



**PLANNING COMMISSION
MEETING AGENDA
REGULAR MEETING**

500 W. Big Beaver
Troy, MI 48084
(248) 524-3364
www.troymi.gov
planning@troymi.gov

Donald Edmunds, Chair, Philip Sanzica, Vice Chair
Karen Crusse, Michael W. Hutson, Tom Krent
Thomas Strat and John J. Tagle

January 27, 2015

7:00 P.M.

Council Board Room

1. ROLL CALL
2. APPROVAL OF AGENDA
3. MINUTES – January 13, 2015
4. PUBLIC COMMENT – For Items Not on the Agenda
5. ZONING BOARD OF APPEALS (ZBA) REPORT
6. DOWNTOWN DEVELOPMENT AUTHORITY (DDA) REPORT
7. PLANNING AND ZONING REPORT

PRELIMINARY SITE PLAN REVIEW

8. PRELIMINARY SITE PLAN REVIEW (File Number SP 1002) – Proposed The Mark of Troy, Southeast corner of Maple and Axtell (2785 W Maple), Section 32, Currently Zoned IB (Integrated Industrial and Business) District

OTHER BUSINESS

9. PUBLIC COMMENT – Items on Current Agenda
10. PLANNING COMMISSION COMMENT

ADJOURN

NOTICE: People with disabilities needing accommodations for effective participation in this meeting should contact the City Clerk by e-mail at clerk@troymi.gov or by calling (248) 524-3317 at least two working days in advance of the meeting. An attempt will be made to make reasonable accommodations.

Chair Edmunds called the Regular meeting of the Troy City Planning Commission to order at 7:00 p.m. on January 13, 2015 in the Council Chamber of the Troy City Hall.

1. ROLL CALL

Present:

Karen Crusse
Donald Edmunds
Michael W. Hutson
Tom Krent
Philip Sanzica
Gordon Schepke
Thomas Strat
John J. Tagle

Also Present:

R. Brent Savidant, Planning Director
Allan Motzny, Assistant City Attorney
Kathy L. Czarnecki, Recording Secretary

2. APPROVAL OF AGENDA

Resolution # PC-2015-01-001

Moved by: Schepke
Seconded by: Sanzica

RESOLVED, To approve the Agenda as prepared.

Yes: All present (8)

MOTION CARRIED

3. APPROVAL OF MINUTES

Resolution # PC-2015-01-002

Moved by: Strat
Seconded by: Krent

RESOLVED, To approve the minutes of the December 9, 2014 Regular meeting as published.

Yes: All present (8)

MOTION CARRIED

4. PUBLIC COMMENTS – Items not on the Agenda

There was no one present who wished to speak.

PRELIMINARY SITE PLAN REVIEW

5. PRELIMINARY SITE PLAN REVIEW (File Number SP 1001) – Proposed Multi-Tenant Development, Northeast corner of Big Beaver and Talbot (335 E Big Beaver), Section 22, Currently Zoned BB (Big Beaver) District

Mr. Savidant reviewed the Preliminary Site Plan application. He specifically addressed:

- Project’s relationship with the Master Plan.
- Cross access easement to the east.
- Parking in the rear; 6 bicycle spaces.
- Landscaping/hardscape along Big Beaver.
- Extension of sidewalk from building to connect to parking.
- Transparency requirements.
- Confirmation that all plans are sealed as required.

Mr. Savidant said it is recommended to grant Preliminary Site Plan approval with the conditions as identified in the Carlisle Wortman Associates report dated January 8, 2015.

Present were Tim Ponton of Stonefield Engineering and Design; and Mark Ehgotz and John Galwaa of Saroki Architecture.

Samples of exterior building materials and colors were circulated.

There was discussion on:

- Exterior planters, benches, etc.
- Exterior sign panels; rain screen product.
- Barrier-free building access.
- Stormwater management.
- Exterior dining dimensions.
- Tenancy; restaurant and retail.
- Transparency requirements; enforcement.

Resolution # PC-2015-01-003

Moved by: Sanzica

Seconded by: Strat

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed Multi-Tenant Development, located on the northeast corner of Big Beaver and Talbot (335 E. Big Beaver), Section 22, within the BB (Big Beaver Form Based) District, be granted, subject to the following:

1. Confirm that any vegetation within the corner clearance is less than thirty (30) inches in height.
2. Add two (2) street trees along Big Beaver Road.
3. Extend sidewalk from building to the north through easement.
4. Provide material samples, swatches, or manufacturer’s specification sheets of the predominant proposed exterior materials and colors of all buildings and permanent structures, including walls and fences.

Yes: All present (8)

MOTION CARRIED

OTHER BUSINESS

6. **ELECTION OF OFFICERS FOR 2015**

Chair Edmunds opened the floor for nominations of Chair, Vice Chair and Zoning Board of Appeals Representative.

Mr. Krent nominated Donald Edmunds as Chair. Mr. Hutson supported the nomination. There were no further nominations placed on the floor.

Roll Call vote on the nomination on the floor.

Yes: All present (8)

MOTION CARRIED

Mr. Strat nominated Philip Sanzica for Zoning Board of Appeals Representative. Mr. Hutson supported the nomination. There were no further nominations placed on the floor.

Roll Call vote on the nomination on the floor.

Yes: All present (8)

MOTION CARRIED

Mr. Hutson nominated Philip Sanzica for Vice Chair. Mr. Strat supported the nomination. There were no further nominations placed on the floor.

Roll Call vote on the nomination on the floor.

Yes: All present (8)

MOTION CARRIED

Chair Edmunds announced that the Mayor nominated Padma Kuppa and Ollie Apahidean to serve on the Planning Commission to fill the term vacancy of Mr. Gottlieb and the term expiration of Gordon Schepke.

Chair Edmunds thanked Mr. Schepke for his dedicated service on the Board.

7. PUBLIC COMMENT – Items on Current Agenda

There was no one present who wished to speak.

8. PLANNING COMMISSION COMMENT

Mr. Savidant addressed the *Big Beaver Move Across Troy* project that was presented to City Council on January 12, 2015 and the Student Forum to be conducted for the Master Plan that is scheduled on January 19.

Members thanked Mr. Schepke for his service and wished him well in his future endeavors.

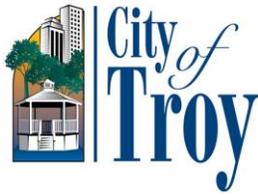
The Regular meeting of the Planning Commission adjourned at 7:39 p.m.

Respectfully submitted,

Donald Edmunds, Chair

Kathy L. Czarnecki, Recording Secretary

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PLANNING COMMISSION 2014 ANNUAL REPORT

The Michigan Planning Enabling Act requires that municipal planning commissions prepare an annual written report to the legislative body concerning operations and the status of planning activities undertaken during the calendar year. In accordance, the following information has been compiled:

PLANNING COMMISSION

In 2014 the Planning Commission consisted of Don Edmunds (Chair), Phil Sanzica (Vice Chair), Karen Crusse (who replaced Robert Schultz in April, 2014), Steve Gottlieb, Michael Hutson, Tom Krent, Gordon Schepke, Thomas Strat and John Tagle. The Student Representative was Frank Boudon.

Tom Krent was Zoning Board of Appeals (ZBA) Representative.

The Planning Commission held twenty-two (22) meetings during the year. There was one (1) joint Planning Commission/City Council meeting held on February 11, 2014.

Thomas Strat and Michael Hutson served on the Sustainable Design Review Committee.

Planning Commission Bylaws

The Planning Commission approved revisions to bylaws on April 8, 2014.

Planning Commission Training

City Attorney Lori Bluhm gave a training presentation to the Planning Commission on September 23, 2014. The two newest Planning Commission members (Karen Crusse and Steve Gottlieb) attended training session at the Michigan Association of Planning (MAP) Annual Conference.

MASTER PLAN UPDATE

The process for updating the Master Plan was ongoing in 2014. Planning Commission members attended the Real Estate Forum on April 29, 2014. This event gathered input from Troy stakeholders and helped to kick start the Master Plan update process. The Planning Commission held numerous meetings to discuss the Master Plan including the North Troy Study Area (June 24, 2014), the Rochester Road Study Area (July 22, 2014), the Maple Road Study Area (August 26, 2014) and the Demographics section (November 11, 2014). It is anticipated that the revisions to the Master Plan will be adopted in 2015.

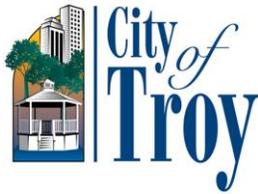


PLANNING COMMISSION 2014 ANNUAL REPORT

SITE PLAN REVIEWS

The Planning Commission considered the following applications in 2014:

Project	Description	PC Action
Poppleton Ridge Site Condominium	11 unit site condominium, South side of Big Beaver, East of Adams between Brooklawn and Wrenwood (3737 W Big Beaver), Section 30, Zoned R-1C	Granted Preliminary Site Plan Approval on March 11, 2014
SP 080-D	Walsh College Renovations and Addition, East side of Livernois, South of Wattles (3838 Livernois), Section 22, Zoned CF	Granted Preliminary Site Plan Approval on March 25, 2014
SU 412	Advanced Landscape & Builders Supply Inc., North side of Birchwood, East of Bellingham (1871 Birchwood), Section 26, Zoned IB	Granted Preliminary Site Plan Approval and Special Use Approval on April 8, 2014
SP 990	Belleclaire Condominiums, East side of Rochester, North of Wattles, South side of Lamb (part of 4210 Rochester Road), Section 14, Zoned RT	Granted Preliminary Site Plan Approval on April 8, 2014
SU 117-D	St. Mark Coptic Orthodox Church, West side of Livernois, South of Wattles (3603-3615 Livernois), Section 21, Zoned R-1B	Granted Preliminary Site Plan Approval and Special Use Approval on June 10, 2014
SP 994	Children's Hospital of Michigan, Northeast corner of Big Beaver Road and Civic Center Drive (350 W. Big Beaver), Section 21, Zoned BB	Granted Preliminary Site Plan Approval on June 24, 2014
SP 995	Field and Stream, East side of I-75, North of 14 Mile (750 W 14 Mile), Section 35, Zoned GB	Granted Preliminary Site Plan Approval on June 24, 2014
SP 998	Murray Plaza, West side of Rochester between Vanderpool and Trombley (3385 Rochester), Section 22, Zoned GB	Postponed by Planning Commission on September 23, 2014 due to noncompliance
SP 997	Kresge Foundation Headquarters Expansion, South side of Big Beaver, West of Coolidge (3215 W Big Beaver) Section 30, Zoned BB	Granted Preliminary Site Plan Approval on October 1, 2014
SP 1000	Penske Automotive Group Parking Lot Expansion, North side of Maple, West of Stephenson (1225 East Maple), Section 26, Zoned IB	Granted Preliminary Site Plan Approval on October 28, 2014



PLANNING COMMISSION 2014 ANNUAL REPORT

ZONING ORDINANCE AMENDMENTS

The Planning Commission considered the following amendment applications in 2014:

Amendment	Description	PC Action
Z 739	Zoning Ordinance Map Amendment, West of Rochester, South side of Colebrook (3545 Rochester Road), Section 22, Rezoned from R-1C to CB	Recommended approval on January 14, 2014
PUD 8-A	Revisions to Big Beaver Place Planned Unit Development, North side of Big Beaver, East of John R, Section 24, Zoned PUD #8	Application withdrawn by applicant after numerous meetings
ZOTA 247	Zoning Ordinance Text Amendment to create provisions regulating Oil and Gas Extraction	Planning Commission developed draft language at numerous meetings
CR 011	Conditional Rezoning, Amber Town Center Townhomes and Lofts, Northwest corner of Livernois and Town Center (3409 Livernois), Section 21, Rezoned from O to BB	Recommended approval to City Council on March 25, 2014



CITY COUNCIL REPORT

January 16, 2015

TO: Brian Kischnick, City Manager

FROM: Mark F. Miller, Director of Economic and Community Development
Glenn Lapin, Economic Development Specialist

SUBJECT: Economic Development Activity Update

General Market Activity

The City of Troy continued to see positive economic development activity in the fourth quarter of 2014.

According to CBRE, a leading international commercial real estate services company, **Troy's office vacancy rate in the 4Q of 2014 was 20.6%**. This compares to a 4Q 2013 office vacancy rate of about 23.8% and a 4Q 2012 office vacancy rate of 27%. The five-year office vacancy average is 25.1%. These rates all exclude the Kmart Headquarters which is functionally obsolete and is not being actively marketed for leasable office space.

Troy's industrial vacancy rate in the 4Q of 2014 was 4.5%. This compares to a 4Q 2013 industrial vacancy rate of about 6.2% and a 4Q 2012 industrial vacancy rate of about 7%. The five-year industrial vacancy average is 10.2%.

Troy's retail market vacancies remain low at 3.8% in the 4Q of 2014. The five-year retail vacancy average is 4.9%. Available retail sites along the prime Big Beaver corridor are limited. Potential opportunities for new Big Beaver retail development exist with the redevelopment of smaller, mature Big Beaver properties along with the out lot parking areas of larger Big Beaver office properties.

Although the methodology for calculating vacancy rates may vary between sources, the trend remains positive. The commercial brokers that focus on Troy have provided positive feedback on the level of activity they are continuing to see.

Recent Activity

Examples of recent economic development activity announced include the following:



CITY COUNCIL REPORT

Form G Tech – Form G Tech, a specialist in Carbide Header Tooling, purchased **1291 Rochester Road** for its expanding operations. This 53,000 square foot facility formerly housed Palmer Paint. Approximately 40 employees are expected to be located in the facility.

MSSC – MSSC, a division of Mitsubishi Steel Manufacturing, is a leading tier one supplier of automotive suspension components. The company plans to move its sales and technical center to a 20,000 square foot facility at **2040 Crooks**. Approximately 40 employees will be moving to the site in April of 2015.

Orbbec 3D International – Based in China, Orbbec 3D specializes in 3D measurement systems, sensors and artificial intelligence. The company is locating its new North American headquarters at **950 Stephenson Highway**. About 40 people are expected to be employed at the facility.

SMZ – SMZ is a branding and digital marketing company that has moved into its new 11,000 square foot Troy headquarters at **1200 Kirts**. The company employs approximately 40 people.

Stanley Engineered Fastening – This company, formerly known as Emhart Teknologies, provides fastening and assembly technologies for a variety of industries. Stanley Engineered Fastening is leasing 70,468 square feet of space at **2380, 2400 and 2500 Meijer Drive** in space formerly occupied by Faurecia.

Peter-Lacke USA – This international company, based in Germany, develops and produces paint and coating systems. Peter-Lacke USA will be locating its production and research facility at **865 Stephenson Highway** (former DuPont facility). The facility is expected to house approximately 27 employees initially. A spring 2015 opening is anticipated.

Primetime Testing – This mechanical testing lab for automotive interiors has located at **575 Robbins**. Approximately 20 employees are expected to work in this 9,000 square foot facility.

Tebis America – Germany-based Tebis AG, a provider of computer-aided design and manufacturing software for the die and mold industries worldwide, has relocated its U.S. headquarters to a 12,000-square-foot facility at **400 E. Big Beaver**, nearly twice the space of its previous location on Crooks Road. Tebis America has more than 20 employees with growth expected.



CITY COUNCIL REPORT

Innovative Learning Group – ILG is a training and performance improvement solutions company. The company will be moving its headquarters to a 10,000 square foot facility at **1130 Coolidge**. Occupancy is expected around the third quarter of 2015. The company employs approximately 15 people.

Sciometric Instruments – This Canadian-based company specializes in manufacturing data management, measurement and testing. Sciometric Instruments has located its U.S. Headquarters at **1409 Allen Road**. The company is expected to employ about 15 people in Troy with growth expected.

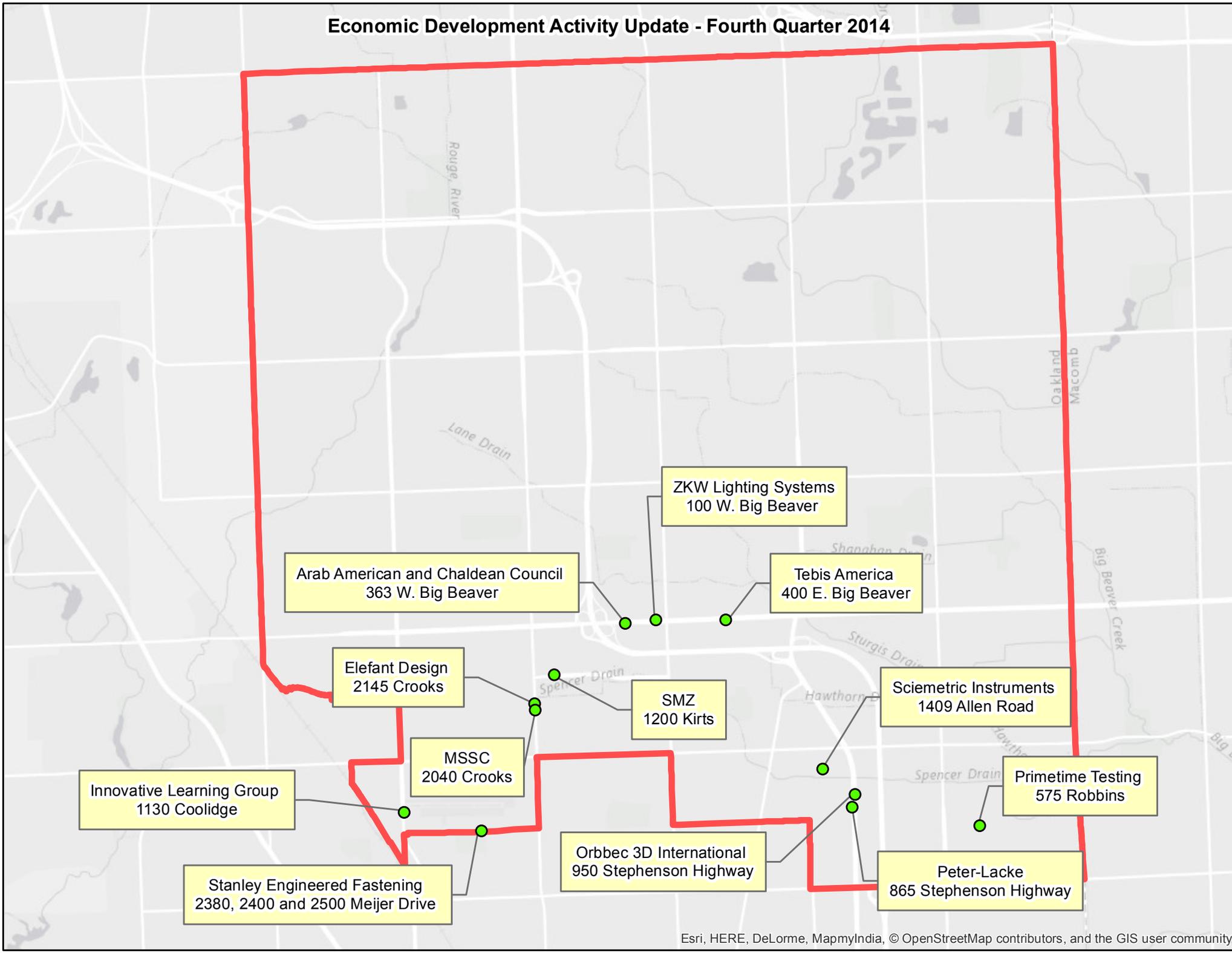
ZKW Lighting Systems – This Austria-based lighting technology company has leased about 4,000 square feet of space at **100 W. Big Beaver** for its first North American automotive lighting systems engineering office. The office will house eight employees initially. This international company has 5,200 employees worldwide.

