.500	.625	.250	.850	.000	.853	.000	.000	.000	.000	.000	.918	.250	.919	.967
Pass Cars	2	0	2	4	1	390	0	391	0	0	0	0	0	1031	1	1032	1427
% Pass Cars	66.7	0	100	80.0	100	98.0	0	98.0	0	0	0	0	0	98.2	100	98.2	98.1
Single Units	1	0	0	1	0	8	0	8	0	0	0	0	0	14	0	14	23
% Single Units	33.3	0	0	20.0	0	2.0	0	2.0	0	0	0	0	0	1.3	0	1.3	1.6
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	5	5
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0.3
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

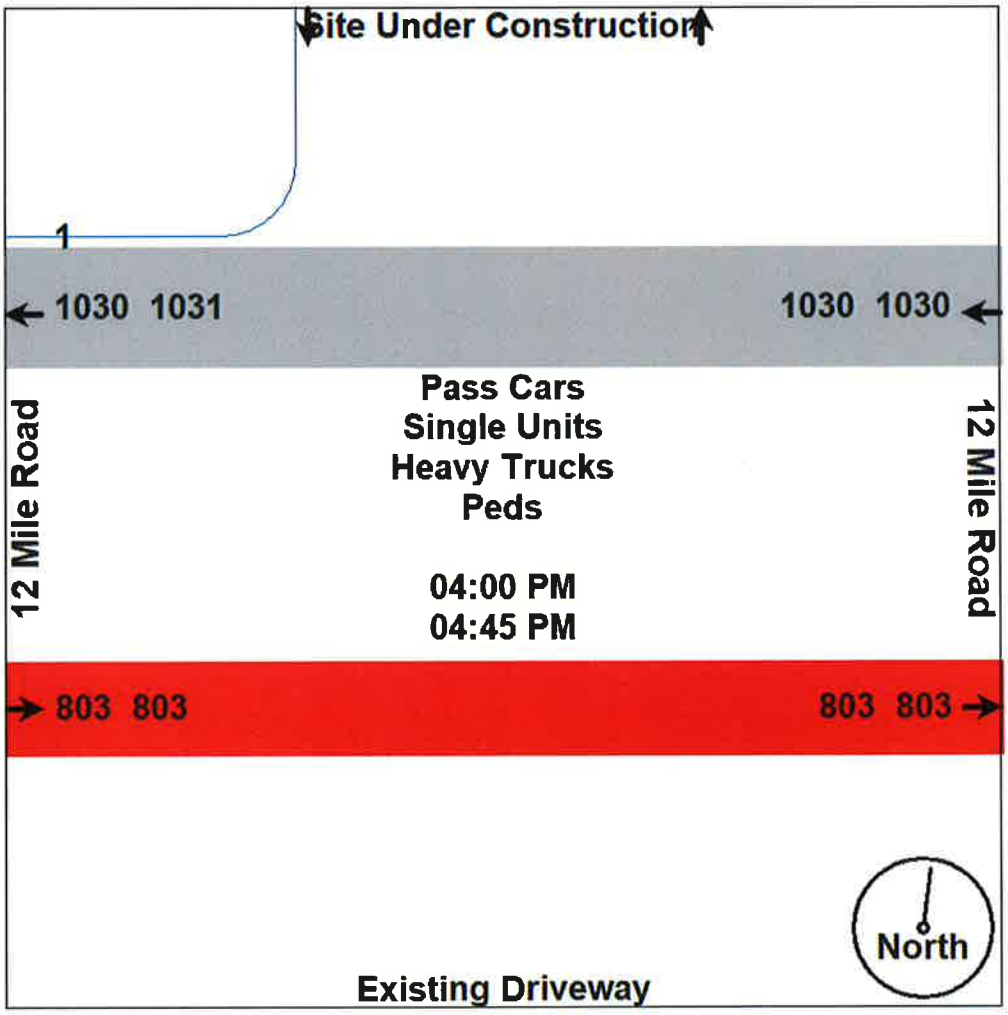
Traffic Study Performed For:

Fleis & Vandenbrink

Project: Novi Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Rain PM Deg's 60's
Count By Miovision Video VCU 5DW NE

File Name : TMC_2 12 Mile & Site Dw_10-10-18
Site Code : TMC_2
Start Date : 10/10/2018
Page No : 4

	Site Under Construction Southbound				12 Mile Road Westbound				Existing Driveway Northbound				12 Mile Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 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	251	0	251	0	0	0	0	0	199	0	199	450
04:15 PM	0	0	0	0	0	**286**	0	**286**	0	0	0	0	0	191	0	191	**477**
04:30 PM	**1**	0	0	**1**	0	248	0	248	0	0	0	0	0	202	0	202	451
04:45 PM	0	0	0	0	0	245	0	245	0	0	0	0	0	**211**	0	**211**	456
Total Volume	1	0	0	1	0	1030	0	1030	0	0	0	0	0	803	0	803	1834
% App. Total	100	0	0		0	100	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.900	.000	.900	.000	.000	.000	.000	.000	.951	.000	.951	.961
Pass Cars	1	0	0	1	0	1010	0	1010	0	0	0	0	0	795	0	795	1806
% Pass Cars	100	0	0	100	0	98.1	0	98.1	0	0	0	0	0	99.0	0	99.0	98.5
Single Units	0	0	0	0	0	13	0	13	0	0	0	0	0	8	0	8	21
% Single Units	0	0	0	0	0	1.3	0	1.3	0	0	0	0	0	1.0	0	1.0	1.1
Heavy Trucks	0	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0	7
% Heavy Trucks	0	0	0	0	0	0.7	0	0.7	0	0	0	0	0	0	0	0	0.4
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Phone: 586.786-5407

Traffic Study Performed For:

Fleis & Vandenbrink

Project: Novi Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny/Cldy. Rain PM Deg's 60's
Count By Miovision Video VCU 5DW NE

File Name : TMC_2 12 Mile & Site Dw_10-10-18
Site Code : TMC_2
Start Date : 10/10/2018
Page No : 5

Aerial Photo

Crash and Road Data

Road Segment Report

12 Mile Rd W, (PR Number 4462980)

From:	Park Dr W 0.550 BMP
To:	12 Mile Rd W 1.390 EMP
FALINK ID:	18753
Community:	City of Novi
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	0.840 miles
Number of Lanes:	2
Posted Speed:	45 (source: TCO)
Route Classification:	Not a route
Annual Crash Average 2013-2017:	18
Traffic Volume (2016)*:	16,200 (Observed AADT)
Pavement Type (2016):	Asphalt
Pavement Rating (2016):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	(1178) Capacity Improvement

Street View

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

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Search...

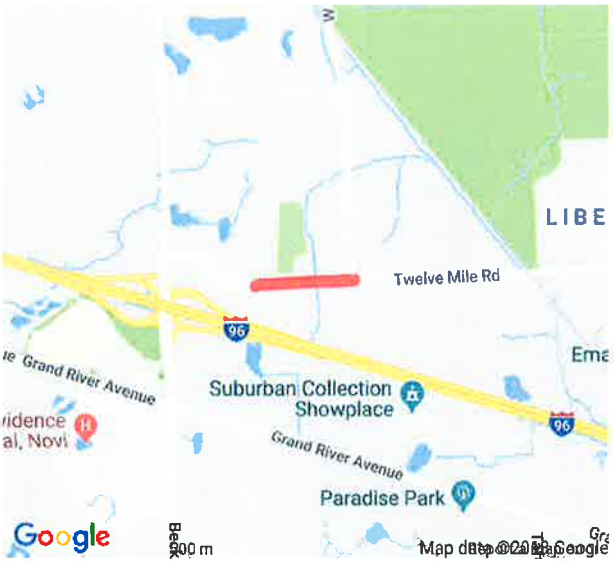
Crash and Road Data

Road Segment Report

12 Mile Rd W, (PR Number 4462980)

From:	12 Mile Rd W 0.275 BMP
To:	Park Dr W 0.550 EMP
FALINK ID:	18752
Community:	City of Novi , City of Wixom
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	0.275 miles
Number of Lanes:	2
Posted Speed:	0 (source:)
Route Classification:	Not a route
Annual Crash Average 2013-2017:	7
Traffic Volume (2016)*:	14,300 (Observed AADT)
Pavement Type (2016):	Asphalt
Pavement Rating (2016):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	

Street View



SEMCOG | Southeast Michigan
Council of Governments

Search...

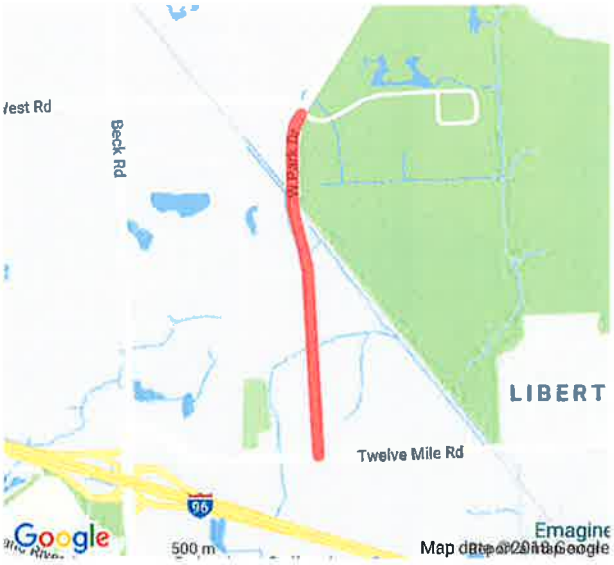
Crash and Road Data

Road Segment Report

Park Dr W, (PR Number 4413388)

From:	12 Mile Rd W 0.000 BMP
To:	Park Dr W 0.956 EMP
FALINK ID:	18340
Community:	City of Novi
County:	Oakland
Functional Class:	4 - Minor Arterial
Direction:	1 Way
Length:	0.956 miles
Number of Lanes:	3
Posted Speed:	25 (source: COG)
Route Classification:	Not a route
Annual Crash Average 2013-2017:	6
Traffic Volume (2016)*:	11,500 (Observed AADT)
Pavement Type (2016):	Asphalt
Pavement Rating (2016):	Poor
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	

Street View



OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

FEB 16 2016

LOCATION: 12 MILE & WEST PARK DATE: 1/19/16

CITY/TOWNSHIP: NOVI BY: DAWN BIERLEIN

COUNTY#: 1085 STATE#: - CHARGES: 78 01085 0

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.....																			
_____ CHANGE OFFSET.....																			
_____ CHANGE CYCLE LENGTH.....																			
_____ ADD DIAL/SPLIT.....																			

_____ CHANGE BREAKOUT OR EPROM: _____

_____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

_____ REPROGRAM TBC

_____ INSTALL INTERCONNECT: _____ TBC _____ MINITROL _____ TONE

_____ MBT OK: _____ YES _____ NO

_X_ NO CHANGE - RECORD CORRECTION (CAMERAS ARE 2004 NOT SOLO PRO)

_____ OTHER: _____

APPROVED BY: _____ DATE: 2/9/16

DATE INSTALLED: 2/10/16

INSTALLED BY: WILLIAMS / RICHARDSON

INTERSECTION :- 1085 12 Mile and Westpark
DESCRIPTION PROMS :- X00020R / F4808
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE :- MOD 52 SCATS w/fya (Version s15)

PHYSICAL INPUTS :-

1. SB WESTPARK L (LK)
2. SB WESTPARK R (LK)
3. EB 12 MILE LT NL)
4. EB 12 MILE LT ADV (NL)
5. EB 12 MILE (LK)
6. NB WESTPARK L (LK)
7. NB WESTPARK R (LK)
8. WB 12 MILE LT (NL)
9. WB 12 MILE LT ADV (NL)
10. WB 12 MILE (LK)
11. WB 12 MILE R (LK)
12. EB 12 MILE R (LK)

NOTE: ALL DETECTORS ARE AUTOSCOPE 2004.

PED 2: 12 MILE PED NORTH (WA) P.B.
PED 4: WESTPARK PED WEST (WB) P.B.
PED 6: 12 MILE PED SOUTH (WC) P.B.
PED 8: WESTPARK PED EAST (WD) P.B.

APPROACHES :-

A APPR 1 : EB 12 MILE	A APPR 2 : WB 12 MILE
B APPR 1 : SB WESTPARK	B APPR 2 : NB WESTPARK
C APPR 1 : EB 12 MILE LT	C APPR 2 : WB 12 MILE LT
C APPR 3 : WB 12 MILE	C APPR 4 : EB 12 MILE

FLEXIDATA:-

SEQUENCE	A,B,C	A,B,C
AUTO REL		
R- REL	A	A
R+ REL	B	B
Q- REL	C	C
Q+ REL		
LOOKAHEAD		

PEDESTRIANS:-

1. P1
2. P2 (12 MILE NORTH)
3. P3
4. P4 (WESTPARK WEST)
5. P5
6. P6 (12 MILE SOUTH)
7. P7
8. P8 (WESTPARK EAST)

SPECIAL FEATURES :-

Controller Software must be 2070/M52 S15 or later (VC=5)
The personality revision number is currently 3 (=C).

Ped outputs mapped to phases as follows: ped 2 = 18, ped 4 = 20, ped 6 = 22 and ped 8 = 24. VC5 software reports them as mapped.

Left turns are permissive to NCHRP flshing yellow recommendation. Signal groups 9 and 11 provide flashing yellow (green aspect), yellow and red, i.e. upper aspects of 4 section turn display. Signal groups 1 and 5 provide the green (bottom) aspect, i.e. turn arrow.

A STAGE HAS A PERMANENT DEMAND
DEMAND FOR STAGES B AND C IN FLEXI AND ISOLATED. SET XSF8 TO DISABLE.

Signal Group 1 and 5 non-locked detectors will not call stage C directly.

If XSF7 is set signal Group 1 and 5 detectors will call stage B and then stage C.

IN MASTERLINK AND FLEXILINK:
Z- ON CAUSES C1 TURN TO APPEAR AND HOLD IN C STAGE
Z+ ON CAUSES C2 TURN TO APPEAR AND HOLD IN C STAGE
Z- & Z+ ON CAUSES BOTH TURNS TO APPEAR AND HOLD IN C

Flash rate for FYA is set with Timesettings 28 and 29.
TSM28=0.6 (on rate), TSM29=0.4 (off rate)

Backpanel for size P44-12 cabinet:

Load Switch 1:	EB 12 Mile LT (G: green arrow)	CL	-
Load Switch 2:	WB 12 Mile	A	FLA
Load Switch 4:	SB Westpark	B	FLR
Load Switch 5:	WB 12 Mile LT (G: green arrow)	AL	-
Load Switch 6:	EB 12 Mile	C	FLA
Load Switch 7:	12 Mile Ped South (Ped 6)	WC	-
Load Switch 8:	NB Westpark	D	FLR
Load Switch 9:	EB 12 Mile LT	CL	FLA
(OLA)	G: flashing yellow arrow, Y: yellow arrow, R: red arrow		
Load Switch 10:	Westpark Peds (Ped 4 & Ped 8)	WB & WD	-
Load Switch 11:	WB 12 Mile LT	AL	FLA
(OLC)	G: flashing yellow arrow, Y: yellow arrow, R: red arrow		
Load Switch 12:	12 Mile Ped North (Ped 2)	WA	-

Jumpers:
193-194,195-196,197-198,199-200,201-268,202-203,205-206,207-274,208-209,
217-218,219-220,221-222,223-224,229-230,237-238,239-240,241-242,243-244,
245-256,246-247,249-250,251-260,252-253,261-262,263-264,265-266,325-326,
327-328,329-330,331-332,333-334,335-400,343-PB1,347-348,349-350,351-PB1,
356-357,356-401,369-370,371-372,373-374,375-376,377-378,387-PB1,391-392,
393-394,395-PB1,298-302.

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.
Remove 7G from conflict monitor and tape it. Hook 7G to CH 6W (379).
All switches OFF EXCEPT: Dual Select A&B; G&Y Enable;
FYA 1-9, 5-11 Enable; SSM 2, 4, 6, 8, 9, 11.
Minimum Flash = 4 + 2 + 1.

```
********************************
* CONTROLLER INFORMATION SHEET *
*     FOR SITE NO.   1085      *
*        Rachel Jones          *
*  DATE : 13-Apr-2007          *
********************************
```

Checksums:
Times B5 / 265
Pers 67 / 147
Total D2 / 322

Autoscope 37-Pin Male Output Harness (33457G2) Wiring

Autoscope Output Harness Pins #1 & #20 to Logic Common & Pins #18 & # 37 to +24 VDC

Camera Number	EIM Switch Position	EIM LED#	Output Harness Pin#	D-Conn. Term#	Detector		Detector Description	Phase
					D-Conn	On Print		
1	1	1	29	1	Det.9	1	SB Westpark L	4
	1	2	30	2	Det.10	2	SB Westpark R	4
	1	3	31					
	1	4	32					
	1	5	33					
	1	6	34					
	1	7	35					
	1	8	36					
2	2	1	10	3	Det.11	3	EB 12 Mile Lt	1
	2	2	11	4	Det 12	4	EB 12 Mile Lt ADV	1
	2	3	12	5	Det.13	5	EB 12 Mile	6
	2	4	13	12	Det.20	12	EB 12 Mile R	6
	2	5	14					
	2	6	15					
	2	7	16					
	2	8	17					
3	3	1	21	6	Det.14	6	NB Westpark L	8
	3	2	22	7	Det.15	7	NB Westpark R	8
	3	3	23					
	3	4	24					
	3	5	25					
	3	6	26					
	3	7	27					
	3	8	28					
4	4	1	2	8	Det.16	8	WB 12 Mile Lt	5
	4	2	3	9	Det.17	9	WB 12 Mile Lt ADV	5
	4	3	4	10	Det.18	10	WB 12 Mile	2
	4	4	5	11	Det.19	11	WB 12 Mile R	2
	4	5	6					
	4	6	7					
	4	7	8					
	4	8	9					

Autoscope 37-Pin Female Input Harness (33457G3) Wiring

EIM Switch Position	EIM LED#	Input Harness Pin#	Phase Status Input From +24 VDC	Backpanel Terminal Position
5	1	29	Phase 8 Green	L.S. 8 (266)
5	1	30	Phase 7 Green	
5	1	31	Phase 6 Green	L.S. 6 (244)
5	1	32	Phase 5 Green	L.S. 5 (238)
5	1	33	Phase 4 Green	L.S. 4 (222)
5	1	34	Phase 3 Green	
5	1	35	Phase 2 Green	L.S. 2 (200)
5	1	36	Phase 1 Green	L.S. 1 (194)
6	2	10	Phase 8 Red	L.S. 8 (262)
6	2	11	Phase 7 Red	
6	2	12	Phase 6 Red	L.S. 6 (240)
6	2	13	Phase 5 Red	L.S. 11 (246)
6	2	14	Phase 4 Red	L.S. 4 (218)
6	2	15	Phase 3 Red	
6	2	16	Phase 2 Red	L.S. 2 (196)
6	2	17	Phase 1 Red	L.S. 9 (202)

FLEXILINK PLAN DATA

Intersection # 1085 State # _____ Date: 04/13/07 Prepared By: Rachel Jones

Intersection: 12 Mile and Westpark City: Novi

Flash: 7 Days 10 pm to 6 am Approved By: Deneau

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	100	100					
1	A		0	0	0					
2	B		41	48	54					
3	C		66	84	84					
4	D									
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Of (Y-)		0	40	55					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-									
15	Q+									
16	XH									
17	XL									

NOTE: STAGES WITH ONE SECOND PHASE TIMES ARE SKIPPED
BLANK ENTRIES ARE DEFAULT VALUES = 0 FOR ENTRIES #0 - #7, #16 - #17
254 FOR ENTRIES #8 - #15 'C' ENTRY MEANS CONTINOUS = 255

							Timers		
Phase	Direction	Min	Max	ECO	Amber	All Red	Gap	Hdwy	Waste
A	12 Mile	10.0	30.0		4.3	1.6	3.0	1.0	6.0
B	Westpark	8.0	20.0		3.9	1.8	3.0	1.0	6.0
C	12 Mile LT	4.0	15.0		4.3	1.6	3.0	1.0	6.0
D									
E									
F									
G									