Elefant Design – This design and marketing strategy company has selected **2145 Crooks** as its home. The office is located in a newly renovated building that will house a restaurant and other retailers and offices. The Elefant Design office will initially house 2 employees with growth expected.

Arab American and Chaldean Council – The ACC has moved its headquarters from Southfield to 11,000 square feet of space at **363 W. Big Beaver**. The ACC is the largest nonprofit human service organization serving the Middle-Eastern population in the United States. Over 80,000 clients are served each year.

As indicated in the above list, Troy continues to be a favored location for foreign based companies. Troy's central location is a hub for a wide range of industries including those specializing in advanced technology, financial services and automotive components. The types of companies based here, combined with quality of life factors such as first class retail, excellent schools and attractive neighborhoods, makes Troy a preferred location for not just foreign based companies but all companies interested in staying competitive in today's marketplace.

Economic Development Activity Update - Fourth Quarter 2014



DATE: January 22, 2015

TO: Planning Commission

FROM: R. Brent Savidant, Planning Director

SUBJECT: PRELIMINARY SITE PLAN REVIEW (File Number SP 1002) – Proposed The Mark of Troy, Southeast corner of Maple and Axtell (2785 W Maple), Section 32, Currently Zoned IB (Integrated Industrial and Business) District

The petitioner Schafer Development submitted the above referenced Preliminary Site Plan application for a proposed apartment complex at the southeast corner of Maple and Axtell.

The property is currently zoned IB (Integrated Industrial and Business) District. The Planning Commission is responsible for granting Preliminary Site Plan approval for this item.

The proposed development has been discussed conceptually by the Planning Commission on two occasions. The Planning Commission provided feedback that has been considered by the applicant.

The attached report prepared by Carlisle/Wortman Associates, Inc. (CWA), the City's Planning Consultant, summarizes the project. CWA prepared the report with input from various City departments including Planning, Engineering, Public Works and Fire. City Management supports the findings of fact contained in the report and the recommendations included therein.

Attachments:

1. Maps
2. Report prepared by Carlisle/Wortman Associates, Inc.

G:\SITE PLANS\SP 1002 The Mark of Troy Sec 32\SP-1002 PC Memo 01 27 2015.docx

PROPOSED RESOLUTION

PRELIMINARY SITE PLAN REVIEW (File Number SP 1002) – Proposed The Mark of Troy, Southeast corner of Maple and Axtell (2785 W Maple), Section 32, Currently Zoned IB (Integrated Industrial and Business) District

Resolution # PC-2015-01-

Moved by:

Seconded by:

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed The Mark of Troy, located on the southeast corner of Maple and Axtell (2785 W. Maple), Section 32, within the IB (Integrated Industrial and Business) District, be granted, subject to the following:

_____) or

(denied, for the following reasons: _____) or

(postponed, for the following reasons: _____)

Applicant shall resubmit a full set of plans which addressing the following:

1. Implement road improvements as required by the City and the RCOC.
2. Shift the two (2) buildings that front on Maple Road five (5) feet south from Maple Road to comply with 30-foot setback requirement.
3. If determined by the City and RCOC that Axtell Drive should be shifted to align with Axtell Drive across Maple Road, shift the Axtell Road buildings east by eight (8) feet to comply with 30-foot setback requirement.
4. Show 8-foot sidewalk on Maple Road.
5. Show concrete walk extension through the proposed drive approaches.
6. Show the gate on the northern most entrance on Axtell.
7. Provide planting details including bioswales, and a detail of the landscape bed along Maple Road
8. Resubmit lighting plan showing Axtell Road shift.

Yes:

No:

MOTION CARRIED/FAILED



Legend:

- Aerial
- Red: Band_1
 - Green: Band_2
 - Blue: Band_3

417 0 208 417 Feet

Scale 1: 2,500



Legend:

Form Based Zoning 2

- (PUD) Planned Unit Development
- (CF) Community Facilities District
- (EP) Environmental Protection District
- (BB) Big Beaver Road
- (MR) Maple Road
- (NN) Neighborhood Nodes (A-U)
- (CB) Community Business
- (GB) General Business
- (IB) Integrated Industrial Business District
- (O) Office Building District
- (OM) Office Mixed Use
- (P) Vehicular Parking District
- (R-1A) One Family Residential District
- (R-1B) One Family Residential District
- (R-1C) One Family Residential District
- (R-1D) One Family Residential District
- (R-1E) One Family Residential District
- (RT) One Family Attached Residential District
- (MF) Multi-Family Residential
- (MHP) Manufactured Housing
- (UR) Urban Residential
- (RC) Research Center District
- (PV) Planned Vehicle Sales

Aerial

- Red: Band_1
- Green: Band_2
- Blue: Band_3

417 0 208 417 Feet

Scale 1: 2,500

Date: January 20, 2015

Site Condominium Review For City of Troy, Michigan

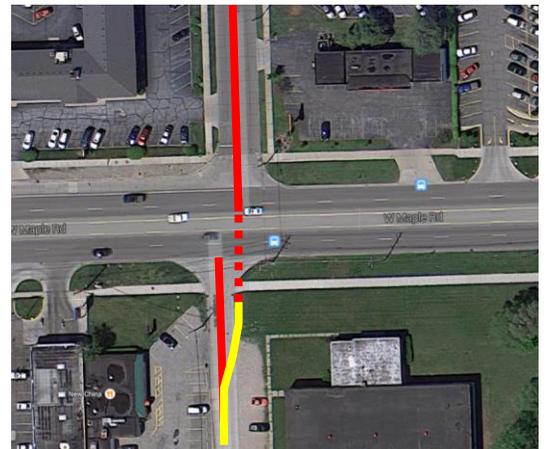
Applicant:	Schafer Development
Project Name:	The Mark of Troy
Location:	2785 W. Maple Road
Current Zoning:	IB, Integrated Industrial and Business District
Action Requested:	Site Plan Review

BACKGROUND

The Maple Road Apartments is a redevelopment of the 9-acre McGregor site at the southeast corner of Maple Road and Axtell Drive. The applicant is requesting approval to demolish the existing building and construct seven (7) apartment buildings, varying from thirty-two (32) to forty (40) apartment units each. The total number of proposed apartments is 248 dwelling units. The proposed buildings are five (5) stories. The site is zoned IB, Integrated Industrial and Business District. Multiple family dwelling is a permitted use in this district.

Axtell is currently not aligned on the north and south side of Maple Road. The traffic study includes a recommendation to align the northbound and southbound approaches of Axtell Drive.

The applicant has submitted two treatments of the Axtell Road and the Maple Road intersection. One plan, shown on Sheet C-206, shows Axtell Drive shifted to the west and widened to align with Axtell Drive on the other side of Maple Road. The other plans in the plan set show the Axtell Road in its current location with no proposed changes. After discussion with the City Traffic Engineer and based on the results of the traffic study, shifting of the Axtell Drive to align with Axtell Drive across Maple Road is



preferred. The applicant did not have time to change the complete plan set based on the findings of the traffic study and conversation with the Traffic Engineer.

If Axtell Drive is shifted, the (2) buildings on that front on Maple Road will be shifted to the south so that the 30-foot setback requirement on Axtell Drive is maintained.

Location of Subject Property:



Size of Subject Property:

The parcel is 8.23 acres in area:

Proposed Uses of Subject Parcel:

252 dwelling units apartment complex

Current Use of Subject Property:

The subject property is currently vacant. Was a former manufacturing facility.

Current Zoning:

IB, Integrated Industrial and Business District

Surrounding Property Details:

Direction	Zoning	Use
North	Maple Road Form Based Business	Commercial
South	IB, Integrated Industrial and Business	Warehouse/light industrial
East	IB, Integrated Industrial and Business	Office
West	Maple Road Form Based Business/ IB, Integrated Industrial and Business	Restaurant, warehouse/light industrial

The applicant has revised their concept plan to incorporate recommendations made by the Planning Commission. The significant changes to the plan since the last Planning Commission review:

- Eliminated the Maple Road access point, which is endorsed by the City Traffic Engineer. All site access will be via Axtell Drive.
- Submitted a traffic study. Findings of traffic study.
 - Install a traffic signal at the intersection of Maple Road and Axtell Drive
 - Align the northbound and southbound approaches of Axtell Drive
 - Provide two lanes on the northbound approach of Axtell Drive
- Rearranged the interior courtyard area with pool, pavilion, and clubhouse.
- Submitted revised elevations.
- Revised streetscape along Maple and Axtell.
- Provided bioswale along southern and eastern property line.

SITE ARRANGEMENT

The seven (7) apartment buildings are arranged around a central courtyard. Access to the site is via two (2) curb cuts on Axtell Drive. The applicant has moved two (2) buildings parallel to Axtell and two (2) buildings parallel to Maple Road to frame both streets. This creates a consistent street wall and allows for the installation of an urban streetscape.

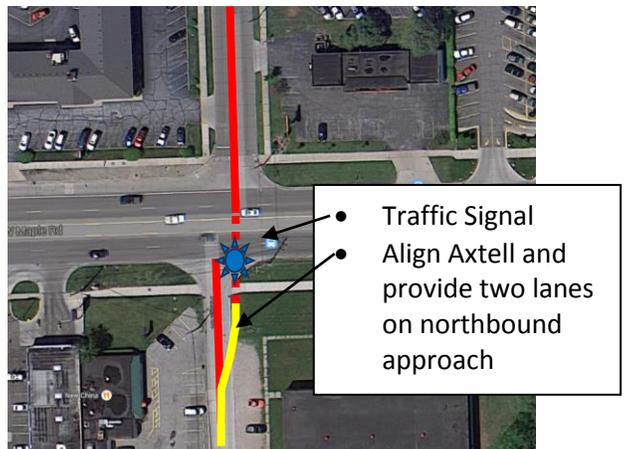
Items to be Addressed: *None*

TRAFFIC STUDY

The applicant has submitted a traffic study. The study has three major recommendations:

- Install a traffic signal at the intersection of Maple Road and Axtell Drive.
- Shift Axtell Drive to the east to align the northbound and southbound approaches of Axtell Drive.
- Provide two lanes on the northbound approach of Axtell Drive.

The applicant has a meeting Friday, January 23rd with City and Road Commission of Oakland County to discuss the



required road improvements. We will update the Commission regarding results of Friday’s meeting.

Items to be Addressed: *Implement road improvements as required by the City and the RCOC.*

AREA, WIDTH, HEIGHT, SETBACKS

As noted, the site plan shows two treatments of the Axtell Drive and the Maple Road intersection. Sheet 206 is the only plan that shows the Axtell Drive shifted and Sheet 206 is only a partial plan of the site. If the shifting Axtell Drive is required by the Traffic Engineer and the RCOC, the applicant will need to submit a full set of plans showing the road shift on all sheets.

The requirements and the proposed dimensions are as follows:

	<u>Required:</u>	<u>Provided:</u>	<u>Compliance:</u>
Front (Maple)	30 feet	25 feet	Does not comply. Applicant notes that they will shift the Maple Road buildings back by five (5) feet.
Front (Axtell)	30 feet	22 feet (With Axtell shifted) 32 feet (if Axtell is not shifted)	Does not comply. Applicant notes that if Axtell Drive has to shift they will shift the Maple Road buildings south by eight (8) feet.
Rear	20 feet	24 feet	Complies
Side	10 feet	Over 10 feet	Complies
Maximum Lot Area Covered by Buildings	40%	25%	Complies

Items to be addressed: *1). Shift the two (2) buildings that front on Maple Road five (5) feet away from Maple Road to comply with 30-foot setback; 2). If determined by the City and RCOC that Axtell Drive should be shifted to align with Axtell Drive across Maple Road, shift the Axtell Road buildings east to comply with 30-foot setback.*

SITE ACCESS AND CIRCULATION

The development is accessed off Axtell Drive. The applicant proposes to control access of the site with gates, which will remain open during the day and close at night. At night, visitors will either have a passcode or be buzzed in by resident. Though not common there are a few gated residential developments in Troy. The gates will be reviewed internally to ensure public safety access.

Internal access is provided by a grid layout circulation pattern. In regards to pedestrian access and circulation, the applicant will need to install an 8-foot wide concrete sidewalk on W. Maple Road and extend the concrete sidewalk through the proposed drive approaches.

Items to be addressed: 1). Show 8-foot sidewalk on Maple Road; 2). Show concrete walk extension through the proposed drive approaches; and 3). Show the gate on the northern most entrance on Axtell Drive.

LANDSCAPING

The applicant has submitted a conceptual landscape plan:

	<u>Required:</u>	<u>Provided:</u>	<u>Compliance:</u>
Maple Road	One evergreen tree for every 50 lineal feet. feet = 10 trees	21	Compliant
Axtell Road	One evergreen tree for every 50 lineal feet. feet = 14 trees	24	Compliant
<u>Parking Lot Screening:</u> Screened via three (3) foot berm or approved landscaping or screen wall.	Southern and Western Property Line: Berm or approved landscape or screen wall	Trees and Bioswale	Complies with Planning Commission approval
Site Landscaping	15%	Over 20%	Complaint

The applicant is proposing bioswales along the southern and western property line. The applicant should provide plants of sufficient height in the bioswales to help screen the parking lot.

The applicant has provided planting calculations however has not provided species. The applicant should provide planting details including bioswales, and a detail of the landscape bed along Maple Road.

Items to be Addressed: Provide planting details including bioswales, and a detail of the landscape bed along Maple Road

PHOTOMETRICS

The applicant is proposing:

Type	Location	Number	Height off Ground
Pedestrian Pole Mounted	Along Maple Road and Axtell Road and along building perimeters.	96	15 feet
Parking Lot Pole Mounted Lights	Within and along parking lots	25	20 feet

The light fixtures and photometrics meet ordinance.

The photometric plan will have to be amended to reflect the shifting of Axtell Road.

Items to be Addressed: *Resubmit lighting plan showing Axtell Road shift*

STORMWATER DETENSION and UTILITIES

The applicant is proving bioswales along the southern and western property line. In addition, the applicant will provide underground detention. Utility details including a utility easement along Axtell is required to be provided by the applicant.

Items to be Addressed: *None*

RECOMMENDATIONS

We support the conceptual development of this site, and find that the plan and development details are consistent with the vision of the Maple Road. The development of this site could serve as a catalyst for future redevelopment along Maple Road.

However, we cannot recommend Preliminary Site Plan approval until we review a full set of plans that include the shifting of Axtell Drive. We recommend that the applicant resubmit a full set of plans including landscaping and lighting, which addressing the following:

1. *Implement road improvements as required by the City and the RCOC.*
2. *Shift the two (2) buildings that front on Maple Road five (5) feet away from Maple Road to comply with 30-foot setback.*
3. *If determined by the City and RCOC that Axtell Drive should be shifted to align with Axtell Drive across Maple Road, shift the Axtell Road buildings east by eight (8) feet.*
4. *Show 8-foot sidewalk on Maple Road.*
5. *Show concrete walk extension through the proposed drive approaches.*
6. *Show the gate on the northern most entrance on Axtell.*
7. *Provide planting details including bioswales, and a detail of the landscape bed along Maple Road*
8. *Resubmit lighting plan showing Axtell Road shift.*

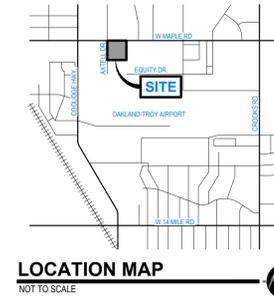


CARLISLE/WORTMAN ASSOC., INC.
Benjamin R. Carlisle, LEED AP, AICP

Cc:

PRELIMINARY SITE PLAN FOR THE MARK OF TROY

CITY OF TROY, OAKLAND COUNTY, MICHIGAN



LOCATION MAP
NOT TO SCALE

NEDERVELD
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Ann Arbor, MI 48103
Phone: 734.929.6963
CHICAGO
COLUMBUS
GRAND RAPIDS
HOLLAND
INDIANAPOLIS
ST. LOUIS

PREPARED FOR:

Schafer Development
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Phone: 248.932.7500

REVISIONS:

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DESIGN TEAM CONTACTS

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ENGINEER/SURVEYOR
Nederveld
3025 Miller Rd.
Ann Arbor, MI 48103
Phone: 734.929.6963

PROJECT SUMMARY

PROJECT DESCRIPTION

- THE PROJECT SITE (48.23 ACRES, T1N 20-32-126-001) IS LOCATED AT THE CORNER OF WEST MAPLE AND AXTELL DRIVE, IN THE CITY OF TROY, MICHIGAN.
- THE EXISTING BUILDINGS AND SITE FEATURES WILL BE DEMOLISHED.
- THE PROPOSED PROJECT INCLUDES THE CONSTRUCTION OF SEVEN (7) MULTIFAMILY UNIT BUILDINGS CONSISTING OF 248 TOTAL UNITS ALONG WITH A CLUB HOUSE/POOL & COMMON AREA, SERVICED BY ASPHALT PARKING LOTS WITH ACCESS TO AXTELL DRIVE, UTILITY CONNECTIONS TO CITY OF TROY PUBLIC UTILITIES, LANDSCAPING, AND SITE LIGHTING.
- TWO (2) NEW CURB CUTS ARE PROPOSED ALONG AXTELL DRIVE.
- NO ACCESS IS PROPOSED TO WEST MAPLE ROAD.
- ALL IMPROVEMENTS ARE PROPOSED TO BE CONSTRUCTED IN ONE PHASE.