	Day	Hours	Plan#
SC1	8	6:00	2
SC2	8	9:30	1
SC3	8	14:30	3
SC4	8	19:00	1
SC5	13	6:00	1
SC6	14	22:00	0
SC7	14	0:00	0
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
12 Mile Ped North	7.0	11.0	4.3
Westpark Ped West	7.0	12.0	3.9
12 Mile Ped South	7.0	8.0	4.3
Westpark Ped East	7.0	12.0	3.9

Flash rate Timesettings TSM28=0.6 (on rate); TSM29=0.4 (off rate)

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

0	End of Schedule	4	WED	8	MON-FRI	12	MON,FRI,SAT
1	SUN	5	THUR	9	MON-SAT	13	SAT,SUN
2	MON	6	FRI	10	TUE,WED,THU	14	EVERY DAY
3	TUE	7	SAT	11	MON,FRI	15	NEVER

Autoscope Output Harness Pins #1 & #20 to Logic Common & Pins #18 & # 37 to +24 VDC

Camera Number	EIM Switch Position	EIM LED#	Output Harness Pin#	D-Conn. Term#	Detector D-Conn	Detector On Print	Detector Description	Phase
1	1	1	29	1	Det.9	1	SB Westpark L	4
	1	2	30	2	Det.10	2	SB Westpark R	4
	1	3	31					
	1	4	32					
	1	5	33					
	1	6	34					
	1	7	35					
	1	8	36					
2	2	1	10	3	Det.11	3	EB 12 Mile Lt	1
	2	2	11	4	Det.12	4	EB 12 Mile Lt ADV	1
	2	3	12	5	Det.13	5	EB 12 Mile	6
	2	4	13	12	Det.20	12	EB 12 Mile R	6
	2	5	14					
	2	6	15					
	2	7	16					
	2	8	17					
3	3	1	21	6	Det.14	6	NB Westpark L	8
	3	2	22	7	Det.15	7	NB Westpark R	8
	3	3	23					
	3	4	24					
	3	5	25					
	3	6	26					
	3	7	27					
	3	8	28					
4	4	1	2	8	Det.16	8	WB 12 Mile Lt	5
	4	2	3	9	Det.17	9	WB 12 Mile Lt ADV	5
	4	3	4	10	Det.18	10	WB 12 Mile	2
	4	4	5	11	Det.19	11	WB 12 Mile R	2
	4	5	6					
	4	6	7					
	4	7	8					
	4	8	9					

Autoscope 37-Pin Female Input Harness (33457G3) Wiring

EIM Switch Position	EIM LED#	Input Harness Pin#	Phase Status Input From +24 VDC	Backpanel Terminal Position
5	1	29	Phase 8 Green	L.S. 8 (266)
5	1	30	Phase 7 Green	
5	1	31	Phase 6 Green	L.S. 6 (244)
5	1	32	Phase 5 Green	L.S. 5 (238)
5	1	33	Phase 4 Green	L.S. 4 (222)
5	1	34	Phase 3 Green	
5	1	35	Phase 2 Green	L.S. 2 (200)
5	1	36	Phase 1 Green	L.S. 1 (194)
6	2	10	Phase 8 Red	L.S. 8 (262)
6	2	11	Phase 7 Red	
6	2	12	Phase 6 Red	L.S. 6 (240)
6	2	13	Phase 5 Red	L.S. 11 (246)
6	2	14	Phase 4 Red	L.S. 4 (218)
6	2	15	Phase 3 Red	
6	2	16	Phase 2 Red	L.S. 2 (196)
6	2	17	Phase 1 Red	L.S. 9 (202)

TIMESETTINGS FOR INTERSECTION 1085

Stage Times

STG	MAX2	LST	MIN	INC	MVG	MAX	ECG	AMB	RED	SRED
A	0.0	0.0	10.0	0.0	0.0	30.0	0.0	4.3	1.6	0.0
B	0.0	0.0	8.0	0.0	0.0	20.0	0.0	3.9	1.8	0.0
C	0.0	0.0	4.0	0.0	0.0	15.0	0.0	4.3	1.6	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Approach Times

STG	G1	H1	W1	G2	H2	W2	G3	H3	W3	G4	H4	W4
A	3.0	1.0	6.0	3.0	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
B	3.0	1.0	6.0	3.0	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
C	3.0	1.0	6.0	3.0	1.0	6.0	3.0	1.0	6.0	3.0	1.0	6.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
F	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
G	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Pedestrian Times

PED	DLY	WLK	CLR1	CLR2
1	0.0	6.0	10.0	0.0
2	0.0	7.0	11.0	4.3
3	0.0	6.0	10.0	0.0
4	0.0	7.0	12.0	3.9
5	0.0	6.0	10.0	0.0
6	0.0	7.0	8.0	4.3
7	0.0	6.0	10.0	0.0
8	0.0	7.0	12.0	3.9

Daily Times

START	FINISH
08:00	18:00

Presence Times

1	2	3	4	5	6	7	8	9	10	11	12
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

13	14	15	16	17	18	19	20	21	22	23	24
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Special Times

1	2	3	4	5	6	7	8
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

9	10	11	12	13	14	15	16
0.0	120.0	5.0	5.0	0.0	0.0	10.0	120.0

17	18	19	20	21	22	23	24
2.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0

25	26	27	28	29	30	31	32
0.5	0.5	0.0	0.6	0.4	0.0	0.0	0.0

33	34	35	36	37	38	39	40
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Plan data

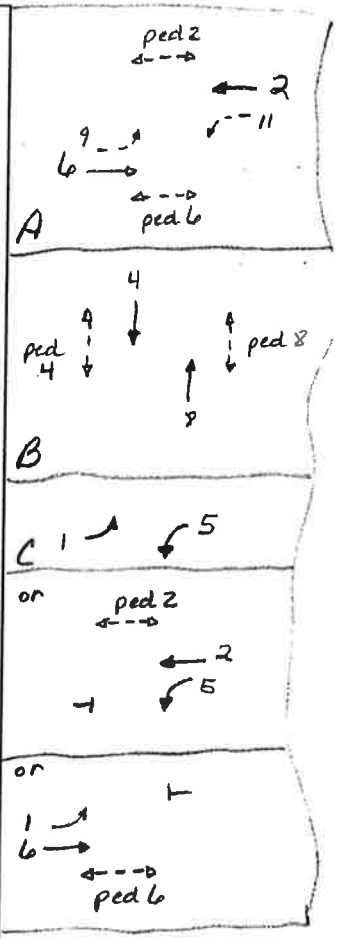
Plan	CL	A	B	C	D	E	F	G	R-	R+	Y-	Y+	Z-	Z+	Q-	Q+	XSF
0	0	0	0	0	0	0	0	0	NU	NU	NU	CT	NU	NU	NU	NU	0
1	80	0	41	66	0	0	0	0	NU	NU	0	NU	NU	NU	NU	NU	0
2	100	0	48	84	0	0	0	0	NU	NU	40	NU	NU	NU	NU	NU	0
3	100	0	54	84	0	0	0	0	NU	NU	55	NU	NU	NU	NU	NU	0
4	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
5	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
6	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
7	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
8	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
9	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0
10	0	0	0	0	0	0	0	0	NU	NU	NU	NU	NU	NU	NU	NU	0

Schedule data

Sched	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Day	8	8	8	8	13	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0
Hour	6	9	14	19	6	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Min.	0	30	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plan	2	1	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Checksum = $B5

Movement Diagram



INSTALL 40FT. ANCHOR BASE STEEL STRAIN POLE

⑥⑫ SEE DETAIL "F-1" DETAIL SHEET OC-4

⑦⑦ INSTALL (2) PUSHBUTTONS & R10 SIGNS ON STEEL POLE FOR CROS 12 MILE & WEST PARK

POCH 23'-0" (EAST SPAN) & 24'-0" (SOUTH SPAN)

EXIST. SEC. CABLE POLE

EXIST. 120V. SERVICE

EXIST. PHONE SERVICE

INSTALL 60A. SAFETY SWITCH (STAINLESS STEEL)

GN LEGEND

C.S.#1 FACING SOUTH
C.S.#2 FACING NORTH
(ALUMINUM PANEL)

-WAY, 24"X30"
D CASE SIGN

55'

VAR.

VAR.

12'

12'

12 MILE RD.

FACING
LEFT TURN LANE
T.S.#1A & T.S.#8A
INSTALL 1-WAY, 4-SECTION
LEFT TURN T.S.

INSTALL 40FT. ANCHOR BASE STEEL STRAIN POLE

⑪ INSTALL (SALVAGED) 4.8MM AU CAMERA & 18FT. BRACKET ARM E.BD. STOP BAR (MOUNT AT 3

⑤ SEE DETAIL "A-1" DETAIL SHEE

⑥ SEE DETAIL "B-3" DETAIL SHEE

⑦⑦ INSTALL (2) PUSHBUTTONS & R SIGNS ON STEEL POLE FOR CR 12 MILE & WEST PARK

POCH 23'-0" (EAST SPAN) & 24'-0" (NORTH SPAN)

RIALS	QUANTITIES
	4 Ea
	8 Ea
(LED)	2 Ea
h	2 Ea
ct (LED)	2 Ea
ld (LED)	4 Ea
	8 Ea
ated	1 Ea
ated, Delivered	1 Ea
	1 Ea
	1 Ea
	1 Ea
	10 Ft
	1 Ea
	3 Ea
	3 Ea
	2 Ea
	1 Ea
	180 Ft

CONTACT MR. CARL FORD, D
(1-248-486-6272) PRIOR
OF TRAFFIC SIGNALS.
NO CHARGES.

SPAN WIRE POLE CONTACT HEIGH
ON PLAN (FROM RD. GRADE) MA
ADJUSTING AS DIRECTED BY TH
(INCLUDED IN THE INSTALLATIO
ON THIS CONTRACT.)

ILE RD. & WESTPARK DR.

ATS 2105

S INC.