COMMUNITY IMPACT

- THE PROPOSED DEVELOPMENT WILL PROVIDE AN INCREASED TAX BASE WITH NO ANTICIPATED NEGATIVE IMPACTS TO THE SCHOOL DISTRICT.
- THE PROPOSED DEVELOPMENT WILL HAVE NO SIGNIFICANT IMPACT ON AIR OR WATER QUALITY.
- A TRAFFIC IMPACT STUDY IS CURRENTLY UNDERWAY AND WILL BE PROVIDED TO THE CITY FOR REVIEW AND APPROVAL ONCE COMPLETE.

SITE ANALYSIS

- THE USDA NATURAL RESOURCES CONSERVATION SERVICE INDICATES THAT THE PREDOMINANT SOIL TYPE ON-SITE IS UDIPSAMMENTS, UNDULATING. THIS SOIL TYPE IS RATED IN HYDROLOGIC SOIL GROUP A. THE PERMEABILITY OF THIS SOIL IS VERY GOOD.
- THE SITE IS LOCATED OUTSIDE THE 100-YEAR FLOODPLAIN.
- THERE ARE NO EXISTING WETLANDS LOCATED ON SITE.

STORM WATER MANAGEMENT

STORM WATER RUNOFF GENERATED BY SITE IMPROVEMENTS WILL BE TREATED ON-SITE, IN ACCORDANCE WITH THE OAKLAND COUNTY WATER RESOURCE COMMISSIONERS STANDARDS. THE PROPOSED STORM WATER MANAGEMENT FACILITIES WILL OUTLET TO THE EXISTING STORM SEWER LOCATED IN W MAPLE ROAD.

SANITARY SEWER SERVICE

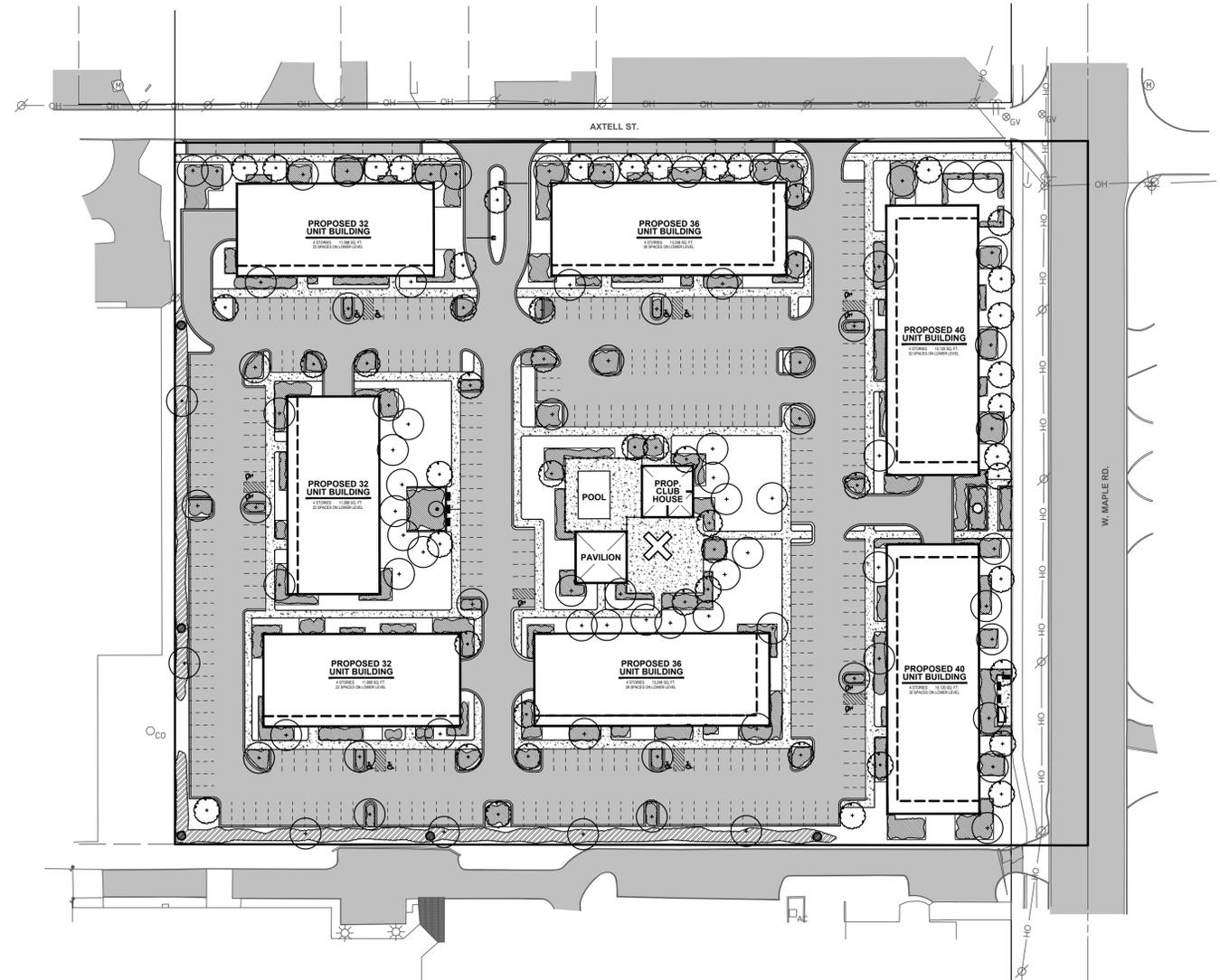
THE PROPOSED BUILDINGS WILL BE SERVICED BY PUBLIC SANITARY SEWER. THE EXISTING PUBLIC SANITARY SEWER LOCATED IN AXTELL ROAD WILL BE EXTENDED NORTH ALONG AXTELL ROAD AND ONTO THE SITE. 6" SEWER SERVICE LEADS WILL BE PROVIDED TO EACH BUILDING.

WATER SERVICE

THE PROPOSED BUILDINGS WILL BE SERVICED BY PUBLIC WATER MAIN. THE EXISTING PUBLIC WATER MAIN LOCATED IN AXTELL ROAD AND ALONG THE SOUTH SIDE OF W MAPLE ROAD WILL BE LOOPED THROUGH THE PROPOSED SITE. FIRE HYDRANTS WILL BE PROVIDED WITHIN 100 FT OF EACH PROPOSED BUILDING. 4" SERVICE LEADS WILL BE PROVIDED TO EACH BUILDING FOR DOMESTIC SERVICE AND FIRE PROTECTION.

FRANCHISE UTILITIES

THE EXISTING FRANCHISE UTILITIES CURRENTLY SERVICE THE SITE. NEW SERVICE CONNECTIONS WILL BE COORDINATED WITH THE FRANCHISE UTILITY COMPANIES.



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SITE DATA

- ZONING OF PROPERTY: I-B INTEGRATED INDUSTRIAL AND BUSINESS DISTRICT
I-B ZONING REQUIREMENTS:
 - A) MINIMUM LOT AREA = N/A
 - B) MINIMUM LOT WIDTH = N/A
 - C) MAXIMUM LOT COVERAGE = 40%
 SETBACKS:
 - A) FRONT YARD = 30 FT.
 - B) SIDE YARD = 10 FT.
 - C) REAR YARD = 20 FT.
- SUMMARY OF LAND USE:
 - A) TOTAL ACREAGE = 8.23 ACRES (358,366 SQ. FT.) (EXCLUDING R.O.W.)
 - B) NUMBER OF UNITS = 248 UNITS
 - C) AREA OF PROPOSED BUILDINGS = 90,000 SQ. FT.
 - D) BUILDING HEIGHT = APPROX. 50 FT.
 - E) LOT COVERAGE = 25%
 - F) GROSS PAVEMENT AREA = APPROX. 122,351 SQ. FT.
 - G) GROSS CONCRETE AREA = APPROX. 34,029 SQ. FT.
 - H) ZONING OF PARCELS TO NORTH AND WEST = I-B - MAPLE ROAD
ZONING OF PARCELS TO SOUTH AND EAST = I-B - INTEGRATED INDUSTRIAL BUSINESS DISTRICT
- PARKING REQUIREMENTS:
 - A) MINIMUM REQUIRED SPACE PER CITY = 9.5x19' (24' AISLE) (17' LONG SPACE WHEN ABUTTING 7' WALK)
 - B) TYPICAL PARKING SPACE PROVIDED = 9.5x19' (24' AISLE)
 - C) TYPICAL BARRIER FREE SPACE = 13'x20'
 - D) NUMBER OF SPACES REQUIRED = 2 SPACES PER EACH DWELLING UNIT (BASED ON TOWNSHIP REQUIREMENTS)
 - E) NUMBER OF SPACES PROVIDED = 496 SPACES
 - F) NUMBER OF SPACES PROVIDED = 186 UNDERGROUND SPACES
317 SURFACE SPACES
503 TOTAL SPACES
- THIS PROJECT IS NOT LOCATED IN THE 100 YEAR FLOOD PLAIN, BASED ON THE NATIONAL FLOOD INSURANCE PROGRAM RATE MAPS.
- BEST MANAGEMENT PRACTICES WILL BE UTILIZED DURING AND AFTER CONSTRUCTION OF THE PROJECT. MEASURES WILL INCLUDE THE USE OF SEEDING AND MULCHING, SEDIMENT INLET FILTERS, COMPACTION AND PAVING. THE OWNER OF THE SUBJECT PARCEL SHALL HAVE THE RESPONSIBILITY TO MAINTAIN THE PERMANENT SOIL EROSION PROTECTION MEASURES.
- UTILITIES SHOWN ARE APPROXIMATE LOCATIONS DERIVED FROM ACTUAL MEASUREMENTS OR AVAILABLE RECORDS. THEY SHOULD NOT BE INTERPRETED TO BE EXACT LOCATIONS NOR SHOULD IT BE ASSUMED THAT THEY ARE THE ONLY UTILITIES IN THIS AREA.
- CONTRACTOR TO FIELD VERIFY ALL INVERTS.
- ALL LIGHTING SHALL BE SHIELDED FROM ALL ADJACENT PROPERTIES. PROPOSED LIGHTING SHALL CONSIST OF WALL-MOUNTED LIGHTS AND LIGHT POLES, BOTH FITTED WITH SHOEBOX TYPE FIXTURES.
- THE PERMANENT PARCEL NUMBER FOR THE SITE IS 20-32-126-001. THE ADDRESS OF THE PROPERTY IS 2785 W. MAPLE RD.
- THERE IS CURRENTLY A VACANT HOUSE ON THE PARCEL. THE EXISTING HOUSE WILL BE DEMOLISHED AS PART OF THIS PROJECT.
- NO FENCES OR WALLS OTHER THAN WHAT IS SHOWN ON THE SITE PLAN ARE PROPOSED AT THIS TIME.

TITLE DESCRIPTION

The Land referred to in this Commitment, situated in the County of Oakland, City of Troy, State of Michigan, (Provided by First American Title Insurance Company) is described as follows:

The West 12 acres of the East 40 acres of the North 60 acres of the Northwest 1/4 of Section 32, Town 2 North, Range 11 East, City of Troy, Oakland County, Michigan, Except the south 275 feet thereof and Except the North 60.00 feet which was deeded for road.

Also referred to as:

Part of the Northwest 1/4 of Section 32, T2N, R11E, City of Troy, Oakland County, Michigan, described as beginning at a point located on the North Line of said section 32 distant N 90°00'00" E, 889.28 feet from the Northwest corner of said Section 32; thence S 00°06'04" E, along the Eastern line of Maple Cooledge Estates, as recorded in Liber 47 of plans, Page 51, Oakland County Records; 714.46 feet; thence N 89°59'22" E, 546.65 feet; thence N 00°04'05" E, 714.36 feet to the North line of said Section 32; thence S 90°00'00" W, along said North line, 548.76 feet to the point of beginning. Parcel contains 8.98 acres of land. Subject to the rights of the public in Maple Road.

THE MARK OF TROY
Cover Sheet
2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R11E,
CITY OF TROY, OAKLAND COUNTY, MICHIGAN

STAMP:

PROJECT NO:
14500172

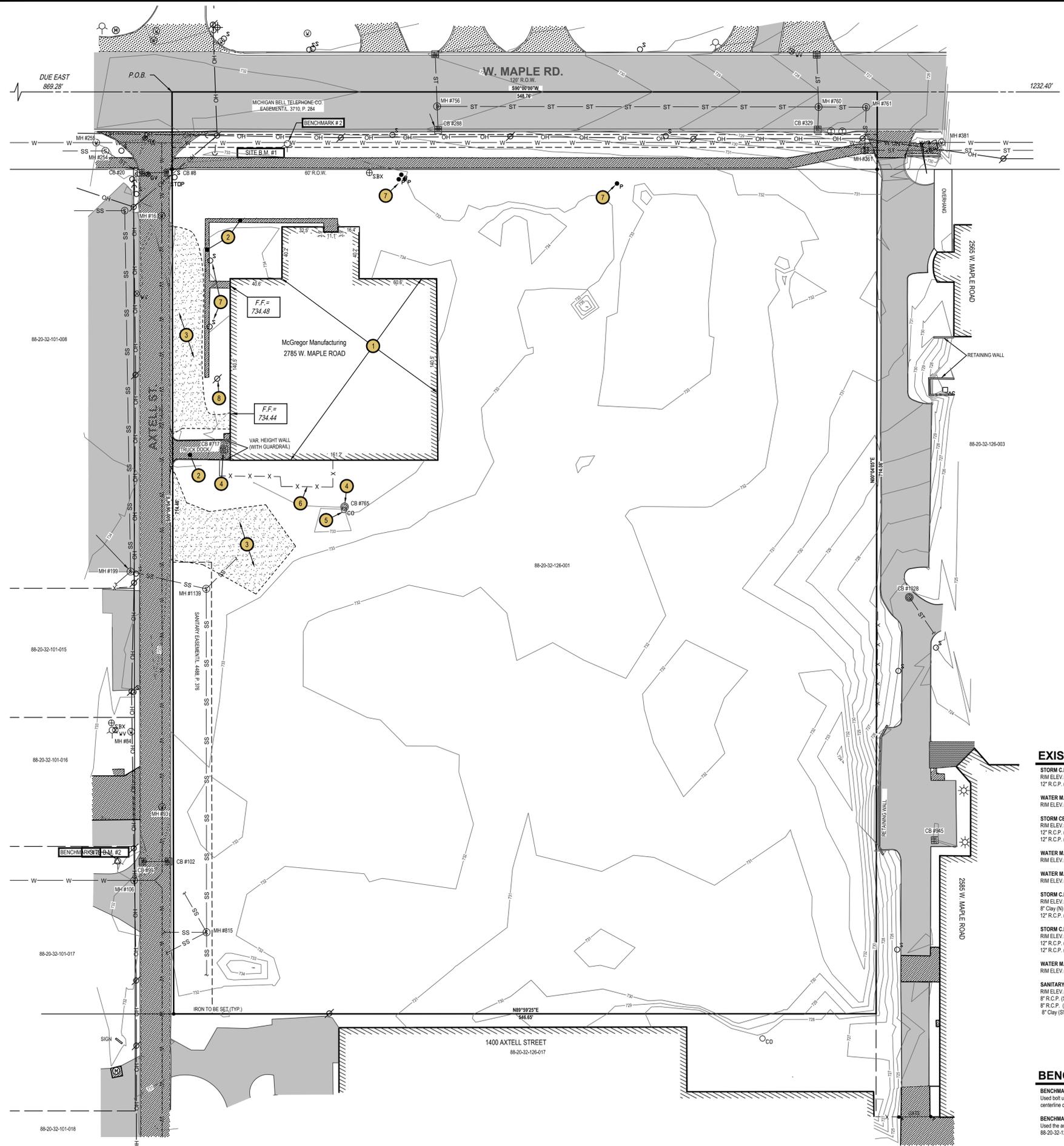
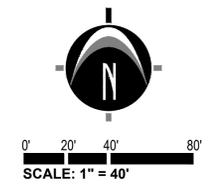
SHEET NO:
C-100

SHEET: 1 OF 11

PREPARED FOR:
 Schafer Development
 Steve Schafer
 29800 Middlebelt Rd. Suite 150
 Farmington Hills, MI 48334
 Phone: 248.932.7500

REVISIONS:

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Drawn: GAN	Checked: JVR
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REMOVAL / DEMOLITION NOTES

- | | |
|-----------------------------------|--------------------------------|
| 1 REMOVE EXISTING BUILDING | 8 REMOVE EXISTING UTILITY POLE |
| 2 REMOVE EXISTING CONCRETE | 9 |
| 3 REMOVE EXISTING GRAVEL | 10 |
| 4 REMOVE EXISTING STORM STRUCTURE | 11 |
| 5 REMOVE EXISTING CLEAN OUT | 12 |
| 6 REMOVE EXISTING FENCE | 13 |
| 7 REMOVE EXISTING POST/SIGN | 14 |

EXISTING STRUCTURE LEGEND

STORM C.B. #8 RIM ELEV.=732.28 12" R.C.P. (W) INV.=728.58 RIM ELEV.=732.82	SANITARY M.H. #254 RIM ELEV.=733.14 12" W. INV.=726.72 12" S.E. INV.=727.98	STORM M.H. #760 RIM ELEV.=727.80 12" Conc. (N) INV.=720.40 12" Conc. (S) INV.=720.60 12" Conc. (E) INV.=720.30 12" Conc. (W) INV.=720.40
WATER M.H. #16 RIM ELEV.=732.82	WATER M.H. #255 RIM ELEV.=732.97	STORM M.H. #761 RIM ELEV.=727.18 12" Conc. (W) INV.=719.28 12" Conc. (S) INV.=719.28
STORM C.B. #20 RIM ELEV.=732.21 12" R.C.P. (E) INV.=726.72 12" R.C.P. (NW) INV.=727.98	STORM C.B. #288 ELEV.=730.99 12" R.C.P. (W) INV.=728.58	STORM C.B. #765 RIM ELEV.=734.29 (FULL OF DEBRIS)
WATER M.H. #84 RIM ELEV.=732.60 12" R.C.P. (N) INV.=721.22	STORM C.B. #329 RIM ELEV.=727.15 12" R.C.P. (N) INV.=721.22	SANITARY M.H. #815 RIM ELEV.=732.36 18" ST. (S) INV.=722.67 10" ST. (N) INV.=723.26 12" Conc. (NW) INV.=725.31 12" Conc. (W) INV.=723.26 8" P.V.C. (SW) INV.=723.91
WATER M.H. #93 RIM ELEV.=732.26	STORM M.H. #361 RIM ELEV.=727.80 15" Conc. (N) INV.=718.42 18" Conc. (E) INV.=718.30	STORM C.B. #945 RIM ELEV.=722.95
STORM C.B. #99 RIM ELEV.=731.68 8" Clay (N) INV.=728.53 12" R.C.P. (E) INV.=727.38	WATER M.H. #361 RIM ELEV.=727.74 12" C.I. (E & W) INV.=721.82	STORM C.B. #1028 RIM ELEV.=724.46 12" Conc. (SE) INV.=721.66
STORM C.B. #102 RIM ELEV.=731.74 12" R.C.P. (S) INV.=726.99 12" R.C.P. (W) INV.=726.44	STORM C.B. #717 RIM ELEV.=730.12 (NOT ACCESSIBLE)	SANITARY M.H. #1139 RIM ELEV.=733.20 6" P.V.C. (NE) INV.=726.34 8" Clay (NW) INV.=724.70 10" ST. (S) INV.=724.60
WATER M.H. #106 RIM ELEV.=731.98	STORM M.H. #756 RIM ELEV.=731.46	
SANITARY M.H. #199 RIM ELEV.=733.69 8" R.C.P. (SE) INV.=726.70 8" Clay (N) INV.=726.70 8" Clay (SW) INV.=727.56	STORM M.H. #199 RIM ELEV.=727.36 12" Conc. (E) INV.=727.66	

LEGEND

AC	Air Conditioner	⊕	Telephone Manhole
△	Benchmark	⊕	Utility Pole
○	Catch Basin - Round	⊕	Water Manhole
□	Catch Basin - Square	⊕	Water Valve
○	Cleanout	⊕	Miscellaneous/Unknown
○	Deciduous Tree	— OE —	Overhead Electric
○	Evergreen Tree	— OH —	Overhead Utility
⊕	Guy Anchor	— SS —	Sanitary
⊕	Hydrant	— ST —	Storm
•	Iron - Set	— W —	Watermain
○	Iron - Found	— X — X —	Fence
⊕	Light Pole	—	Tree
⊕	Manhole	▒	Asphalt
⊕	Post	▒	Concrete
⊕	Sign	▒	Gravel
⊕	Sanitary Sewer Manhole	▒	Building
⊕	Stormwater Manhole		

BENCHMARKS

BENCHMARK #1 ELEV.=734.34 (NAV088)
 Used both under "E" on the hydrant located 40' South of the centerline of Maple Road and 100' East of the centerline of Axtell Street.

BENCHMARK #2 ELEV.=734.58 (NAV088)
 Used the arrow on the hydrant located 42' West and 118' North of the Southwest property corner of parcel 88-20-32-126-001.

811 Know what's below.
 CALL before you dig.

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NOTE: EXISTING UTILITIES AND SERVICE LINES IDENTIFIED AS "PLANS" WERE OBTAINED FROM AVAILABLE CITY AS-BUILT RECORD DRAWINGS. THE CONTRACTOR SHALL VERIFY THE LOCATION, DEPTH AND STATUS OF ALL UTILITIES AND SERVICE LINES PRIOR TO NEW CONNECTIONS.

THE MARK OF TROY
Existing Conditions / Demolition Plan
 2785 W. Maple Road
 PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R1E,
 CITY OF TROY, OKLAND COUNTY, MICHIGAN

STAMP:

PROJECT NO:
14500172

SHEET NO:
C-201

SHEET: 2 OF 11

PREPARED FOR:

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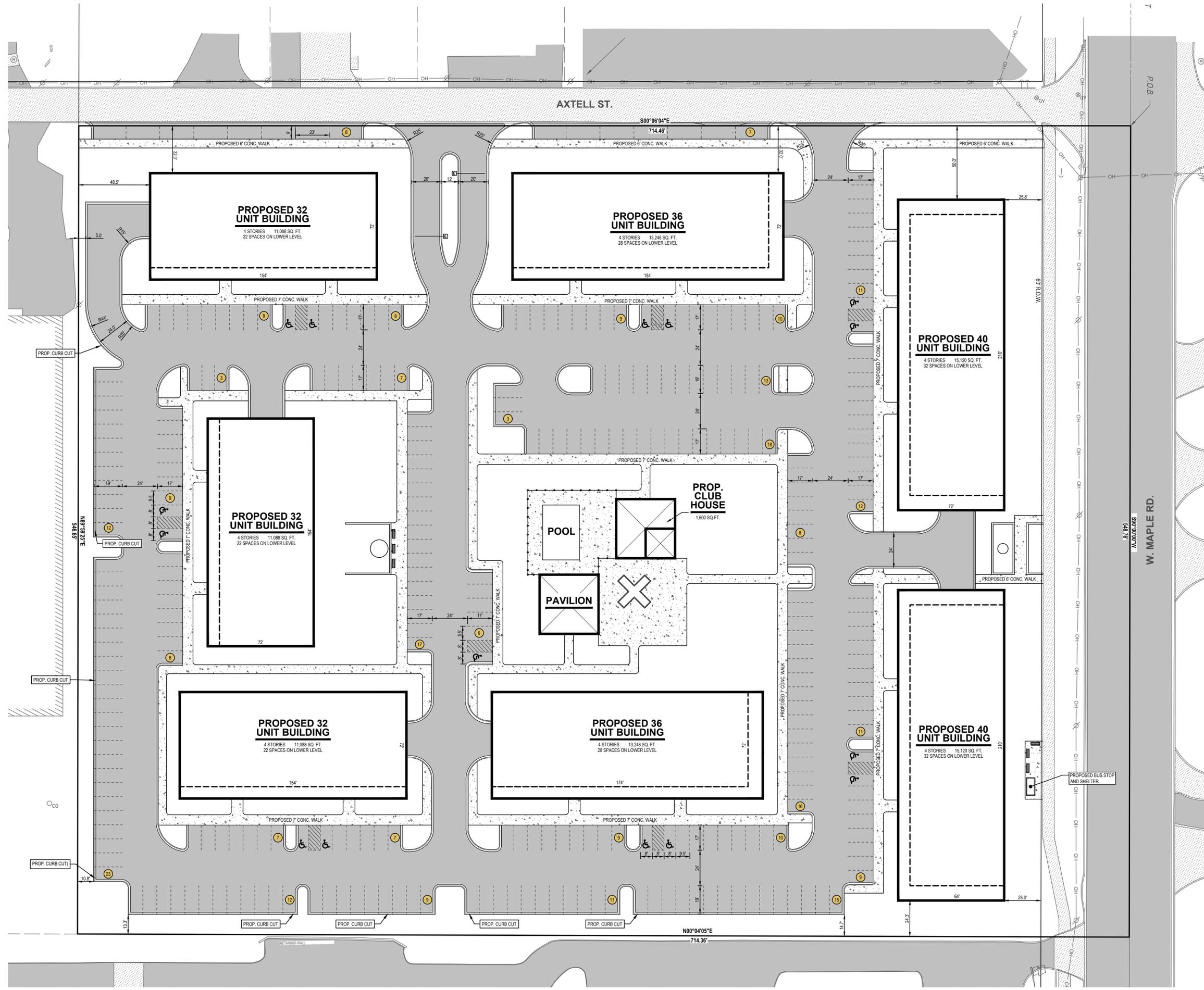
0' 15' 30' 60'
SCALE: 1" = 30'

LEGEND

	EXISTING BITUMINOUS
	EXISTING CONCRETE
	PROPOSED BITUMINOUS (STANDARD DUTY)
	PROPOSED CONCRETE (STANDARD DUTY)

SITE PLAN NOTES

- BUILDING ADDRESS SHALL BE CLEARLY VISIBLE WHEN APPROACHING THE BUILDING.
- GARBAGE AND RECYCLING CONTAINERS WILL BE LOCATED WITHIN THE FIRST FLOOR PARKING AREAS
- SITE DIMENSIONS ARE TO FACE OF CURB OR FACE OF WALK, UNLESS OTHERWISE NOTED.
- THE CONSTRUCTION OF THE SITE WILL BEGIN IMMEDIATELY PENDING CITY APPROVALS AND PERMITS.
- THE PROJECT WILL BE COMPLETED IN 1 PHASE.
- THE PROPOSED PROJECT IS NOT LOCATED WITHIN THE 100 YEAR FLOOD PLAN.



THE MARK OF TROY

Site Layout Plan

2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R17E,
CITY OF TROY, OKLAND COUNTY, MICHIGAN

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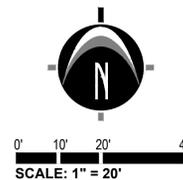
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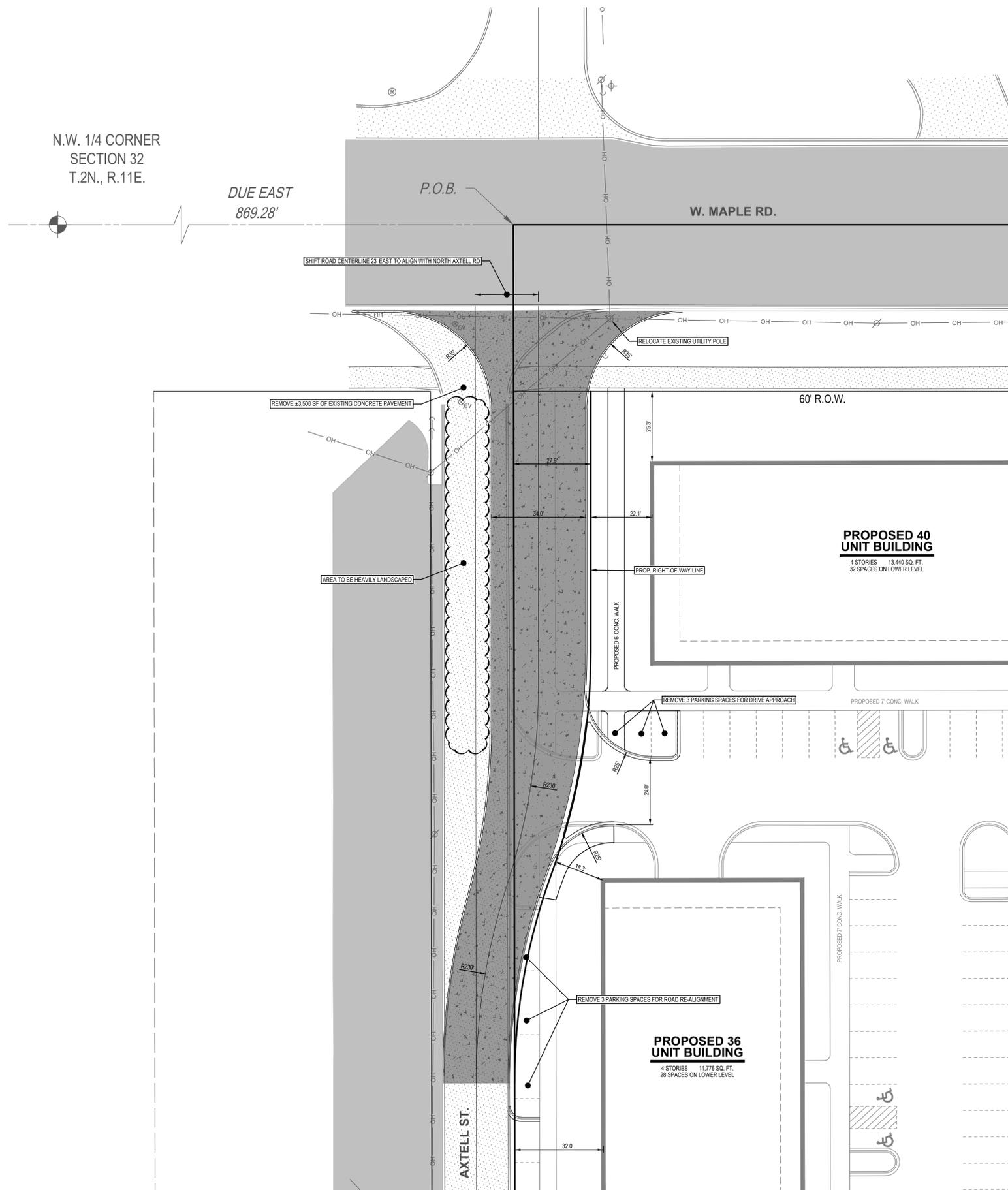
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N.W. 1/4 CORNER
 SECTION 32
 T.2N., R.11E.

DUE EAST
 869.28'



LEGEND

	EXISTING BITUMINOUS
	EXISTING CONCRETE
	PROPOSED CONCRETE (HEAVY DUTY)
	PROPOSED CONCRETE (STANDARD DUTY)

SITE PLAN NOTES

1. BUILDING ADDRESS SHALL BE CLEARLY VISIBLE WHEN APPROACHING THE BUILDING.
2. GARBAGE AND RECYCLING CONTAINERS WILL BE LOCATED WITHIN THE FIRST FLOOR PARKING AREAS
3. SITE DIMENSIONS ARE TO FACE OF CURB OR FACE OF WALK, UNLESS OTHERWISE NOTED.
4. THE CONSTRUCTION OF THE SITE WILL BEGIN IMMEDIATELY PENDING CITY APPROVALS AND PERMITS.
5. THE PROJECT WILL BE COMPLETED IN 1 PHASE.
6. THE PROPOSED PROJECT IS NOT LOCATED WITHIN THE 100 YEAR FLOOD PLAIN.

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THE MARK OF TROY

Alternate Axtell Road Alignment

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 CITY OF TROY, OKLAND COUNTY, MICHIGAN

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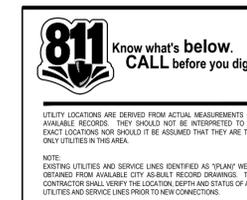
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SHEET NO:

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ST. LOUIS

PREPARED FOR:

Schafer Development
Steve Schafer

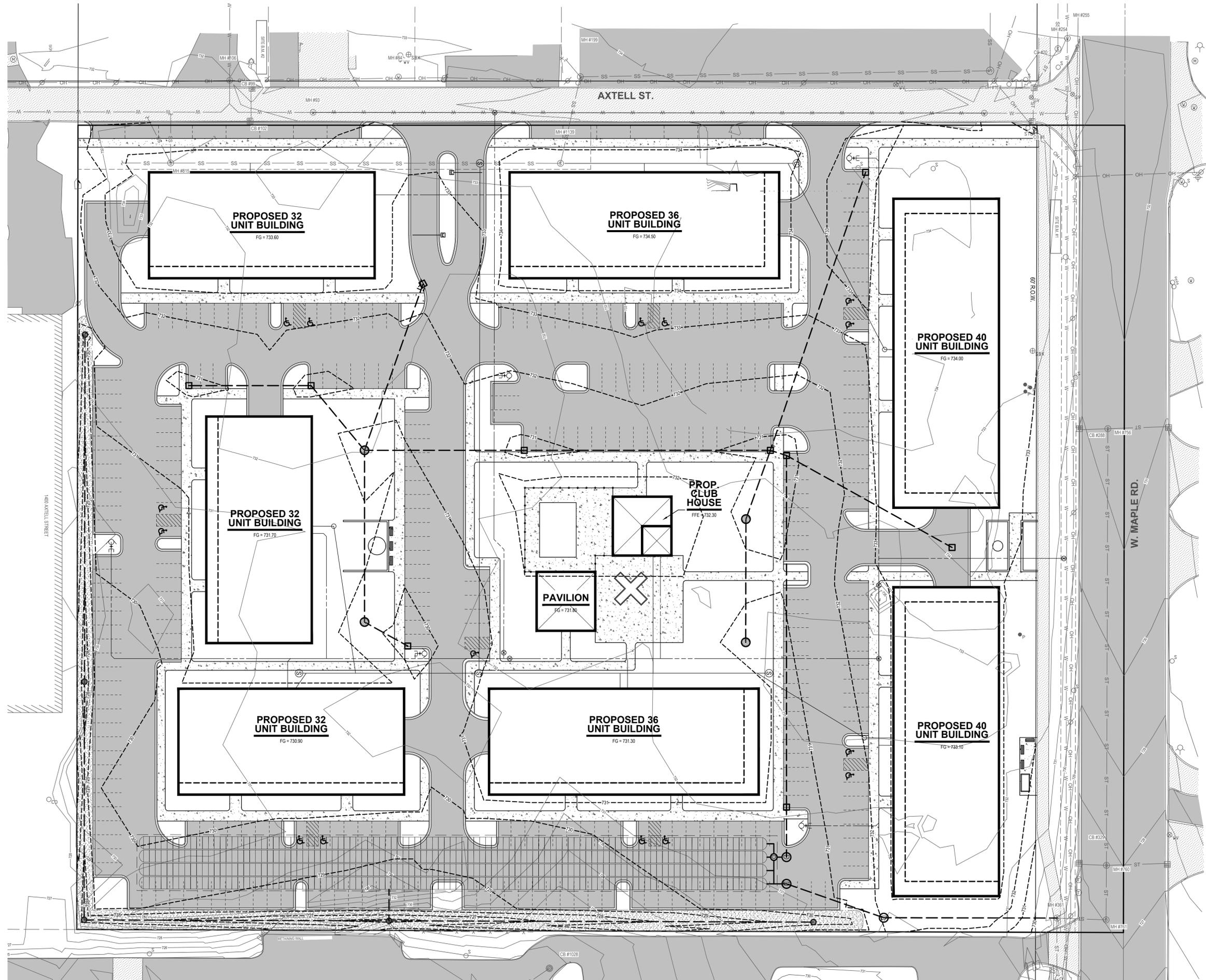
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0' 15' 30' 60'
SCALE: 1" = 30'