JOB NO.	PROJECT NAME	SHEET NO.
M4102A	T.S. MODERNIZATION	4 OF 5

Appendix B

EXISTING TRAFFIC CONDITIONS

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	655	19	6	230	165	0	0	2	392	3	281
Future Volume (veh/h)	265	655	19	6	230	165	0	0	2	392	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	704	20	7	267	192	0	0	3	417	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	542	926	785	224	727	616	72	0	313	516	5	497
Arrive On Green	0.11	0.50	0.50	0.01	0.39	0.39	0.00	0.00	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1403	16	1559
Grp Volume(v), veh/h	285	704	20	7	267	192	0	0	3	417	0	302
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1403	0	1575
Q Serve(g_s), s	9.1	30.6	0.6	0.2	10.2	8.5	0.0	0.0	0.2	28.9	0.0	16.2
Cycle Q Clear(g_c), s	9.1	30.6	0.6	0.2	10.2	8.5	0.0	0.0	0.2	29.1	0.0	16.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Lane Grp Cap(c), veh/h	542	926	785	224	727	616	72	0	313	516	0	502
V/C Ratio(X)	0.53	0.76	0.03	0.03	0.37	0.31	0.00	0.00	0.01	0.81	0.00	0.60
Avail Cap(c_a), veh/h	607	926	785	284	727	616	81	0	327	536	0	524
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.5	20.2	12.7	20.1	21.6	21.1	0.0	0.0	23.3	33.2	0.0	28.7
Incr Delay (d2), s/veh	0.8	5.8	0.1	0.1	1.4	1.3	0.0	0.0	0.0	8.7	0.0	1.8
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	3.4	13.2	0.2	0.1	4.4	3.1	0.0	0.0	0.0	10.4	0.0	6.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.3	26.1	12.8	20.2	23.0	22.4	0.0	0.0	23.3	41.9	0.0	30.5
LnGrp LOS	B	C	B	C	C	C	A	A	C	D	A	C
Approach Vol, veh/h		1009			466			3			719	
Approach Delay, s/veh		22.7			22.7			23.3			37.1	
Approach LOS		C			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	55.8		37.6	17.3	45.1		37.6				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 45		* 33	* 15	* 34		* 33				
Max Q Clear Time (g_c+I1), s	2.2	32.6		31.1	11.1	12.2		2.2				
Green Ext Time (p_c), s	0.0	3.6		0.8	0.3	2.0		0.0				

Intersection Summary												
HCM 6th Ctrl Delay			27.4									
HCM 6th LOS			C									

Notes

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

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1050	398	1	2	3
Future Vol, veh/h	1	1050	398	1	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	1	1141	468	1	2	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	469	0	-	0	1611	468
Stage 1	-	-	-	-	468	-
Stage 2	-	-	-	-	1143	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	1093	-	-	-	104	560
Stage 1	-	-	-	-	594	-
Stage 2	-	-	-	-	280	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1093	-	-	-	104	560
Mov Cap-2 Maneuver	-	-	-	-	213	-
Stage 1	-	-	-	-	593	-
Stage 2	-	-	-	-	280	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1093	-	-	-	213	560
HCM Lane V/C Ratio	0.001	-	-	-	0.01	0.006
HCM Control Delay (s)	8.3	-	-	-	22.1	11.5
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0	-	-	-	0	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	L	TR
Maximum Queue (ft)	269	565	155	31	250	193	39	396	132
Average Queue (ft)	125	217	14	4	111	56	2	217	65
95th Queue (ft)	246	412	76	21	203	134	18	339	116
Link Distance (ft)		623			464		242		622
Upstream Blk Time (%)		0							
Queuing Penalty (veh)		0							
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	8	30	0		10	0			
Queuing Penalty (veh)	58	84	0		18	0			

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	30	48
Average Queue (ft)	3	3
95th Queue (ft)	17	21
Link Distance (ft)	280	280
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 160

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	655	19	6	230	165	0	0	2	392	3	281
Future Volume (veh/h)	265	655	19	6	230	165	0	0	2	392	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	704	20	7	267	192	0	0	3	417	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	540	923	782	222	724	614	72	0	315	516	3	684
Arrive On Green	0.11	0.50	0.50	0.01	0.39	0.39	0.00	0.00	0.32	0.32	0.32	0.32
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1386	10	1572
Grp Volume(v), veh/h	285	704	20	7	267	192	0	0	3	420	0	299
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1396	0	1572
Q Serve(g_s), s	9.1	30.7	0.6	0.2	10.2	8.5	0.0	0.0	0.2	29.1	0.0	13.3
Cycle Q Clear(g_c), s	9.1	30.7	0.6	0.2	10.2	8.5	0.0	0.0	0.2	29.3	0.0	13.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	540	923	782	222	724	614	72	0	315	519	0	684
V/C Ratio(X)	0.53	0.76	0.03	0.03	0.37	0.31	0.00	0.00	0.01	0.81	0.00	0.44
Avail Cap(c_a), veh/h	605	923	782	282	724	614	80	0	327	537	0	704
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.6	20.3	12.8	20.3	21.7	21.2	0.0	0.0	23.2	33.1	0.0	19.7
Incr Delay (d2), s/veh	0.8	5.9	0.1	0.1	1.4	1.3	0.0	0.0	0.0	8.8	0.0	0.4
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	3.4	13.3	0.2	0.1	4.5	3.2	0.0	0.0	0.0	10.5	0.0	4.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	15.4	26.3	12.8	20.3	23.2	22.5	0.0	0.0	23.2	42.0	0.0	20.2
LnGrp LOS	B	C	B	C	C	C	A	A	C	D	A	C
Approach Vol, veh/h		1009			466			3			719	
Approach Delay, s/veh		22.9			22.8			23.2			32.9	
Approach LOS		C			C			C			C	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.6	55.7		37.7	17.3	44.9		37.7
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7
Max Green Setting (Gmax), s	* 4.1	* 45		* 33	* 15	* 34		* 33
Max Q Clear Time (g_c+I1), s	2.2	32.7		31.3	11.1	12.2		2.2
Green Ext Time (p_c), s	0.0	3.6		0.8	0.3	2.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	26.2
HCM 6th LOS	C

Notes

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

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1050	398	1	2	3
Future Vol, veh/h	1	1050	398	1	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	1	1141	468	1	2	3

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	469	0	-	0	1611	468			
Stage 1	-	-	-	-	468	-			
Stage 2	-	-	-	-	1143	-			
Critical Hdwy	4.12	-	-	-	6.6	6.4			
Critical Hdwy Stg 1	-	-	-	-	5.6	-			
Critical Hdwy Stg 2	-	-	-	-	5.6	-			
Follow-up Hdwy	2.218	-	-	-	3.68	3.48			
Pot Cap-1 Maneuver	1093	-	-	-	104	560			
Stage 1	-	-	-	-	594	-			
Stage 2	-	-	-	-	280	-			
Platoon blocked, %		-	-	-					
Mov Cap-1 Maneuver	1093	-	-	-	104	560			
Mov Cap-2 Maneuver	-	-	-	-	213	-			
Stage 1	-	-	-	-	593	-			
Stage 2	-	-	-	-	280	-			

Approach	EB	WB	SB
HCM Control Delay, s	0	0	15.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1093	-	-	-	213	560
HCM Lane V/C Ratio	0.001	-	-	-	0.01	0.006
HCM Control Delay (s)	8.3	-	-	-	22.1	11.5
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0	-	-	-	0	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	LT	R
Maximum Queue (ft)	269	482	155	28	234	145	34	358	117
Average Queue (ft)	115	195	12	4	106	44	2	212	57
95th Queue (ft)	227	374	70	19	192	96	16	321	103
Link Distance (ft)		617			464		242		622
Upstream Blk Time (%)		0							
Queuing Penalty (veh)		0							
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	6	25	0		9	0			
Queuing Penalty (veh)	40	70	0		16	0			

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	30	48
Average Queue (ft)	3	3
95th Queue (ft)	17	21
Link Distance (ft)	280	280
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 127

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	362	9	8	739	226	17	12	3	400	4	531
Future Volume (veh/h)	242	362	9	8	739	226	17	12	3	400	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	398	10	8	778	238	21	15	4	460	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	261	969	821	465	794	673	72	438	117	487	4	481
Arrive On Green	0.10	0.51	0.51	0.01	0.42	0.42	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1404	13	1587
Grp Volume(v), veh/h	266	398	10	8	778	238	21	0	19	460	0	615
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1404	0	1600
Q Serve(g_s), s	10.1	13.0	0.3	0.3	40.7	10.1	0.0	0.0	0.7	29.6	0.0	30.3
Cycle Q Clear(g_c), s	10.1	13.0	0.3	0.3	40.7	10.1	30.3	0.0	0.7	30.3	0.0	30.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.99
Lane Grp Cap(c), veh/h	261	969	821	465	794	673	72	0	555	487	0	485
V/C Ratio(X)	1.02	0.41	0.01	0.02	0.98	0.35	0.29	0.00	0.03	0.94	0.00	1.27
Avail Cap(c_a), veh/h	261	969	821	524	794	673	72	0	555	487	0	485
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	29.4	15.0	11.9	16.4	28.5	19.7	50.0	0.0	24.5	36.7	0.0	34.9
Incr Delay (d2), s/veh	60.4	1.3	0.0	0.0	27.5	1.5	2.2	0.0	0.0	27.3	0.0	136.5
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	10.6	5.4	0.1	0.1	22.6	3.8	0.6	0.0	0.3	14.6	0.0	29.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	89.8	16.3	11.9	16.5	56.0	21.2	52.2	0.0	24.6	63.9	0.0	171.4
LnGrp LOS	F	B	B	B	E	C	D	A	C	E	A	F
Approach Vol, veh/h		674			1024			40			1075	
Approach Delay, s/veh		45.2			47.6			39.1			125.4	
Approach LOS		D			D			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	57.3		36.0	16.0	48.0		36.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 48		* 30	* 10	* 42		* 30				
Max Q Clear Time (g_c+I1), s	2.3	15.0		32.3	12.1	42.7		32.3				
Green Ext Time (p_c), s	0.0	2.3		0.0	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	76.6	
HCM 6th LOS	E	

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	0	803	1030	0	0	1
Future Vol, veh/h	0	803	1030	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	0	845	1144	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1144	0	-	0	1989	1144
Stage 1	-	-	-	-	1144	-
Stage 2	-	-	-	-	845	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	611	-	-	-	60	224
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	392	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	611	-	-	-	60	224
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	392	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	21.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	611	-	-	-	224
HCM Lane V/C Ratio	-	-	-	-	0.005
HCM Control Delay (s)	0	-	-	-	21.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	259	321	54	214	480	215	77	44	525	649
Average Queue (ft)	146	131	3	14	463	184	26	10	340	362
95th Queue (ft)	237	248	27	85	510	292	65	35	576	673
Link Distance (ft)		623			464		242	242		622
Upstream Blk Time (%)					28					9
Queuing Penalty (veh)					275					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	27	20			54	0			4	10
Queuing Penalty (veh)	99	51			127	1			25	40

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	WB	SB
Directions Served	T	LR
Maximum Queue (ft)	856	6
Average Queue (ft)	605	0
95th Queue (ft)	1158	6
Link Distance (ft)	800	281
Upstream Blk Time (%)	41	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)	37	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 619

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	362	9	8	739	226	17	12	3	400	4	531
Future Volume (veh/h)	242	362	9	8	739	226	17	12	3	400	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	398	10	8	778	238	21	15	4	460	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	271	988	837	477	813	689	72	423	113	469	4	629
Arrive On Green	0.10	0.52	0.52	0.01	0.43	0.43	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1358	15	1598
Grp Volume(v), veh/h	266	398	10	8	778	238	21	0	19	465	0	610
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1373	0	1598
Q Serve(g_s), s	9.8	12.7	0.3	0.3	40.0	10.0	0.0	0.0	0.7	28.6	0.0	29.3
Cycle Q Clear(g_c), s	9.8	12.7	0.3	0.3	40.0	10.0	29.3	0.0	0.7	29.3	0.0	29.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	0.99		1.00
Lane Grp Cap(c), veh/h	271	988	837	477	813	689	72	0	536	474	0	629
V/C Ratio(X)	0.98	0.40	0.01	0.02	0.96	0.35	0.29	0.00	0.04	0.98	0.00	0.97
Avail Cap(c_a), veh/h	271	988	837	536	813	689	72	0	536	474	0	629
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	28.0	14.4	11.4	15.9	27.6	19.0	50.0	0.0	25.3	37.6	0.0	29.7
Incr Delay (d2), s/veh	49.6	1.2	0.0	0.0	22.8	1.4	2.2	0.0	0.0	36.4	0.0	28.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	5.2	0.1	0.1	21.3	3.7	0.6	0.0	0.3	16.0	0.0	18.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	77.6	15.6	11.4	15.9	50.3	20.4	52.2	0.0	25.3	74.0	0.0	57.9
LnGrp LOS	E	B	B	B	D	C	D	A	C	E	A	E
Approach Vol, veh/h		674			1024			40			1075	
Approach Delay, s/veh		40.0			43.1			39.4			64.9	
Approach LOS		D			D			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	58.3		35.0	16.0	49.0		35.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 49		* 29	* 10	* 43		* 29				
Max Q Clear Time (g_c+I1), s	2.3	14.7		31.3	11.8	42.0		31.3				
Green Ext Time (p_c), s	0.0	2.3		0.0	0.0	0.7		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	50.6
HCM 6th LOS	D

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	0	803	1030	0	0	1
Future Vol, veh/h	0	803	1030	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	0	845	1144	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1144	0	-	0	1989	1144
Stage 1	-	-	-	-	1144	-
Stage 2	-	-	-	-	845	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	611	-	-	-	60	224
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	392	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	611	-	-	-	60	224
Mov Cap-2 Maneuver	-	-	-	-	176	-
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	392	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	21.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	611	-	-	-	224
HCM Lane V/C Ratio	-	-	-	-	0.005
HCM Control Delay (s)	0	-	-	-	21.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	LT	R
Maximum Queue (ft)	246	316	24	174	479	215	73	44	489	570
Average Queue (ft)	135	122	2	12	453	180	23	10	262	257
95th Queue (ft)	224	256	12	82	545	293	60	36	448	479
Link Distance (ft)		617			464		242	242		622
Upstream Blk Time (%)					25					1
Queuing Penalty (veh)					242					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	20	13			52	0			1	1
Queuing Penalty (veh)	77	33			122	1			5	5

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	WB	SB
Directions Served	T	LR
Maximum Queue (ft)	860	6
Average Queue (ft)	566	0
95th Queue (ft)	1137	6
Link Distance (ft)	800	281
Upstream Blk Time (%)	32	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)	35	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 486

Appendix C

BACKGROUND TRAFFIC CONDITIONS

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	771	19	6	239	173	0	0	2	472	3	281
Future Volume (veh/h)	265	771	19	6	239	173	0	0	2	472	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	829	20	7	278	201	0	0	3	502	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	500	863	731	106	653	553	72	0	347	564	6	550
Arrive On Green	0.12	0.46	0.46	0.01	0.35	0.35	0.00	0.00	0.35	0.35	0.35	0.35
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1403	16	1559
Grp Volume(v), veh/h	285	829	20	7	278	201	0	0	3	502	0	302
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1403	0	1575
Q Serve(g_s), s	9.8	43.2	0.7	0.3	11.4	9.5	0.0	0.0	0.2	35.1	0.0	15.4
Cycle Q Clear(g_c), s	9.8	43.2	0.7	0.3	11.4	9.5	0.0	0.0	0.2	35.3	0.0	15.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Lane Grp Cap(c), veh/h	500	863	731	106	653	553	72	0	347	564	0	556
V/C Ratio(X)	0.57	0.96	0.03	0.07	0.43	0.36	0.00	0.00	0.01	0.89	0.00	0.54
Avail Cap(c_a), veh/h	555	863	731	166	653	553	72	0	347	564	0	556
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.7	25.9	14.5	25.8	24.7	24.1	0.0	0.0	21.0	32.8	0.0	25.9
Incr Delay (d2), s/veh	1.1	22.5	0.1	0.3	2.0	1.8	0.0	0.0	0.0	16.1	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	22.3	0.2	0.1	5.1	3.6	0.0	0.0	0.0	13.8	0.0	5.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.8	48.4	14.6	26.0	26.8	25.9	0.0	0.0	21.0	48.8	0.0	27.0
LnGrp LOS	B	D	B	C	C	C	A	A	C	D	A	C
Approach Vol, veh/h		1134			486			3			804	
Approach Delay, s/veh		40.1			26.4			21.0			40.6	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	52.4		41.0	17.9	41.1		41.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 43		* 35	* 15	* 32		* 35				
Max Q Clear Time (g_c+I1), s	2.3	45.2		37.3	11.8	13.4		2.2				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.3	2.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay		37.5
HCM 6th LOS		D

Notes

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

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1196	419	1	2	3
Future Vol, veh/h	1	1196	419	1	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	1	1300	493	1	2	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	494	0	-	0	1795	493
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	1302	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	1070	-	-	-	80	541
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	233	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1070	-	-	-	80	541
Mov Cap-2 Maneuver	-	-	-	-	179	-
Stage 1	-	-	-	-	577	-
Stage 2	-	-	-	-	233	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1070	-	-	-	179	541
HCM Lane V/C Ratio	0.001	-	-	-	0.012	0.006
HCM Control Delay (s)	8.4	-	-	-	25.4	11.7
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	L	TR
Maximum Queue (ft)	270	648	154	72	257	190	46	482	415
Average Queue (ft)	164	342	18	7	110	50	2	270	90
95th Queue (ft)	302	626	90	39	201	114	19	434	280
Link Distance (ft)		623			464		242		622
Upstream Blk Time (%)		3							1
Queuing Penalty (veh)		0							0
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	11	36	0		9	0		1	0
Queuing Penalty (veh)	85	103	1		17	0		4	2

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	SB	SB
Directions Served	L	R
Maximum Queue (ft)	25	52
Average Queue (ft)	3	4
95th Queue (ft)	16	26
Link Distance (ft)	280	280
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 211

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	771	19	6	239	173	0	0	2	472	3	281
Future Volume (veh/h)	265	771	19	6	239	173	0	0	2	472	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	829	20	7	278	201	0	0	3	502	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	500	863	731	106	653	553	72	0	347	562	3	744
Arrive On Green	0.12	0.46	0.46	0.01	0.35	0.35	0.00	0.00	0.35	0.35	0.35	0.35
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1388	8	1572
Grp Volume(v), veh/h	285	829	20	7	278	201	0	0	3	505	0	299
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1397	0	1572
Q Serve(g_s), s	9.8	43.2	0.7	0.3	11.4	9.5	0.0	0.0	0.2	35.1	0.0	12.4
Cycle Q Clear(g_c), s	9.8	43.2	0.7	0.3	11.4	9.5	0.0	0.0	0.2	35.3	0.0	12.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	500	863	731	106	653	553	72	0	347	565	0	744
V/C Ratio(X)	0.57	0.96	0.03	0.07	0.43	0.36	0.00	0.00	0.01	0.89	0.00	0.40
Avail Cap(c_a), veh/h	555	863	731	166	653	553	72	0	347	565	0	744
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.7	25.9	14.5	25.8	24.7	24.1	0.0	0.0	21.0	32.9	0.0	17.1
Incr Delay (d2), s/veh	1.1	22.5	0.1	0.3	2.0	1.8	0.0	0.0	0.0	16.6	0.0	0.4
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	3.7	22.3	0.2	0.1	5.1	3.6	0.0	0.0	0.0	14.0	0.0	4.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.8	48.4	14.6	26.0	26.8	25.9	0.0	0.0	21.0	49.5	0.0	17.5
LnGrp LOS	B	D	B	C	C	C	A	A	C	D	A	B
Approach Vol, veh/h		1134			486			3			804	
Approach Delay, s/veh		40.1			26.4			21.0			37.6	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.6	52.4		41.0	17.9	41.1		41.0
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7
Max Green Setting (Gmax), s	* 4.1	* 43		* 35	* 15	* 32		* 35
Max Q Clear Time (g_c+I1), s	2.3	45.2		37.3	11.8	13.4		2.2
Green Ext Time (p_c), s	0.0	0.0		0.0	0.3	2.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	36.5
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	1	1196	419	1	2	3
Future Vol, veh/h	1	1196	419	1	2	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	1	1300	493	1	2	3