THE MARK OF TROY

Grading Plan

2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R1E,
CITY OF TROY, OKLAND COUNTY, MICHIGAN

STAMP:

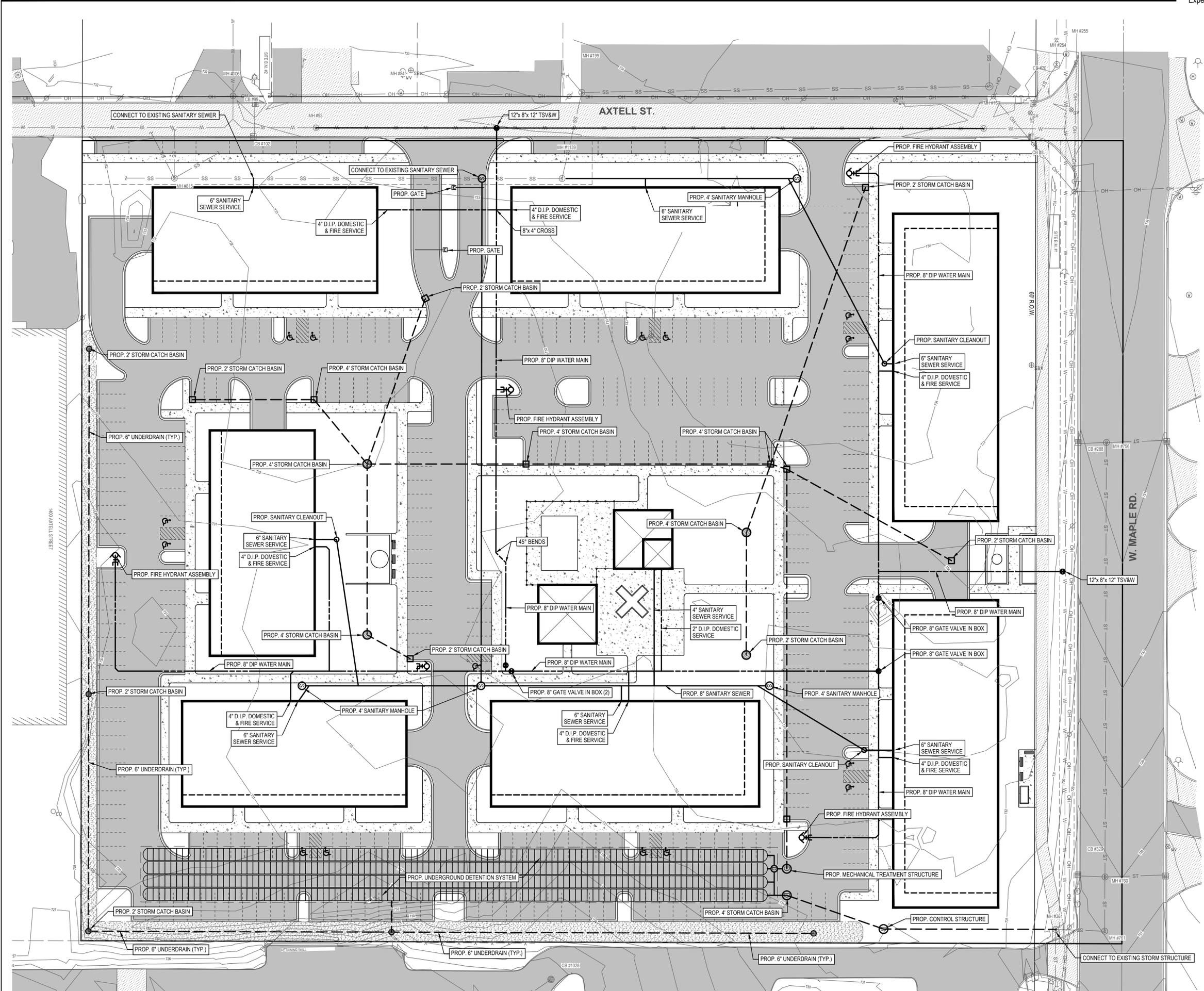
PROJECT NO:

14500172

SHEET NO:

C-300

SHEET: 5 OF 11



0' 15' 30' 60'
SCALE: 1" = 30'

STORM SEWER CONSTRUCTION

- 1) ALL CATCH BASINS SHOULD BE PROVIDED WITH A MINIMUM 2' SUMP.
- 2) ALL STORM SEWER SHALL BE SLOPP (MEETING AASHTO M252 AND M254), UNLESS OTHERWISE SPECIFIED.
- 3) 6" UNDERDRAIN SHALL BE PERFORATED PIPE WITH SOCK, MEETING THE REQUIREMENTS OF AASHTO M-252 AND THE GEOTEXTILE SHALL MEET AASHTO M-288 REQUIREMENTS

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THE MARK OF TROY
Utility Plan
2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R1E,
CITY OF TROY, OKLAND COUNTY, MICHIGAN

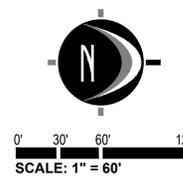
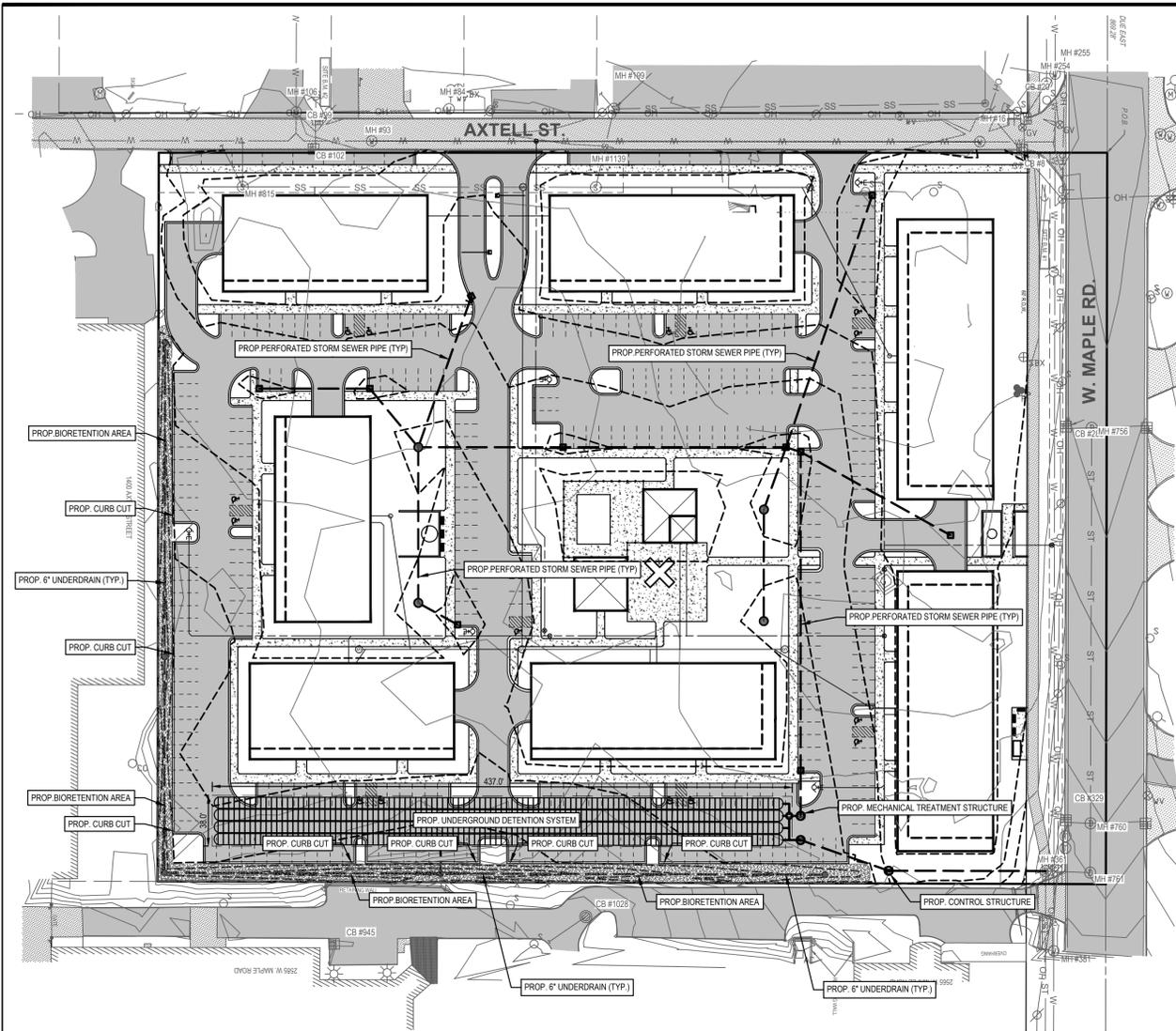
STAMP:

PROJECT NO:
14500172

SHEET NO:
C-400

SHEET: 6 OF 11

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STORM WATER MANAGEMENT NARRATIVE

EXISTING SITE
THIS PROJECT CONSISTS OF A 2.2 ACRE PARCEL THAT IS LOCATED ON THE SOUTH SIDE OF MAPLE ROAD, BETWEEN COOLIDGE HIGHWAY AND MAPLELAWN DRIVE, IN TROY, MICHIGAN. THE EXISTING PARCEL CURRENTLY CONSISTS OF ONE VACANT BUILDING AND ASSOCIATED PARKING AREAS ALONG AXTELL DRIVE. THE MAJORITY OF THE EXISTING SITE IS UNDEVELOPED. REFER TO EXISTING CONDITIONS PLAN AND TREE SURVEY.

PER USDA SOIL INFORMATION, THE MAJORITY OF THE PARCEL SOILS ARE CLASSIFIED AS UDDIPANSMENTS, UNULATING. THIS SOIL TYPE IS RATED IN HYDROLOGIC SOIL GROUP A. THE PERMEABILITY OF THIS SOIL IS VERY RAPID. BASED ON THE EXISTING SITE SOILS AND SITE SLOPES OF LESS THAN 4%, A RUNOFF COEFFICIENT OF 0.30 IS ASSUMED FOR SEMI-PERVIOUS AREAS OF THE SITE.

EXISTING DRAINAGE
THE TOPOGRAPHIC SURVEY INDICATES THAT THIS PARCEL GENERALLY DRAINS FROM WEST TO EAST, WITH THE HIGHEST SITE ELEVATIONS ALONG AXTELL STREET. (REFER TO THE EXISTING CONDITIONS PLAN FOR SITE CONTOURS) THE ELEVATIONS ON THE SITE RANGE FROM 725 FEET AT THE HIGH POINT ALONG AXTELL TO 728 FEET AT THE EAST PROPERTY LINE. EXISTING RUNOFF FROM THE SITE DRAINS TO A SERIES OF ENCLOSED STORM SEWER PIPES LOCATED WITHIN THE AXTELL ROAD RIGHT-OF-WAY, MAPLE ROAD RIGHT-OF-WAY, AND THE ADJACENT PROPERTY TO THE EAST.

PROPOSED IMPROVEMENTS
THE PROPOSED PROJECT WILL IMPACT/DISTURB APPROXIMATELY 8 ACRES OF LAND. THE PROPOSED SITE IMPROVEMENTS WILL CONSIST OF THE CONSTRUCTION OF APPROXIMATELY 85,000 S.F. OF MULTIFAMILY RESIDENTIAL BUILDINGS, SERVICED BY A BITUMINOUS PARKING LOT.

STORM WATER MANAGEMENT
THE STORM WATER MANAGEMENT SYSTEM (SMS) WILL BE DESIGNED TO OAKLAND COUNTY WATER RESOURCE COMMISSIONER AND CITY OF TROY STANDARDS AND WILL PROVIDE FLOOD CONTROL (WATER QUANTITY) AND WATER RESOURCE PROTECTION (WATER QUALITY).

THE PROPOSED STORM SEWER PIPE NETWORK WILL CONVEY STORM WATER RUNOFF TO THE PROPOSED UNDERGROUND DETENTION BASINS LOCATED ALONG THE EAST BOUNDARY OF THE SITE. DUE TO THE HIGH PERMEABILITY OF THE EXISTING SITE SOILS, THE PROPOSED STORM SEWER PIPES WILL BE PERFORATED TO FURTHER PROMOTE THE INFILTRATION OF STORM RUNOFF. THE PROPOSED STORM SEWER WILL BE SIZED TO CONVEY A 10-YEAR RAIN EVENT.

PRIOR TO STORM WATER ENTERING THE PROPOSED DETENTION BASIN, THE STORM RUNOFF WILL BE DIRECTED THROUGH A STORM WATER QUALITY DEVICE OR BIO-RETENTION AREA. THESE SYSTEMS ARE DESIGNED TO REMOVE POINT SOURCE POLLUTANTS SUCH AS COARSE SEDIMENT, OIL AND GREASE, LITTER AND FLOATABLE DEBRIS.

THE PROPOSED UNDERGROUND DETENTION BASINS WILL BE DESIGNED TO DETAIN THE 25-YEAR STORM EVENT PER CITY STANDARDS. AN OUTLET CONTROL STRUCTURE WILL BE INSTALLED ON THE DOWNSTREAM SIDE OF THE UNDERGROUND DETENTION BASIN TO RESTRICT AND DETAIN RUNOFF FOR AN EXTENDED PERIOD OF TIME, REDUCING DOWNSTREAM FLOODING AND FURTHER ENHANCING THE SETTLEMENT PROCESS OF SUSPENDED SOLIDS IN THE STORM RUNOFF. PERFORATED UNDERGROUND DETENTION PIPES WILL ALSO BE INSTALLED TO PROMOTE INFILTRATION OF THE DETAINED RUNOFF INTO THE SURROUNDING SOILS.

THE PROPOSED UNDERGROUND DETENTION BASIN WILL OUTLET TO THE PUBLIC STORM SEWER SYSTEM LOCATED IN W MAPLE ROAD. THE RESTRICTED RELEASE RATES WILL NOT ADVERSELY IMPACT THE EXISTING STORM SEWER NETWORK WITHIN THE PUBLIC ROAD RIGHT-OF-WAY.

"BEST MANAGEMENT PRACTICES" (BMP'S) WILL BE USED DURING AND AFTER CONSTRUCTION. DURING CONSTRUCTION, BMP'S WILL BE UTILIZED TO CONTROL SOIL EROSION. SILT FENCE WILL BE INSTALLED ON THE DOWN-SLOPE SIDE OF IMPACTED AREAS TO MINIMIZE SOIL LOSS DURING CONSTRUCTION. IN ADDITION, STONE TRACKING MAT WILL BE INSTALLED TO REDUCE THE AMOUNT OF SOIL LOSS FROM VEHICLES LEAVING THE SITE. UPON THE COMPLETION OF THE STORM WATER MANAGEMENT IMPROVEMENTS, INLET FILTERS WILL BE PLACED ON ALL PROPOSED CATCH BASINS TO MINIMIZE THE AMOUNT OF SEDIMENT ENTERING THE SMS. UPON PROJECT COMPLETION, INLET FILTERS WILL BE REMOVED AND THE STORM SEWER CATCH BASINS SHALL BE CLEANED OF ALL CONSTRUCTION SEDIMENT.

THE FOLLOWING PERMANENT POST-CONSTRUCTION BMP'S WILL ALSO BE PROVIDED:

- BIO-RETENTION AREAS ALONG SOUTH AND EAST BOUNDARIES OF THE PROPOSED PARKING AREA TO PROMOTE INFILTRATION AND REDUCE RUNOFF.
- STORM WATER QUALITY DEVICE TO REMOVE POINT SOURCE POLLUTANTS FROM STORM SEWER SYSTEM.
- PERFORATED UNDERGROUND DETENTION BASINS TO PROMOTE INFILTRATION, PROVIDE FLOOD CONTROL, AND IMPROVE WATER QUALITY OF SITE DISCHARGE.

STORM WATER MANAGEMENT CALCULATIONS

Design Basis: Use the Oakland County Water Resources Commission Design Criteria for the 25 year storm event.

I. Total Volume of Detention Area: 25 Year storm

Surface	Area (sq. ft)	C Factor	Weighted C
Developed Area contributing runoff (a)			8.23 acres
Building	85,120	0.95	0.23
Pavement	148,835	0.42	0.42
Grass	118,812	0.30	0.10
	352,767	0.74	

Developed Runoff Coefficient (c) = 0.74

2) Maximum Allowable Runoff, Q_a = (local req'ts)
Q_a = a * 0.15 cblacoe = 1.23 cfs

3) Calculate Q₀ = Q_a / (a * c)
(max. outflow per acre impervious) = 0.20 cfs/acre imperv.