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	494	0	-	0	1795	493
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	1302	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	1070	-	-	-	80	541
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	233	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1070	-	-	-	80	541
Mov Cap-2 Maneuver	-	-	-	-	179	-
Stage 1	-	-	-	-	577	-
Stage 2	-	-	-	-	233	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	17.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1070	-	-	-	179	541
HCM Lane V/C Ratio	0.001	-	-	-	0.012	0.006
HCM Control Delay (s)	8.4	-	-	-	25.4	11.7
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	LT	R
Maximum Queue (ft)	270	631	129	36	254	166	47	464	378
Average Queue (ft)	160	335	12	5	108	42	2	257	65
95th Queue (ft)	301	620	67	23	197	96	19	413	187
Link Distance (ft)		617			464		242		622
Upstream Blk Time (%)		3							
Queuing Penalty (veh)		0							
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	9	33	0		10	0		0	0
Queuing Penalty (veh)	76	94	0		18	0		0	0

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	5	29	52
Average Queue (ft)	0	3	4
95th Queue (ft)	3	17	26
Link Distance (ft)		280	280
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 188

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	373	9	8	840	281	17	12	3	410	4	531
Future Volume (veh/h)	242	373	9	8	840	281	17	12	3	410	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	410	10	8	884	296	21	15	4	471	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	217	1007	853	480	869	736	72	409	109	459	4	449
Arrive On Green	0.08	0.53	0.53	0.01	0.46	0.46	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1404	13	1587
Grp Volume(v), veh/h	266	410	10	8	884	296	21	0	19	471	0	615
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1404	0	1600
Q Serve(g_s), s	8.1	13.0	0.3	0.2	46.1	12.3	0.0	0.0	0.8	27.5	0.0	28.3
Cycle Q Clear(g_c), s	8.1	13.0	0.3	0.2	46.1	12.3	28.3	0.0	0.8	28.3	0.0	28.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.99
Lane Grp Cap(c), veh/h	217	1007	853	480	869	736	72	0	518	459	0	453
V/C Ratio(X)	1.22	0.41	0.01	0.02	1.02	0.40	0.29	0.00	0.04	1.03	0.00	1.36
Avail Cap(c_a), veh/h	217	1007	853	540	869	736	72	0	518	459	0	453
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	30.1	13.9	10.9	14.3	26.9	17.8	50.0	0.0	26.0	38.4	0.0	35.9
Incr Delay (d2), s/veh	134.4	1.2	0.0	0.0	34.9	1.6	2.2	0.0	0.0	48.9	0.0	175.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.3	5.2	0.1	0.1	26.8	4.5	0.6	0.0	0.3	17.3	0.0	32.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	164.5	15.1	10.9	14.3	61.8	19.5	52.2	0.0	26.0	87.3	0.0	211.1
LnGrp LOS	F	B	B	B	F	B	D	A	C	F	A	F
Approach Vol, veh/h		686			1188			40			1086	
Approach Delay, s/veh		73.0			51.0			39.8			157.4	
Approach LOS		E			D			D			F	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	59.3		34.0	14.0	52.0		34.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 50		* 28	* 8.1	* 46		* 28				
Max Q Clear Time (g_c+I1), s	2.2	15.0		30.3	10.1	48.1		30.3				
Green Ext Time (p_c), s	0.0	2.4		0.0	0.0	0.0		0.0				

Intersection Summary		
HCM 6th Ctrl Delay	94.4	
HCM 6th LOS	F	

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	0	833	1153	0	0	1
Future Vol, veh/h	0	833	1153	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	0	877	1281	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1281	0	-	0	2158	1281
Stage 1	-	-	-	-	1281	-
Stage 2	-	-	-	-	877	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	542	-	-	-	46	185
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	379	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	542	-	-	-	46	185
Mov Cap-2 Maneuver	-	-	-	-	154	-
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	379	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	542	-	-	-	-	185
HCM Lane V/C Ratio	-	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	0	24.6
HCM Lane LOS	A	-	-	-	A	C
HCM 95th %tile Q(veh)	0	-	-	-	-	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	270	501	30	141	478	215	95	48	525	650
Average Queue (ft)	175	192	3	9	469	185	29	12	476	543
95th Queue (ft)	289	417	18	67	476	292	77	39	632	796
Link Distance (ft)		623			464		242	242		622
Upstream Blk Time (%)		1			28					33
Queuing Penalty (veh)		0			314					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	51	18			52	0			23	22
Queuing Penalty (veh)	197	47			150	4			126	90

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	WB	SB
Directions Served	T	R
Maximum Queue (ft)	850	24
Average Queue (ft)	700	1
95th Queue (ft)	1127	10
Link Distance (ft)	800	280
Upstream Blk Time (%)	47	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)	40	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 927

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	373	9	8	840	281	17	12	3	410	4	531
Future Volume (veh/h)	242	373	9	8	840	281	17	12	3	410	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	410	10	8	884	296	21	15	4	471	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	253	1007	853	480	831	705	72	409	109	455	4	613
Arrive On Green	0.10	0.53	0.53	0.01	0.44	0.44	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1356	14	1598
Grp Volume(v), veh/h	266	410	10	8	884	296	21	0	19	476	0	610
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1371	0	1598
Q Serve(g_s), s	10.1	13.0	0.3	0.2	44.1	12.7	0.0	0.0	0.8	27.5	0.0	28.3
Cycle Q Clear(g_c), s	10.1	13.0	0.3	0.2	44.1	12.7	28.3	0.0	0.8	28.3	0.0	28.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	0.99		1.00
Lane Grp Cap(c), veh/h	253	1007	853	480	831	705	72	0	518	460	0	613
V/C Ratio(X)	1.05	0.41	0.01	0.02	1.06	0.42	0.29	0.00	0.04	1.04	0.00	0.99
Avail Cap(c_a), veh/h	253	1007	853	540	831	705	72	0	518	460	0	613
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	31.1	13.9	10.9	15.3	28.0	19.2	50.0	0.0	26.0	38.4	0.0	30.7
Incr Delay (d2), s/veh	70.3	1.2	0.0	0.0	49.4	1.8	2.2	0.0	0.0	51.5	0.0	34.8
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	10.9	5.2	0.1	0.1	29.2	4.7	0.6	0.0	0.3	17.7	0.0	19.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.3	15.1	10.9	15.3	77.4	21.0	52.2	0.0	26.0	89.9	0.0	65.5
LnGrp LOS	F	B	B	B	F	C	D	A	C	F	A	E
Approach Vol, veh/h		686			1188			40			1086	
Approach Delay, s/veh		48.5			62.9			39.8			76.2	
Approach LOS		D			E			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	59.3		34.0	16.0	50.0		34.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 50		* 28	* 10	* 44		* 28				
Max Q Clear Time (g_c+I1), s	2.2	15.0		30.3	12.1	46.1		30.3				
Green Ext Time (p_c), s	0.0	2.4		0.0	0.0	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	64.1
HCM 6th LOS	E

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	0	833	1153	0	0	1
Future Vol, veh/h	0	833	1153	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	0	877	1281	0	0	1

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1281	0	-	0	2158	1281
Stage 1	-	-	-	-	1281	-
Stage 2	-	-	-	-	877	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	542	-	-	-	46	185
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	379	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	542	-	-	-	46	185
Mov Cap-2 Maneuver	-	-	-	-	154	-
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	379	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	24.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	542	-	-	-	-	185
HCM Lane V/C Ratio	-	-	-	-	-	0.006
HCM Control Delay (s)	0	-	-	-	0	24.6
HCM Lane LOS	A	-	-	-	A	C
HCM 95th %tile Q(veh)	0	-	-	-	-	0

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	LT	R
Maximum Queue (ft)	259	336	50	65	479	215	85	48	525	646
Average Queue (ft)	146	139	4	5	471	174	30	12	321	298
95th Queue (ft)	248	280	28	37	481	294	76	40	529	582
Link Distance (ft)		617			464		242	242		622
Upstream Blk Time (%)					29					5
Queuing Penalty (veh)					322					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	30	14			53	0			6	2
Queuing Penalty (veh)	116	35			153	2			32	10

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	WB	SB
Directions Served	T	R
Maximum Queue (ft)	853	24
Average Queue (ft)	720	1
95th Queue (ft)	1114	10
Link Distance (ft)	800	280
Upstream Blk Time (%)	51	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)	42	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 670

Appendix D

FUTURE TRAFFIC CONDITIONS

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	804	19	6	246	178	0	0	2	495	3	281
Future Volume (veh/h)	265	804	19	6	246	178	0	0	2	495	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	865	20	7	286	207	0	0	3	527	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	503	881	747	95	674	572	72	0	337	550	5	535
Arrive On Green	0.12	0.47	0.47	0.01	0.36	0.36	0.00	0.00	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1403	16	1559
Grp Volume(v), veh/h	285	865	20	7	286	207	0	0	3	527	0	302
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1403	0	1575
Q Serve(g_s), s	9.6	45.9	0.7	0.3	11.6	9.6	0.0	0.0	0.2	34.1	0.0	15.6
Cycle Q Clear(g_c), s	9.6	45.9	0.7	0.3	11.6	9.6	0.0	0.0	0.2	34.3	0.0	15.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.99
Lane Grp Cap(c), veh/h	503	881	747	95	674	572	72	0	337	550	0	540
V/C Ratio(X)	0.57	0.98	0.03	0.07	0.42	0.36	0.00	0.00	0.01	0.96	0.00	0.56
Avail Cap(c_a), veh/h	561	881	747	155	674	572	72	0	337	550	0	540
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	25.8	14.0	26.0	24.0	23.3	0.0	0.0	21.7	34.5	0.0	26.7
Incr Delay (d2), s/veh	1.1	26.2	0.1	0.3	2.0	1.8	0.0	0.0	0.0	28.0	0.0	1.3
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	3.6	24.3	0.2	0.1	5.1	3.7	0.0	0.0	0.0	16.8	0.0	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	52.0	14.0	26.3	25.9	25.1	0.0	0.0	21.7	62.5	0.0	28.0
LnGrp LOS	B	D	B	C	C	C	A	A	C	E	A	C
Approach Vol, veh/h		1170			500			3			829	
Approach Delay, s/veh		42.9			25.6			21.7			50.0	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.6	53.4		40.0	17.8	42.2		40.0
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7
Max Green Setting (Gmax), s	* 4.1	* 44		* 34	* 15	* 33		* 34
Max Q Clear Time (g_c+I1), s	2.3	47.9		36.3	11.6	13.6		2.2
Green Ext Time (p_c), s	0.0	0.0		0.0	0.3	2.1		0.0