4) Max. Storage Time, T₂₅ = -25 + sqrt(8,062.5/Q₀) = 174.23 minutes

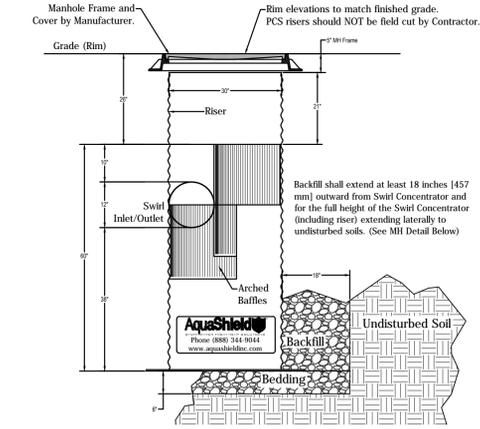
5) Max. Storage Required, V₂₅ = ((12,000 * T) / (T + 25)) - 40 Q₀ T₂₅ = 9,866 cf / acre imperv. = 89,940 cf

6) Total Storage Required, V₂₅ = V₂₅ * (A) * (c) = 89,940 cf

II. Storage Provided - Underground Detention

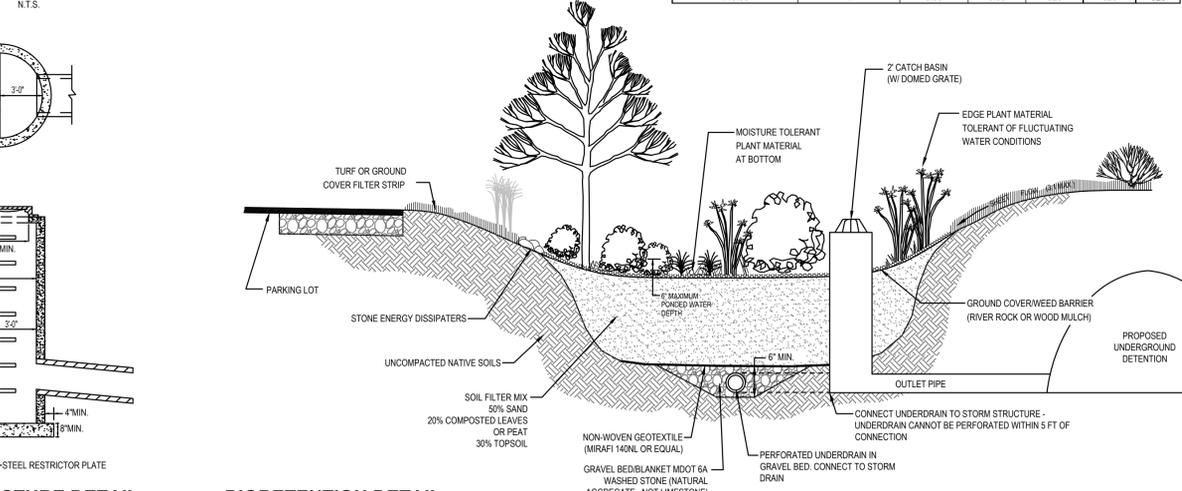
Chamber Model: MC-4500
Number of Chambers: 420
Number of End Caps: 8
Void in Stone (Porosity): 25%
Base of Stone Elevation: 719.30
Area of System: 16,605 sf

Elevation (feet)	Height of System (inches)	StormTech MC-4500 Cumulative Storage Volumes				Total Volume (cubic feet)
		Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch. EC and Stone (cubic feet)	
726.05	81	0.00	0.00	325	325	60,111
725.97	80	0.00	0.00	325	325	59,786
725.88	79	0.00	0.00	325	325	59,461
725.80	78	0.00	0.00	325	325	59,136
725.72	77	0.00	0.00	325	325	58,811
725.63	76	0.00	0.00	325	325	58,486
725.55	75	0.00	0.00	325	325	58,161
725.47	74	0.00	0.00	325	325	57,836
725.38	73	0.00	0.00	325	325	57,511
725.30	72	0.00	0.00	325	325	57,186
725.22	71	0.00	0.00	325	325	56,861
725.13	70	0.00	0.00	325	325	56,536
725.05	69	17.20	0.00	321	338	56,208
724.97	68	48.76	0.08	313	362	55,870
724.88	67	69.19	0.21	308	377	55,508
724.80	66	87.96	0.38	303	391	55,131
724.72	65	112.70	0.54	297	410	54,739
724.63	64	190.17	0.70	278	468	54,329
724.55	63	279.41	0.90	255	536	53,861
724.47	62	335.59	1.13	241	578	53,326
724.38	61	381.41	1.34	230	624	52,747
724.30	60	421.22	1.53	220	642	52,135
724.22	59	456.68	1.72	211	669	51,493
724.13	58	488.66	1.93	203	693	50,824
724.05	57	518.28	2.16	195	716	50,130
723.97	56	545.87	2.38	188	736	49,415
723.88	55	571.63	2.59	182	756	48,678
723.80	54	595.86	2.78	176	774	47,922
723.72	53	618.80	2.97	170	792	47,148
723.63	52	640.56	3.15	164	808	46,356
723.55	51	661.29	3.34	159	824	45,548
723.47	50	680.98	3.52	154	839	44,726
723.38	49	698.58	3.70	149	853	43,896
723.30	48	717.83	3.87	145	867	43,033
723.22	47	735.04	4.04	141	880	42,166
723.13	46	751.50	4.20	136	892	41,287
723.05	45	767.42	4.36	132	904	40,396
722.97	44	782.64	4.52	128	916	39,491
722.88	43	797.30	4.67	125	927	38,576
722.80	42	811.37	4.81	121	937	37,648
722.72	41	824.91	4.96	118	948	36,711
722.63	40	837.95	5.10	115	958	35,763
722.55	39	850.50	5.25	111	967	34,806
722.47	38	862.59	5.39	108	976	33,839
722.38	37	874.23	5.52	105	985	32,862
722.30	36	885.39	5.66	103	994	31,877
722.22	35	896.22	5.79	100	1,002	30,884
722.13	34	905.84	5.92	97	1,010	29,882
722.05	33	916.67	6.05	95	1,017	28,872
721.97	32	928.32	6.17	92	1,025	27,855
721.88	31	935.61	6.30	90	1,032	26,830
721.80	30	944.53	6.41	88	1,038	25,799
721.72	29	953.13	6.57	85	1,045	24,760
721.63	28	961.37	6.73	83	1,051	23,715
721.55	27	969.30	6.77	81	1,057	22,664
721.47	26	976.80	6.87	79	1,063	21,606
721.38	25	984.18	6.98	77	1,069	20,543
721.30	24	991.16	7.08	76	1,074	19,476
721.22	23	997.83	7.18	74	1,079	18,401
721.13	22	1,004.21	7.28	72	1,084	17,322
721.05	21	1,010.29	7.38	71	1,089	16,238
720.97	20	1,016.09	7.47	69	1,093	15,149
720.88	19	1,021.60	7.56	68	1,097	14,056
720.80	18	1,026.83	7.65	67	1,101	12,959
720.72	17	1,031.79	7.74	65	1,105	11,858
720.63	16	1,036.47	7.82	64	1,108	10,753
720.55	15	1,040.88	7.90	63	1,112	9,644
720.47	14	1,045.07	7.98	62	1,115	8,533
720.38	13	1,049.03	8.06	61	1,118	7,419
720.30	12	1,052.73	8.13	60	1,121	6,297
720.22	11	1,056.18	8.20	59	1,124	5,173
720.13	10	1,059.31	8.26	58	1,127	4,055
720.05	9	0.00	0.00	325	325	2,927
719.97	8	0.00	0.00	325	325	2,277
719.88	7	0.00	0.00	325	325	1,952
719.72	6	0.00	0.00	325	325	1,626
719.63	5	0.00	0.00	325	325	1,301
719.55	4	0.00	0.00	325	325	976
719.47	3	0.00	0.00	325	325	651
719.38	2	0.00	0.00	325	325	325

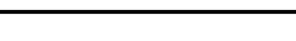


FINAL STORM WATER QUALITY UNIT SIZE AND DESIGN SHALL BE PROVIDED BY THE MANUFACTURER. THE WATER QUALITY UNIT MODEL AND DESIGN SHALL BE IN ACCORDANCE WITH CURRENT COUNTY STORM WATER DESIGN STANDARDS. SHOP DRAWINGS OF THE FINAL DESIGN MUST BE SUBMITTED TO THE ENGINEER OF RECORD AND COUNTY FOR FINAL APPROVAL, PRIOR TO INSTALLATION.

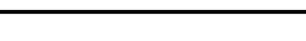
STORM WATER QUALITY UNIT (OR APPROVED EQUAL)



OUTLET CONTROL STRUCTURE DETAIL



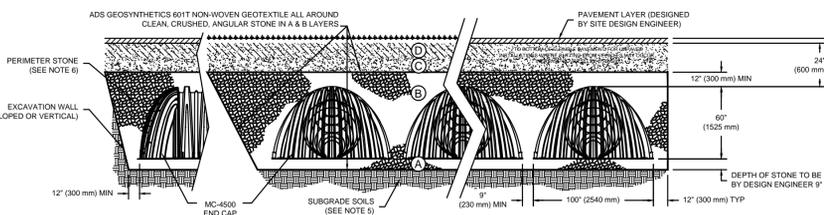
BIORETENTION DETAIL



ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	FINAL FILL: FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	INITIAL FILL: FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE (B) LAYER TO 24\"/>		

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR, NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9\"/>



NOTES:

- MC-4500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F287 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
- "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
- THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
- THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
- PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
- ONCE LAYER 'C' IS PLACED, ANY SOL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE PERMITTED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

MC-4500 STANDARD CROSS SECTION
DRAWN: JLM
CHECKED: JLM
DATE: 11/18/14
PROJECT #:

StormTech
4640 TRUMAN BLVD
ANN ARBOR, MI 48106
734.932.1422

ADS
1000 W. WATSON BLVD
ANN ARBOR, MI 48106
734.932.1422

SHEET 1 OF 1

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ST. LOUIS

PREPARED FOR:
Schafer Development
Steve Schafer
29800 Middlebelt Rd., Suite 150
Farmington Hills, MI 48334
Phone: 248.932.7500

REVISIONS:

Drawn	Checked	By	Date
GAN	Checked	JVR	12/29/14
GAN	Checked	JVR	12/29/14
GAN	Checked	JVR	01/13/15
GAN	Checked	JVR	01/13/15

THE MARK OF TROY
Storm Water Management Plan
2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R17E,
CITY OF TROY, OKLAHOMA COUNTY, MICHIGAN

STAMP:

PROJECT NO:
14500172

SHEET NO:
C-401

SHEET: 7 OF 11



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ST. LOUIS

PREPARED FOR:

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Steve Schafer

29800 Middlebelt Rd., Suite 150
Farmington Hills, MI 48334
Phone: 248.932.7500

REVISIONS:

Title: Submitted for City review V. Date: 12/29/14
Drawn: GAN Checked: JVR S. Date: 12/29/14
Title: Submitted for City review V. Date: 01/13/15
Drawn: GAN Checked: JVR S. Date: 01/13/15

THE MARK OF TROY

Tree Preservation Plan

2785 W. Maple Road
PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R17E,
CITY OF TROY, OKLAND COUNTY, MICHIGAN

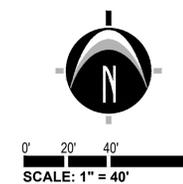
STAMP:

PROJECT NO:
14500172

SHEET NO:
L-101

SHEET: 9 OF 11

W. MAPLE RD.
120' R.O.W.



ALL EXISTING TREES ON SITE TO BE REMOVED

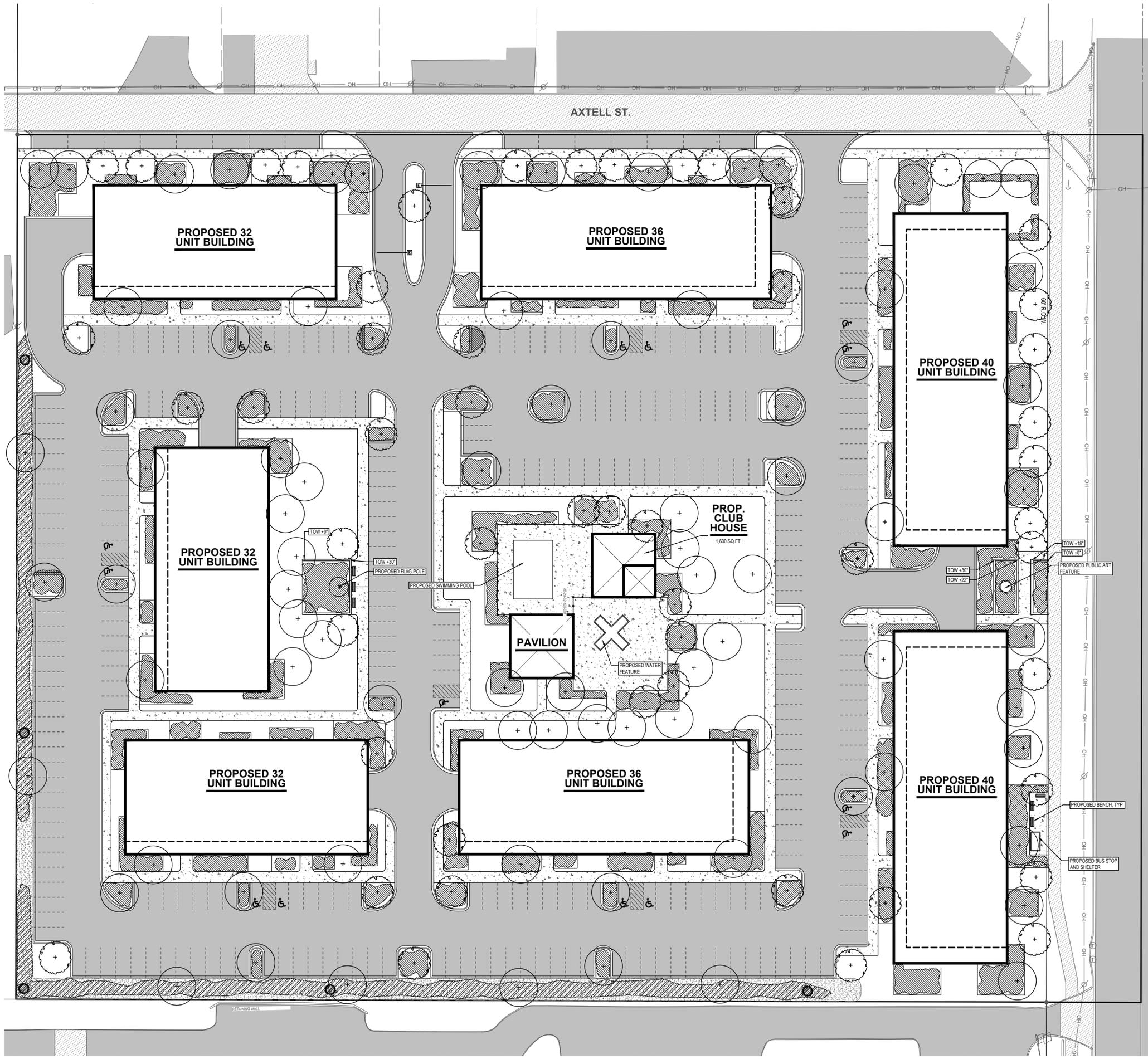
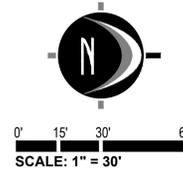
EXISTING TREE CHART

TAG#	SIZE	TREE TYPE	TAG#	SIZE	TREE TYPE	TAG#	SIZE	TREE TYPE	TAG#	SIZE	TREE TYPE
123	6"	POPLAR	546	4"	POPLAR	752	6"	LOCUST	852	6"	WILLOW
124	6"	POPLAR	548	TWIN 6"	POPLAR	753	6"	WILLOW	853	6"	WILLOW
125	8"	BOX ELDER	549	4"	POPLAR	754	6"	WILLOW	854	8"	LOCUST
126	6"	BOX ELDER	550	6"	POPLAR	755	5"	LOCUST	855	6"	WILLOW
127	6"	LOCUST	551	TWIN 4"	POPLAR	756	6"	WILLOW	856	10"	WILLOW
128	6"	LOCUST	552	8"	POPLAR	757	4"	LOCUST	857	8"	WILLOW
129	6"	ELM	553	6"	POPLAR	758	TWIN 6"	WILLOW	858	6"	LOCUST
130	6"	LOCUST	554	6"	POPLAR	759	6"	WILLOW	859	6"	LOCUST
131	6"	ELM	555	6"	POPLAR	760	8"	LOCUST	860	6"	LOCUST
132	6"	ELM	556	6"	POPLAR	761	6"	WILLOW	861	6"	LOCUST
133	6"	ELM	557	6"	POPLAR	762	4"	POPLAR	862	4"	LOCUST
134	8"	LOCUST	558	4"	POPLAR	763	4"	POPLAR	863	6"	LOCUST
135	10"	LOCUST	559	4"	POPLAR	764	6"	LOCUST	864	6"	LOCUST
136	8"	LOCUST	560	8"	CHERRY	765	6"	LOCUST	865	6"	LOCUST
137	4"	LOCUST	561	6"	POPLAR	766	6"	LOCUST	866	6"	LOCUST
138	6"	LOCUST	562	4"	POPLAR	767	6"	POPLAR	867	6"	LOCUST
139	4"	LOCUST	563	4"	POPLAR	768	8"	LOCUST	868	8"	LOCUST
140	8"	LOCUST	564	MULTI 12" & 10"	BOX ELDER	769	8"	LOCUST	869	6"	LOCUST
141	6"	LOCUST	565	6"	POPLAR	770	4"	POPLAR	870	10"	POPLAR
142	6"	LOCUST	566	8"	POPLAR	771	4"	POPLAR	871	6"	LOCUST
143	6"	POPLAR	567	6"	POPLAR	772	6"	LOCUST	872	6"	LOCUST
144	6"	LOCUST	568	TWIN 6"	POPLAR	773	4"	POPLAR	873	8"	LOCUST
145	5"	ELM	569	6"	POPLAR	774	8"	WILLOW	874	4"	LOCUST
146	6"	LOCUST	570	6"	POPLAR	775	4"	POPLAR	875	8"	LOCUST
147	6"	POPLAR	571	4"	POPLAR	776	4"	WILLOW	876	8"	LOCUST
148	10"	POPLAR	572	4"	POPLAR	777	6"	POPLAR	877	6"	LOCUST
149	8"	LOCUST	573	6"	LOCUST	778	8"	POPLAR	878	6"	LOCUST
150	8"	POPLAR	574	6"	LOCUST	779	8"	POPLAR	879	8"	LOCUST
151	8"	POPLAR	575	TWIN 4"	CHERRY	780	6"	WILLOW	880	6"	LOCUST
152	8"	POPLAR	576	TWIN 4"	LOCUST	781	6"	POPLAR	881	6"	LOCUST
153	4"	POPLAR	577	8"	POPLAR	782	6"	WILLOW	882	8"	LOCUST
154	6"	POPLAR	578	5"	POPLAR	783	6"	WILLOW	883	8"	LOCUST
155	6"	POPLAR	579	TWIN 4"	POPLAR	784	TWIN 6"	WILLOW	884	6"	LOCUST
156	5"	POPLAR	580	6"	POPLAR	785	6"	WILLOW	885	6"	LOCUST
157	8"	POPLAR	581	4"	JUNIPER	786	8"	LOCUST	886	8"	LOCUST
158	8"	LOCUST	582	6"	POPLAR	787	TWIN 6"	WILLOW	887	8"	LOCUST
159	6"	LOCUST	583	TWIN 6"	POPLAR	788	6"	WILLOW	888	6"	LOCUST
160	10"	POPLAR	584	6"	POPLAR	789	6"	WILLOW	889	6"	LOCUST
161	6"	POPLAR	585	5"	POPLAR	790	4"	BOX ELDER	890	8"	LOCUST
162	8"	POPLAR	586	4"	POPLAR	791	6"	LOCUST	891	TWIN 6"	LOCUST
163	8"	POPLAR	587	6"	POPLAR	792	4"	WILLOW	892	6"	LOCUST
164	4"	POPLAR	588	5"	POPLAR	793	4"	WILLOW	893	10"	LOCUST
165	4"	LOCUST	589	TWIN 4"	POPLAR	794	TWIN 6"	POPLAR	894	6"	LOCUST
166	4"	POPLAR	590	6"	POPLAR	795	6"	POPLAR	895	8"	LOCUST
167	8"	POPLAR	591	6"	POPLAR	796	6"	LOCUST			
168	6"	POPLAR	592	4"	POPLAR	797	8"	LOCUST			
169	8"	POPLAR	593	4"	ELM	798	8"	LOCUST			
170	4"	ELM	594	4"	POPLAR	799	MULTI 4" & 7"	WILLOW			
171	8"	POPLAR	595	8"	POPLAR	800	8"	LOCUST			
172	6"	POPLAR	596	5"	POPLAR	801	6"	WILLOW			
173	10"	POPLAR	597	8"	CHERRY	802	4"	WILLOW			
174	4"	POPLAR	598	6"	POPLAR	803	6"	WILLOW			
175	8"	POPLAR	599	8"	POPLAR	804	6"	WILLOW			
176	8"	ELM	600	4"	POPLAR	805	4"	WILLOW			
177	4"	ELM	601	4"	POPLAR	806	5"	WILLOW			
178	6"	POPLAR	602	6"	ELM	807	6"	WILLOW			
179	8"	POPLAR	603	8"	POPLAR	808	8"	WILLOW			
180	8"	POPLAR	604	8"	CHERRY	809	TWIN 6"	POPLAR			
181	8"	POPLAR	605	8"	CHERRY	810	6"	WILLOW			
182	8"	POPLAR	606	6"	POPLAR	811	TWIN 10"	WILLOW			
183	8"	POPLAR	607	5"	BOX ELDER	812	4"	WILLOW			
184	TWIN 8"	POPLAR	608	6"	CHERRY	813	6"	WILLOW			
185	10"	POPLAR	609	8"	POPLAR	814	8"	WILLOW			
186	10"	POPLAR	610	10"	CHERRY	815	6"	WILLOW			
187	TWIN 8"	POPLAR	611	6"	CHERRY	816	8"	WILLOW			
188	10"	POPLAR	612	6"	POPLAR	817	6"	WILLOW			
189	8"	POPLAR	613	4"	BOX ELDER	818	4"	WILLOW			
190	8"	POPLAR	614	6"	CHERRY	819	4"	WILLOW			
191	4"	POPLAR	615	10"	BOX ELDER	820	4"	WILLOW			
192	6"	POPLAR	616	8"	CHERRY	821	TWIN 6"	WILLOW			
193	6"	POPLAR	617	6"	CHERRY	822	8"	WILLOW			
194	6"	POPLAR	618	4"	CHERRY	823	4"	WILLOW			
195	6"	POPLAR	619	6"	POPLAR	824	TWIN 4"	WILLOW			
196	4"	HAWTHORN	620	4"	POPLAR	825	4"	WILLOW			
197	5"	POPLAR	621	8"	POPLAR	826	8"	LOCUST			
198	8"	POPLAR	622	8"	POPLAR	827	TWIN 6"	LOCUST			
199	8"	POPLAR	623	6"	LOCUST	828	6"	WILLOW			
200	8"	POPLAR	624	6"	WILLOW	829	6"	POPLAR			
201	10"	LOCUST	625	6"	TWIN 6"	830	6"	POPLAR			
202	8"	LOCUST	626	6"	WILLOW	831	10"	WILLOW			
203	8"	LOCUST	627	6"	WILLOW	832	8"	WILLOW			
204	8"	LOCUST	628	6"	WILLOW	833	6"	POPLAR			
205	8"	LOCUST	629	6"	WILLOW	834	6"	POPLAR			
206	8"	LOCUST	630	6"	WILLOW	835	8"	POPLAR			
207	8"	LOCUST	631	6"	WILLOW	836	6"	BOX ELDER			
208	8"	LOCUST	632	6"	WILLOW	837	6"	WILLOW			
209	8"	LOCUST	633	6"	WILLOW	838	8"	POPLAR			
210	8"	LOCUST	634	6"	WILLOW	839	TWIN 8"	POPLAR			
211	8"	LOCUST	635	6"	WILLOW	840	8"	WILLOW			
212	8"	LOCUST	636	6"	WILLOW	841	8"	WILLOW			
213	8"	LOCUST	637	6"	WILLOW	842	6"	POPLAR			
214	8"	LOCUST	638	6"	WILLOW	843	6"	POPLAR			
215	8"	LOCUST	639	6"	WILLOW	844	6"	WILLOW			
216	8"	LOCUST	640	6"	WILLOW	845	8"	WILLOW			
217	8"	LOCUST	641	6"	WILLOW	846	TWIN 10"	WILLOW			
218	8"	LOCUST	642	6"	WILLOW	847	8"	WILLOW			
219	8"	LOCUST	643	6"	WILLOW	848	6"	WILLOW			
220	8"	LOCUST	644	6"	WILLOW	849	6"	WILLOW			
221	8"	LOCUST	645	6"	WILLOW	850	TWIN 10"	WILLOW			
222	8"	LOCUST	646	6"	WILLOW	851	6"	WILLOW			
223	8"	LOCUST	647	6"	WILLOW						
224	8"	LOCUST	648	6"	WILLOW						
225	8"	LOCUST	649	6"	WILLOW						
226	8"	LOCUST	650	6"	WILLOW						
227	8"	LOCUST	651	6"	WILLOW						
228	8"	LOCUST	652	6"	WILLOW						
229	8"	LOCUST	653	6"	WILLOW						
230	8"	LOCUST	654	6"	WILLOW						
231	10"	LOCUST	655	6"	WILLOW						
232	10"	LOCUST	656	6"	WILLOW						
233	10"	LOCUST	657	6"	WILLOW						
234	10"	LOCUST	658	6"	WILLOW						
235	10"	LOCUST	659	6"	WILLOW						
236	10"	LOCUST	660	6"	WILLOW						
237	10"	LOCUST	661	6"	WILLOW						
238	10"	LOCUST	662	6"	WILLOW						
239	10"	LOCUST	663	6"	WILLOW						
240	10"	LOCUST	664	6"	WILLOW						
241	10"	LOCUST	665	6"	WILLOW						
242	10"	LOCUST	666	6"	WILLOW						
243	10"	LOCUST	667	6"	WILLOW						
244	10"	LOCUST	668	6"	WILLOW						
245	10"	LOCUST	669	6"	WILLOW						
246	10"	LOCUST	670	6"	WILLOW						
247	10"	LOCUST	671	6"	WILLOW						
248	10"	LOCUST	672	6"	WILLOW						
249	10"	LOCUST	673	6"	WILLOW						
250	10"	LOCUST	674	6"	WILLOW						
251	10"	LOCUST	675	6"	WILLOW						
252	10"	LOCUST	676	6"	WILLOW						
253	10"	LOCUST	677	6"	WILLOW						
254	10"	LOCUST	678	6"	WILLOW						
25											

PREPARED FOR:
 Schafer Development
 Steve Schafer
 29800 Middlebelt Rd. Suite 150
 Farmington Hills, MI 48334
 Phone: 248.932.7500

REVISIONS:

Title: Submitted for City review	V. Date: 12/29/14
Drawn: GAN	Checked: JVR
Title: Submitted for City review	V. Date: 01/13/15
Drawn: GAN	Checked: JVR



LANDSCAPE LEGEND / SCHEDULE

TREES					
SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	QUANTITY
(Circle with cross)	DT	N/A	Deciduous Tree	2 1/2' cal. min.	82
(Circle with cross and dots)	OT	N/A	Ornamental Tree	2 1/2' cal. min.	52

SHRUBS, GRASSES, & GROUND COVER					
SYMBOL	ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	QUANTITY
(Hatched rectangle)	N/A	N/A	Landscape Planting Beds*	Varies	As Needed
(Diagonal hatched rectangle)	N/A	N/A	Storm Water Bioswale**	Varies	As Needed

*Landscape planting beds shall be comprised of various shrubs, grasses, and ground covers per City of Troy Zoning Ordinance.
 **Storm water bioswale shall be planted with native herbaceous and woody species to perform runoff attenuation, filtration, water uptake, and purification per City of Troy Zoning Ordinance.

LANDSCAPE NOTES

- PLANTING NOTES:**
- ALL PLANT MATERIAL SHALL BE LOCALLY NURSERY GROWN NO. 1 GRADE AND INSTALLED ACCORDING TO ACCEPTED PLANTING PROCEDURES. ALL PLANT MATERIALS SHALL MEET CURRENT AMERICAN ASSOCIATION OF NURSERYMEN STANDARDS. DO NOT PLANT MATERIALS UNTIL DIRECTED BY OWNER, LANDSCAPE ARCHITECT, AND/OR CONSTRUCTION MANAGER. THE LANDSCAPE ARCHITECT RESERVES THE RIGHT TO REJECT ANY PLANT MATERIAL FOR ANY REASON BEFORE OR AFTER IT IS INSTALLED.
 - SIZES SPECIFIED ARE MINIMUM SIZES TO WHICH THE PLANTS ARE TO BE INSTALLED.
 - ANY PLANT SUBSTITUTIONS SHALL BE APPROVED BY THE LANDSCAPE ARCHITECT.
 - MAINTENANCE OF LANDSCAPING ITEMS, TREES, AND PLANTS SHALL BE PERFORMED BY THE PROPERTY OWNER OR A QUALIFIED PROFESSIONAL. ALL LANDSCAPING SHALL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH APPLICABLE MUNICIPAL STANDARDS AND IN ACCORDANCE WITH CURRENT INDUSTRY STANDARDS IN A NEAT, HEALTHY AND WEED FREE CONDITION. ANY DEAD, DISEASED OR DAMAGED PLANT MATERIALS ARE TO BE REPLACED IMMEDIATELY AFTER NOTIFIED TO DO SO.
 - PLANT TREES AND SHRUBS IN ACCORDANCE WITH PLANTING DETAILS. DIG TREE PITS PER DETAILS. PLANT TREES AND SHRUBS AT THE SAME GRADE LEVEL AT WHICH THEY WERE GROWN AT THE NURSERY. IF HEAVY CLAY SOILS ARE EVIDENT, PLANT TREES AND SHRUBS HIGHER, APPROX. 1/4 OF THE ROOT BALL ABOVE GRADE, AND BACKFILL TO TOP OF ROOT BALL.
 - REMOVE ALL TWINE, WIRE, NURSERY TREE GUARDS, TAGS AND INORGANIC MATERIAL FROM ROOT BALLS. REMOVE THE TOP 1/3 OF BURLAP FROM EARTH BALLS AND REMOVE BURLAP FROM AROUND TRUNK.
 - FINELY SHREDDED HARDWOOD BARK MULCH, NATURAL COLOR (NON-COLORED), IS REQUIRED FOR ALL PLANTINGS AND PLANTING BEDS. MULCH PER PLANTING DETAILS. MULCH IN PLANT BEDS SHALL BE 3" THICK AT TIME OF INSPECTION AND AFTER COMPACTED BY RAIN OR IRRIGATION. ALL PLANTING BEDS SHALL BE EDGED WITH 6" X 12 GAUGE STEEL LANDSCAPE EDGING.
 - LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR THE VERIFICATION OF ALL UNDERGROUND AND OVERHEAD UTILITIES. IF A CONFLICT WITH UTILITIES EXIST, NOTIFY OWNER/CONSTRUCTION MANAGER PRIOR TO PLANTING.
 - PLANT MATERIAL SHALL BE GUARANTEED FOR ONE YEAR AFTER PLANTING AND ACCEPTANCE.
- TOPSOIL AND SOD NOTES:**
- WHEREVER GROUND IN ITS NATURAL STATE HAS BEEN DISTURBED, APPROVED LANDSCAPING OR GRASS SHALL BE FULLY INSTALLED, AND ESTABLISHED WITHIN A REASONABLE PERIOD OF TIME, BUT NO LONGER THAN ONE GROWING SEASON (UNLESS OTHERWISE NOTED AND APPROVED).
 - DURING EXCAVATION, GRADING, AND INSTALLATION OF REQUIRED LANDSCAPING, ALL SOIL EROSION AND SEDIMENTATION CONTROL REGULATIONS SHALL BE STRICTLY FOLLOWED AND COMPLIED WITH.
 - ALL LAWN AREAS SHALL RECEIVE SOD. SOD SHALL BE GROWN ON TOPSOIL UNLESS APPROVED OTHERWISE. SOD SHALL BE 2 YEARS OLD AND STRONGLY ROOTED. PLACE SOD TIGHTLY WITH NO GAPS AND WITH GRAIN IN SAME DIRECTION. SEAMS OF SOD SHALL BE STAGGERED IN A RUNNING BOND PATTERN. SOD SHALL BE WATERED IMMEDIATELY TO AVOID DRYING OUT. DO NOT INSTALL SOD UNTIL ACCEPTANCE OF FINISH GRADE AND IRRIGATION SYSTEM IS OPERATING PROPERLY UNLESS DIRECTED IN WRITING TO DO OTHERWISE. FINISH ROLL SOD WITH A WATER FILLED LAWN ROLLER. ROLL PERPENDICULAR TO LENGTH OF SOD.
 - SOD SHALL BE INSTALLED ON A MIN. 3" OF LIGHTLY COMPACTED APPROVED TOPSOIL. TOPSOIL SHALL BE FERTILE, SCREENED, FRIABLE TOPSOIL FREE OF STONES 1/2" IN DIA. AND LARGER ROOTS, STICKS, OR OTHER EXTRANEOUS MATERIAL INCLUDING NOXIOUS PLANTS. PH BETWEEN 6.0 AND 6.5, SALTS 500 PARTS PPM, ORGANIC CONTENT 3% MIN. DO NOT INSTALL TOPSOIL UNTIL APPROVED BY OWNER/C.M. TOPSOIL SHALL BE FINE GRADED TO A SMOOTH FINISH, FREE OF LUMPS AND DEPRESSIONS.
 - ALL LANDSCAPE ISLANDS WITHIN PARKING LOTS SHALL BE BACK FILLED WITH TOPSOIL TO A DEPTH OF 18".
- IRRIGATION NOTES:**
- ALL PLANTING AREAS, LAWN AREAS AND LANDSCAPE ISLANDS SHOWN ARE TO HAVE A COMPLETE IRRIGATION SYSTEM. THE G.C. SHALL BE RESPONSIBLE FOR RETAINING A QUALIFIED FIRM FOR THE DESIGN OF THE IRRIGATION SYSTEM. THE DESIGN MUST SHOW HOW THE SYSTEM TIES INTO THE BUILDING AND MUST SHOW ALL OF THE NECESSARY EQUIPMENT FOR A COMPLETE SYSTEM. THE G.C. SHALL SUBMIT THE IRRIGATION SYSTEM DESIGN TO THE ARCHITECT/OWNER FOR APPROVAL PRIOR TO COMMENCEMENT OF WORK.

811 Know what's below. CALL before you dig.

UTILITY LOCATIONS ARE DERIVED FROM ACTUAL MEASUREMENTS OR AVAILABLE RECORDS. THEY SHOULD NOT BE INTERPRETED TO BE EXACT LOCATIONS NOR SHOULD IT BE ASSUMED THAT THEY ARE THE ONLY UTILITIES IN THIS AREA.

NOTE: EXISTING UTILITIES AND SERVICE LINES IDENTIFIED AS "PLANNED" WERE OBTAINED FROM AVAILABLE CITY AS-BUILT RECORD DRAWINGS. THE CONTRACTOR SHALL VERIFY THE LOCATION, DEPTH AND STATUS OF ALL UTILITIES AND SERVICE LINES PRIOR TO NEW CONNECTIONS.

THE MARK OF TROY
 Landscape Plan
 2785 W. Maple Road
 PART OF THE NORTHWEST 1/4 OF SECTION 32, T2N, R17E,
 CITY OF TROY, OKLAND COUNTY, MICHIGAN

STAMP:

PROJECT NO:
14500172

SHEET NO:
L-102

SHEET: 10 OF 11

THE MARK OF TROY APARTMENTS TRAFFIC IMPACT STUDY

CITY OF TROY, MICHIGAN

PREPARED FOR:



PREPARED BY:



January 14, 2015

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- A: BACKGROUND INFORMATION
- B: EXISTING TRAFFIC CONDITIONS
- C: FUTURE TRAFFIC CONDITIONS

INTRODUCTION

This report presents the methodologies, analyses, and results of the Traffic Impact Study (TIS) for the proposed Mark of Troy apartment development in the City of Troy, Michigan. The project site is located on the south side of Maple Road approximately 1,000 feet east of Coolidge Highway, as shown on Figure 1. The development is proposed to include a total of 252 apartment units with site access provided via two driveways to Axtell Drive which provides unsignalized access to Maple Road. Maple Road is under the jurisdiction of the Road Commission for Oakland County (RCOC) and Coolidge Highway, Axtell Drive, and Maplelawn Drive are under City jurisdiction.

The scope of this study was developed based on Fleis & VandenBrink (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practice, and information published by the Institute of Transportation Engineers (ITE). Additionally, RCOC and the City of Troy provided input with respect to the requirements of this study. The study analyses were completed using Synchro and SimTraffic, Version 8 traffic analysis software. The study intersections analyzed for this TIS include:

- Maple Road & Coolidge Highway,
- Maple Road & Maplelawn Drive,
- Maple Road & Axtell Drive,
- Coolidge Highway & SB to NB XO S. of Maple Road, and
- The proposed site access locations.