Intersection Summary	
HCM 6th Ctrl Delay	41.7
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	1196	419	15	5	15
Future Vol, veh/h	57	1196	419	15	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	62	1300	493	18	5	16

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	511	0	-	0	1917	493			
Stage 1	-	-	-	-	493	-			
Stage 2	-	-	-	-	1424	-			
Critical Hdwy	4.12	-	-	-	6.6	6.4			
Critical Hdwy Stg 1	-	-	-	-	5.6	-			
Critical Hdwy Stg 2	-	-	-	-	5.6	-			
Follow-up Hdwy	2.218	-	-	-	3.68	3.48			
Pot Cap-1 Maneuver	1054	-	-	-	66	541			
Stage 1	-	-	-	-	578	-			
Stage 2	-	-	-	-	203	-			
Platoon blocked, %		-	-	-					
Mov Cap-1 Maneuver	1054	-	-	-	62	541			
Mov Cap-2 Maneuver	-	-	-	-	119	-			
Stage 1	-	-	-	-	544	-			
Stage 2	-	-	-	-	203	-			

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	18.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1054	-	-	-	119	541
HCM Lane V/C Ratio	0.059	-	-	-	0.046	0.03
HCM Control Delay (s)	8.6	-	-	-	36.7	11.9
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.1

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	L	TR
Maximum Queue (ft)	270	664	154	66	254	191	43	503	532
Average Queue (ft)	187	414	21	6	118	56	3	330	152
95th Queue (ft)	322	711	100	39	207	134	23	528	467
Link Distance (ft)		623			464		242		622
Upstream Blk Time (%)		8							2
Queuing Penalty (veh)		0							0
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	14	39	0		10	0		4	1
Queuing Penalty (veh)	116	112	1		19	0		13	4

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	55	38	59
Average Queue (ft)	15	6	15
95th Queue (ft)	42	25	48
Link Distance (ft)		280	280
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50		
Storage Blk Time (%)	0		
Queuing Penalty (veh)	4		

Zone Summary

Zone wide Queuing Penalty: 268

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	265	804	19	6	246	178	0	0	2	495	3	281
Future Volume (veh/h)	265	804	19	6	246	178	0	0	2	495	3	281
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	1856	1856	1856	1856	1856	1856	1159	1159	1159	1856	1856	1856
Adj Flow Rate, veh/h	285	865	20	7	286	207	0	0	3	527	3	299
Peak Hour Factor	0.93	0.93	0.93	0.86	0.86	0.86	0.60	0.60	0.60	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	3	3	3	50	50	50	3	3	3
Cap, veh/h	503	881	747	95	674	572	72	0	337	548	3	726
Arrive On Green	0.12	0.47	0.47	0.01	0.36	0.36	0.00	0.00	0.34	0.34	0.34	0.34
Sat Flow, veh/h	1767	1856	1572	1767	1856	1572	668	0	982	1388	8	1572
Grp Volume(v), veh/h	285	865	20	7	286	207	0	0	3	530	0	299
Grp Sat Flow(s),veh/h/ln	1767	1856	1572	1767	1856	1572	668	0	982	1396	0	1572
Q Serve(g_s), s	9.6	45.9	0.7	0.3	11.6	9.6	0.0	0.0	0.2	34.1	0.0	12.6
Cycle Q Clear(g_c), s	9.6	45.9	0.7	0.3	11.6	9.6	0.0	0.0	0.2	34.3	0.0	12.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.99		1.00
Lane Grp Cap(c), veh/h	503	881	747	95	674	572	72	0	337	551	0	726
V/C Ratio(X)	0.57	0.98	0.03	0.07	0.42	0.36	0.00	0.00	0.01	0.96	0.00	0.41
Avail Cap(c_a), veh/h	561	881	747	155	674	572	72	0	337	551	0	726
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	0.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.1	25.8	14.0	26.0	24.0	23.3	0.0	0.0	21.7	34.6	0.0	17.9
Incr Delay (d2), s/veh	1.1	26.2	0.1	0.3	2.0	1.8	0.0	0.0	0.0	29.0	0.0	0.4
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	3.6	24.3	0.2	0.1	5.1	3.7	0.0	0.0	0.0	17.0	0.0	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.2	52.0	14.0	26.3	25.9	25.1	0.0	0.0	21.7	63.6	0.0	18.3
LnGrp LOS	B	D	B	C	C	C	A	A	C	E	A	B
Approach Vol, veh/h		1170			500			3			829	
Approach Delay, s/veh		42.9			25.6			21.7			47.3	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	53.4		40.0	17.8	42.2		40.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 44		* 34	* 15	* 33		* 34				
Max Q Clear Time (g_c+I1), s	2.3	47.9		36.3	11.6	13.6		2.2				
Green Ext Time (p_c), s	0.0	0.0		0.0	0.3	2.1		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	40.8
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	57	1196	419	15	5	15
Future Vol, veh/h	57	1196	419	15	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	85	85	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	62	1300	493	18	5	16

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	511	0	-	0	1917	493
Stage 1	-	-	-	-	493	-
Stage 2	-	-	-	-	1424	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	1054	-	-	-	66	541
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	203	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1054	-	-	-	62	541
Mov Cap-2 Maneuver	-	-	-	-	119	-
Stage 1	-	-	-	-	544	-
Stage 2	-	-	-	-	203	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	18.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1054	-	-	-	119	541
HCM Lane V/C Ratio	0.059	-	-	-	0.046	0.03
HCM Control Delay (s)	8.6	-	-	-	36.7	11.9
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.1	0.1

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	SB	SB
Directions Served	L	T	R	L	T	R	TR	LT	R
Maximum Queue (ft)	270	658	155	28	255	215	43	481	449
Average Queue (ft)	183	407	19	5	112	50	3	285	91
95th Queue (ft)	325	720	94	21	205	122	23	460	293
Link Distance (ft)		617			464		242		622
Upstream Blk Time (%)		8							0
Queuing Penalty (veh)		0							0
Storage Bay Dist (ft)	120		55	115		115		500	
Storage Blk Time (%)	12	37	0		9	0		1	0
Queuing Penalty (veh)	99	105	0		17	0		3	0

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	47	38	59
Average Queue (ft)	14	6	15
95th Queue (ft)	39	26	48
Link Distance (ft)		280	280
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	50		
Storage Blk Time (%)	0		
Queuing Penalty (veh)	3		

Zone Summary

Zone wide Queuing Penalty: 228

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	379	9	8	871	292	17	12	3	412	4	531
Future Volume (veh/h)	242	379	9	8	871	292	17	12	3	412	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	416	10	8	917	307	21	15	4	474	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	217	1007	853	476	869	736	72	409	109	459	4	449
Arrive On Green	0.08	0.53	0.53	0.01	0.46	0.46	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1404	13	1587
Grp Volume(v), veh/h	266	416	10	8	917	307	21	0	19	474	0	615
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1404	0	1600
Q Serve(g_s), s	8.1	13.2	0.3	0.2	46.1	12.8	0.0	0.0	0.8	27.5	0.0	28.3
Cycle Q Clear(g_c), s	8.1	13.2	0.3	0.2	46.1	12.8	28.3	0.0	0.8	28.3	0.0	28.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	1.00		0.99
Lane Grp Cap(c), veh/h	217	1007	853	476	869	736	72	0	518	459	0	453
V/C Ratio(X)	1.22	0.41	0.01	0.02	1.06	0.42	0.29	0.00	0.04	1.03	0.00	1.36
Avail Cap(c_a), veh/h	217	1007	853	535	869	736	72	0	518	459	0	453
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	30.1	13.9	10.9	14.3	26.9	18.0	50.0	0.0	26.0	38.4	0.0	35.9
Incr Delay (d2), s/veh	134.4	1.3	0.0	0.0	46.1	1.7	2.2	0.0	0.0	50.7	0.0	175.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	13.3	5.4	0.1	0.1	29.5	4.7	0.6	0.0	0.3	17.6	0.0	32.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	164.5	15.2	10.9	14.4	73.1	19.7	52.2	0.0	26.0	89.1	0.0	211.1
LnGrp LOS	F	B	B	B	F	B	D	A	C	F	A	F
Approach Vol, veh/h		692			1232			40			1089	
Approach Delay, s/veh		72.5			59.4			39.8			158.0	
Approach LOS		E			E			D			F	

Timer - Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	6.7	59.3		34.0	14.0	52.0		34.0
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7
Max Green Setting (Gmax), s	* 4.1	* 50		* 28	* 8.1	* 46		* 28
Max Q Clear Time (g_c+I1), s	2.2	15.2		30.3	10.1	48.1		30.3
Green Ext Time (p_c), s	0.0	2.5		0.0	0.0	0.0		0.0

Intersection Summary	
HCM 6th Ctrl Delay	97.3
HCM 6th LOS	F

Notes

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

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	833	1153	3	19	43
Future Vol, veh/h	8	833	1153	3	19	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	8	877	1281	3	21	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1284	0	-	0	2174	1281
Stage 1	-	-	-	-	1281	-
Stage 2	-	-	-	-	893	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	540	-	-	-	45	185
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	372	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	540	-	-	-	44	185
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	235	-
Stage 2	-	-	-	-	372	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	31.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	540	-	-	-	149	185
HCM Lane V/C Ratio	0.016	-	-	-	0.139	0.253
HCM Control Delay (s)	11.8	-	-	-	33	30.9
HCM Lane LOS	B	-	-	-	D	D
HCM 95th %tile Q(veh)	0	-	-	-	0.5	1

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	269	414	80	178	480	215	91	49	525	653
Average Queue (ft)	159	155	4	11	469	172	34	10	421	490
95th Queue (ft)	267	322	36	76	476	291	97	35	637	794
Link Distance (ft)		623			464		242	242		622
Upstream Blk Time (%)					28					23
Queuing Penalty (veh)					327					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	39	19			52	0			5	25
Queuing Penalty (veh)	153	47			155	3			28	104

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	EB	WB	WB	SB	SB
Directions Served	L	T	R	L	R
Maximum Queue (ft)	24	856	50	309	327
Average Queue (ft)	3	803	2	114	218
95th Queue (ft)	16	948	26	320	371
Link Distance (ft)		800		280	280
Upstream Blk Time (%)		57		23	51
Queuing Penalty (veh)		0		0	0
Storage Bay Dist (ft)	50		25		
Storage Blk Time (%)		45			
Queuing Penalty (veh)		1			

Zone Summary

Zone wide Queuing Penalty: 819

HCM 6th Signalized Intersection Summary
1: W Park Drive & Twelve Mile Road

10/23/2018

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	242	379	9	8	871	292	17	12	3	412	4	531
Future Volume (veh/h)	242	379	9	8	871	292	17	12	3	412	4	531
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	1885	1885	1885	1885	1885	1885	1900	1900	1900	1885	1885	1885
Adj Flow Rate, veh/h	266	416	10	8	917	307	21	15	4	474	5	610
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.80	0.80	0.80	0.87	0.87	0.87
Percent Heavy Veh, %	1	1	1	1	1	1	0	0	0	1	1	1
Cap, veh/h	253	1007	853	476	831	705	72	409	109	456	4	613
Arrive On Green	0.10	0.53	0.53	0.01	0.44	0.44	0.28	0.28	0.28	0.28	0.28	0.28
Sat Flow, veh/h	1795	1885	1598	1795	1885	1598	820	1445	385	1356	14	1598
Grp Volume(v), veh/h	266	416	10	8	917	307	21	0	19	479	0	610
Grp Sat Flow(s),veh/h/ln	1795	1885	1598	1795	1885	1598	820	0	1831	1371	0	1598
Q Serve(g_s), s	10.1	13.2	0.3	0.2	44.1	13.3	0.0	0.0	0.8	27.5	0.0	28.3
Cycle Q Clear(g_c), s	10.1	13.2	0.3	0.2	44.1	13.3	28.3	0.0	0.8	28.3	0.0	28.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.21	0.99		1.00
Lane Grp Cap(c), veh/h	253	1007	853	476	831	705	72	0	518	460	0	613
V/C Ratio(X)	1.05	0.41	0.01	0.02	1.10	0.44	0.29	0.00	0.04	1.04	0.00	0.99
Avail Cap(c_a), veh/h	253	1007	853	535	831	705	72	0	518	460	0	613
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	31.1	13.9	10.9	15.3	28.0	19.3	50.0	0.0	26.0	38.4	0.0	30.7
Incr Delay (d2), s/veh	70.3	1.3	0.0	0.0	63.3	2.0	2.2	0.0	0.0	53.4	0.0	34.8
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	10.9	5.4	0.1	0.1	32.4	4.9	0.6	0.0	0.3	17.9	0.0	19.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.3	15.2	10.9	15.3	91.3	21.3	52.2	0.0	26.0	91.8	0.0	65.5
LnGrp LOS	F	B	B	B	F	C	D	A	C	F	A	E
Approach Vol, veh/h		692			1232			40			1089	
Approach Delay, s/veh		48.2			73.3			39.8			77.1	
Approach LOS		D			E			D			E	

Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.7	59.3		34.0	16.0	50.0		34.0				
Change Period (Y+Rc), s	* 5.9	* 5.9		* 5.7	* 5.9	* 5.9		* 5.7				
Max Green Setting (Gmax), s	* 4.1	* 50		* 28	* 10	* 44		* 28				
Max Q Clear Time (g_c+I1), s	2.2	15.2		30.3	12.1	46.1		30.3				
Green Ext Time (p_c), s	0.0	2.5		0.0	0.0	0.0		0.0				

Intersection Summary	
HCM 6th Ctrl Delay	68.5
HCM 6th LOS	E

Notes

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

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	8	833	1153	3	19	43
Future Vol, veh/h	8	833	1153	3	19	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	50	-	-	25	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	90	90	92	92
Heavy Vehicles, %	2	2	2	2	20	20
Mvmt Flow	8	877	1281	3	21	47

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1284	0	-	0	2174	1281
Stage 1	-	-	-	-	1281	-
Stage 2	-	-	-	-	893	-
Critical Hdwy	4.12	-	-	-	6.6	6.4
Critical Hdwy Stg 1	-	-	-	-	5.6	-
Critical Hdwy Stg 2	-	-	-	-	5.6	-
Follow-up Hdwy	2.218	-	-	-	3.68	3.48
Pot Cap-1 Maneuver	540	-	-	-	45	185
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	372	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	540	-	-	-	44	185
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	235	-
Stage 2	-	-	-	-	372	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	31.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	540	-	-	-	149	185
HCM Lane V/C Ratio	0.016	-	-	-	0.139	0.253
HCM Control Delay (s)	11.8	-	-	-	33	30.9
HCM Lane LOS	B	-	-	-	D	D
HCM 95th %tile Q(veh)	0	-	-	-	0.5	1

Intersection: 1: W Park Drive & Twelve Mile Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	LT	R
Maximum Queue (ft)	266	366	46	106	479	215	69	49	498	567
Average Queue (ft)	136	129	3	8	471	180	24	11	303	313
95th Queue (ft)	236	273	26	59	481	292	59	37	501	585
Link Distance (ft)		617			464		242	242		622
Upstream Blk Time (%)					26					4
Queuing Penalty (veh)					305					0
Storage Bay Dist (ft)	120		55	115		115			500	
Storage Blk Time (%)	25	14			50	1			0	5
Queuing Penalty (veh)	98	35			152	7			0	23

Intersection: 2: Twelve Mile Road & Site Driveway

Movement	EB	WB	WB	SB	SB
Directions Served	L	T	R	L	R
Maximum Queue (ft)	34	853	50	269	311
Average Queue (ft)	4	782	2	101	214
95th Queue (ft)	20	1011	26	297	373
Link Distance (ft)		800		280	280
Upstream Blk Time (%)		53		23	58
Queuing Penalty (veh)		0		0	0
Storage Bay Dist (ft)	50		25		
Storage Blk Time (%)	0	43			
Queuing Penalty (veh)	1	1			

Zone Summary

Zone wide Queuing Penalty: 621

Appendix E

WARRANT SUMMARY

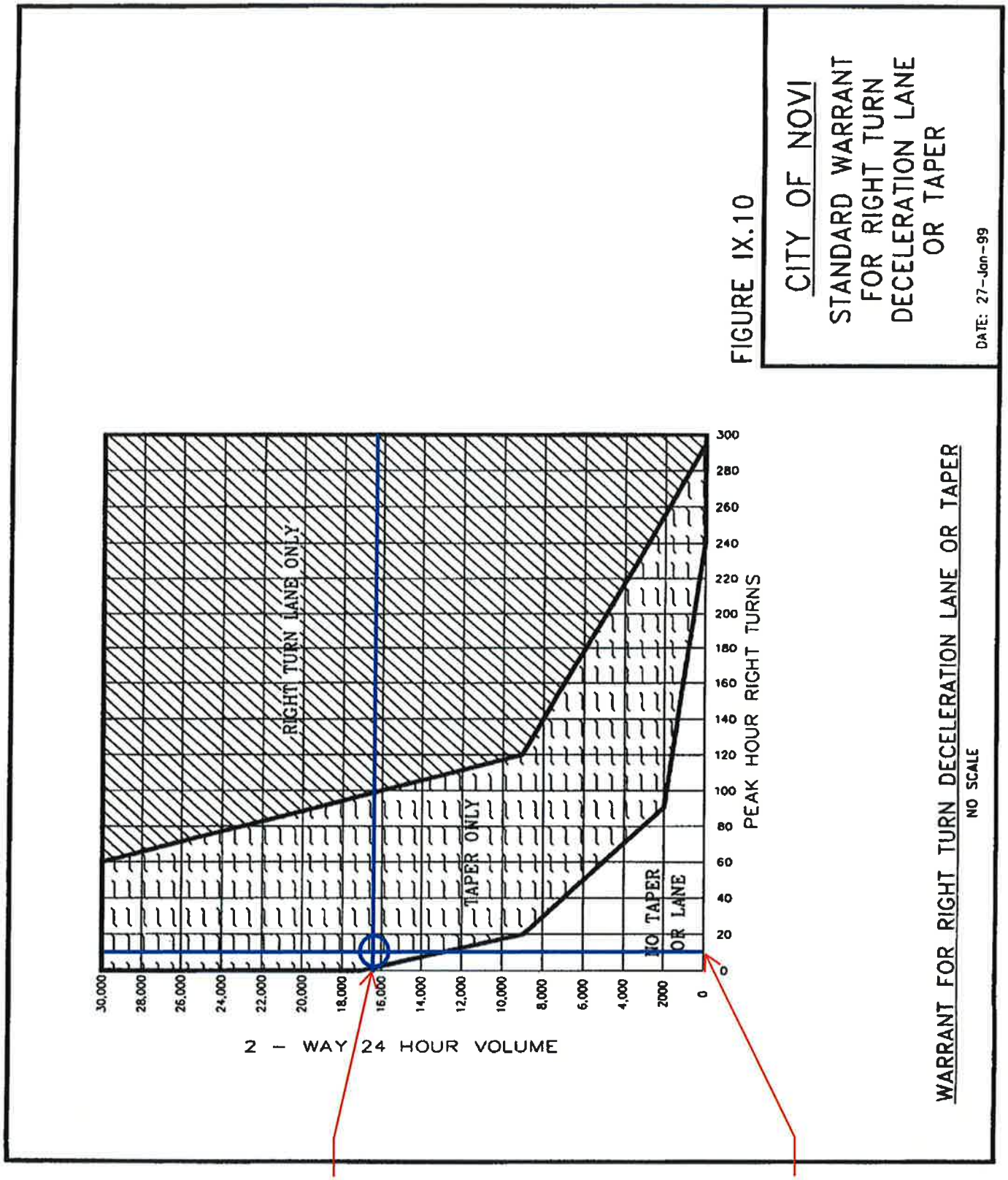


Figure IX.10

(Ord. No. 99-124.11, Pt. XXXIII, 7-26-99)