The purpose of this study is to identify the traffic related impacts, if any, of the proposed project on the adjacent road network. Specific tasks undertaken for this study include the following:

1. Review of the proposed site plan which includes the proposed number of units and desired site access locations.
2. Field reconnaissance of existing roadway and intersection geometrics, traffic controls, and speed limits, and acquisition of traffic signal timing information from RCOC.
3. Collected 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.
4. Identification of the existing AM and PM peak hour traffic volumes at the study intersections.
5. Calculation of the **Existing** vehicle delays, and Levels of Service (LOS), and vehicle queues at the study intersections based on the methodologies of the *Highway Capacity Manual, 2010* using Synchro and SimTraffic, Version 8 traffic analysis software.
6. Calculation of the future background traffic volumes based on an appropriate traffic growth rate to the project build out year and/or any applicable background developments in the vicinity of this project.
7. Calculation of the **Background (without the proposed development)** vehicle delays, LOS, and vehicle queues at the study intersections and identify improvements (if any) that would be required to mitigate any unacceptable background traffic conditions.
8. 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, 9th Edition* and in the *Trip Generation Handbook, 2nd Edition*.
9. Assignment of the trips that would be generated by the proposed development to the adjacent road network based on existing traffic patterns and the proposed site access plan.
10. Combining of the site-generated traffic assignments with the background traffic volumes to establish the Future AM and PM peak hour traffic volumes.
11. Calculation of the **Future (with the proposed development)** vehicle delays, LOS, and vehicle queues at the study intersections and simulate the study network.
12. Evaluation of RCOC and City of Troy standards for right and left turn lanes at the proposed site access locations.
13. Identification of any improvements for the study road and intersection network that would be required to accommodate the site-generated traffic volumes.

Sources of data for this study include traffic counts conducted by Traffic Data Collection, Inc. (TDC), and information provided by the developer, Southeast Michigan Council of Governments (SEMCOG), RCOC, City of Troy, and ITE. All relevant background information is provided in Appendix A.

BACKGROUND DATA

EXISTING ROAD NETWORK

Vehicle transportation to and from the proposed apartment development is provided via Maple Road and Coolidge Highway. The intersections of Maple Road with Coolidge Highway and Maplelawn Drive are traffic signal controlled, while all other study intersections, including the proposed site driveways, are STOP controlled 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).

Maple Road runs in the east and west directions with a posted speed limit of 40 mph. The study section of Maple Road is under the jurisdiction of RCOC and is classified as an Urban Principal Arterial with an average daily traffic (ADT) volume of approximately 29,000 vehicles per day. The study section of Maple Road has a typical five lane cross section with two lanes in each direction and a center lane for left turns.

Coolidge Highway runs in the north and south directions with a posted speed limit of 35 mph. The study section of Coolidge Highway is under City jurisdiction and is classified as an Urban Minor Arterial with an ADT volume of approximately 25,000 vehicles per day. The study section of Coolidge Highway has a two lane Boulevard cross section with indirect left turns provided via directional and bi-directional median crossovers. At its intersection with Maple Road, southbound left turns are prohibited at the intersection and accommodated via a signalized median crossover south of Maple Road.

Maplelawn Drive provides signalized access for several office and commercial developments to the north and south of Maple Road including the Troy Motor Mall. Maplelawn Drive is under City jurisdiction and has a posted speed limit of 35 and 25 mph to the north and south of Maple Road, respectively. Maplelawn Drive is configured as a typical five lane cross section with two lanes in each direction and a center lane for left turns.

Axtell Drive runs in the north and south directions with a posted speed limit of 25 mph and provides unsignalized access to several office and industrial developments to the north and south of Maple Road. Axtell Drive is under City jurisdiction and has a typical two lane cross section with one lane in each direction. At its intersection with Maple Road, the north and south legs of Axtell Drive are offset by approximately 20 feet.

EXISTING TRAFFIC VOLUMES

Existing traffic volume data at the study intersections were collected by F&V traffic subconsultant Traffic Data Collection, Inc. (TDC). Vehicular turning movement count data were collected in 15-minute intervals on January 8th, 2015 between the hours of 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM. Additionally, 24-hour directional approach counts were collected at the intersection of Maple Road & Maplelawn Drive. The existing traffic volume data are included in Appendix A and the existing peak hour volumes are summarized on Figure 3.

The peak hour volumes for each intersection were utilized for this study and the volumes were balanced upward through the study network. At locations where access is provided between study intersections “dummy” intersections were used to account for sink and source volumes, and through volumes were carried along the main study roadways. In general, the peak hours of existing network traffic were identified to occur between 7:45 AM to 8:45 AM and 4:45 PM to 5:45 PM.

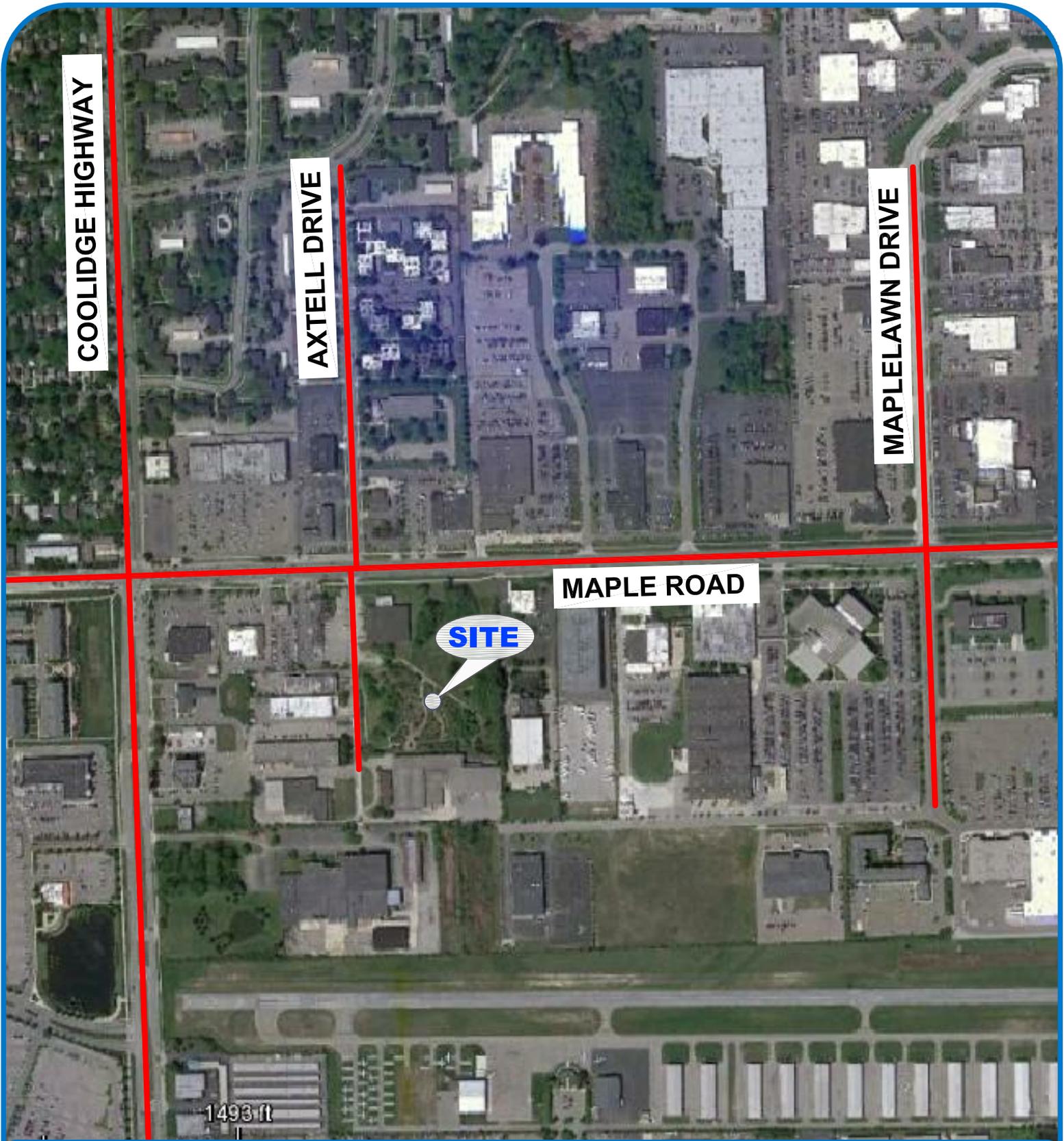


FIGURE 1 SITE LOCATION MAP

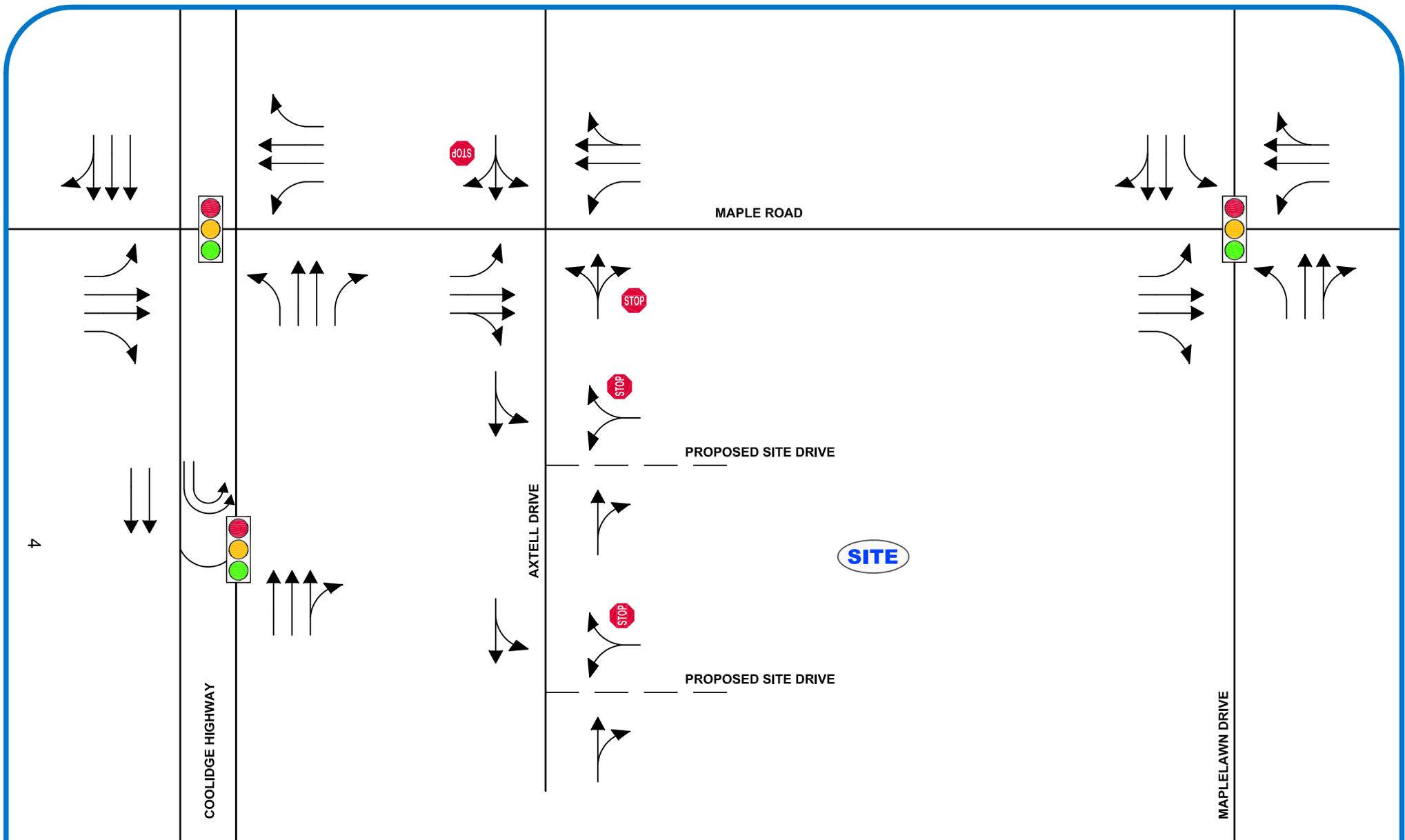
MARK OF TROY APARTMENTS TIS - CITY OF TROY, MI

LEGEND

 SITE LOCATION



NORTH
SCALE: NOT TO SCALE



4



FIGURE 2 LANE USE AND TRAFFIC CONTROL

MARK OF TROY APARTMENTS TIS - CITY OF TROY, MI

LEGEND

-  SIGNALIZED INTERSECTION
-  UNSIGNALIZED INTERSECTION
-  ROADS
-  LANE USE



NORTH
SCALE: NOT TO SCALE

2015

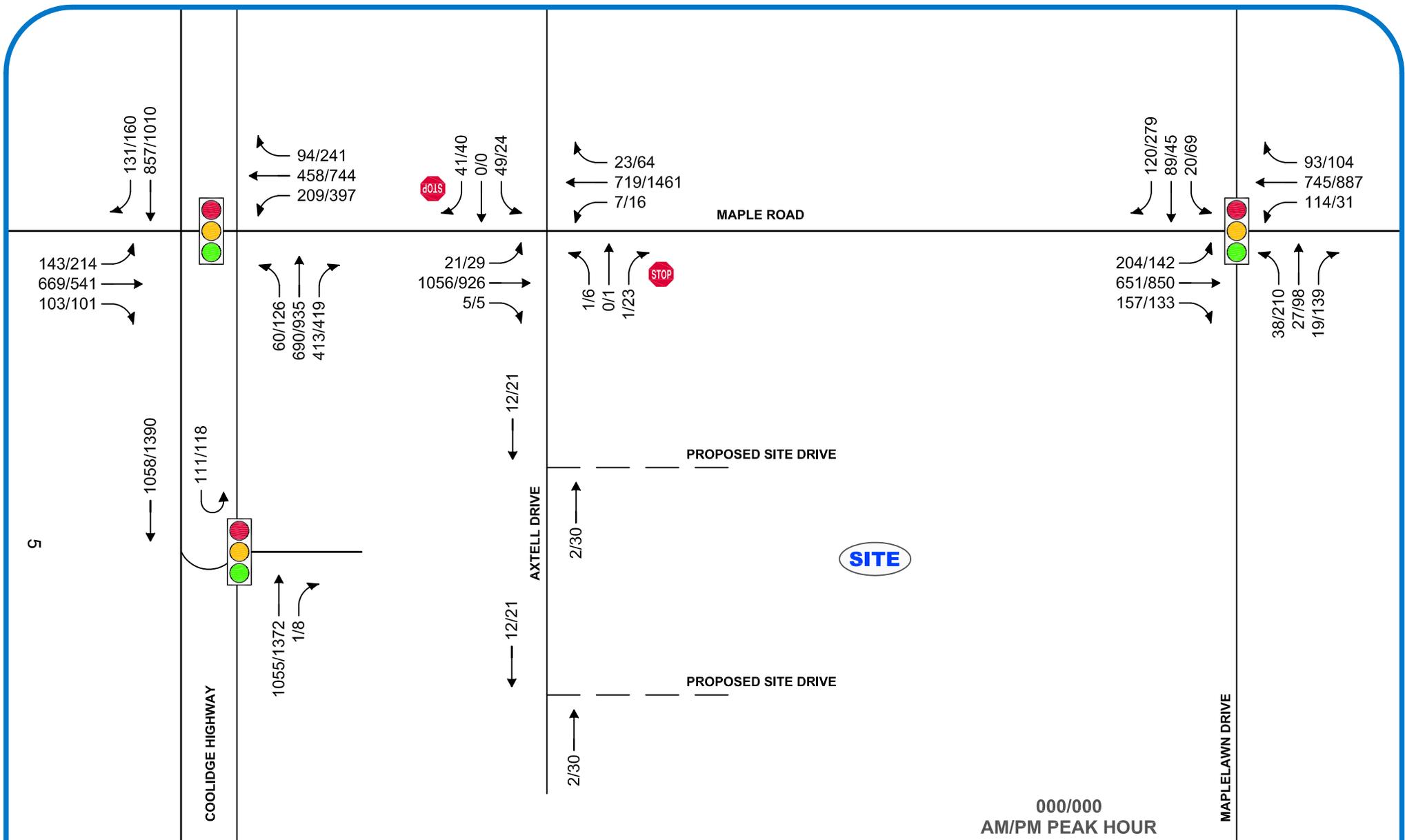


FIGURE 3
EXISTING TRAFFIC VOLUMES
 MARK OF TROY APARTMENTS TIS - CITY OF TROY, MI



LEGEND

-  SIGNALIZED INTERSECTION
 -  UNSIGNALIZED INTERSECTION
 -  TRAFFIC VOLUMES (AM/PM)
 -  ROADS
- 
 NORTH
 SCALE: NOT TO SCALE

ANALYSIS

EXISTING CONDITIONS

Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections using Synchro (Version 8) 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 shown on Figure 3, and the methodologies presented in the Highway Capacity Manual, 2010 (HCM).

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

SimTraffic traffic simulations were also utilized to evaluate existing traffic operations for the study network. The SimTraffic models were calibrated and validated to actual field conditions to ensure accuracy. To complete this process, ten simulations of each peak period were performed and the average of the volumes for each turning movement was reported in the SimTraffic vehicles exited report. These volumes were then compared to actual traffic volumes collected at each intersection and considered validated when the field counts and model results were within the greater of ± 10 percent or ± 20 vehicles.

The signalized study intersections currently operate under SCATS control which is an adaptive traffic control system which responds to allocate green time based on vehicle demands. Existing traffic signal timing information for these intersections was obtained from RCOC; however, the timing plans provided represent the reserve timings for when the SCATS system is not working. The results of the SimTraffic vehicles exited reports indicate that the SimTraffic models are not accurately replicating actual conditions. At the intersection of Maple Road & Coolidge Highway only approximately 65% of the westbound approach volumes are being replicated by the SimTraffic model during the PM peak period. Therefore, in order to more accurately replicate existing traffic operations, the reserve timing plans provided by RCOC were optimized. With the revised timings the SimTraffic model results were within the acceptable range and therefore, validated. The results of the analysis of existing conditions with the optimized timings are shown in Table 1.

The results of the existing conditions analysis indicate that several study intersection approaches and movements currently operate unacceptably. At the intersection of Maple Road & Coolidge Highway, the intersection operates at an overall LOS E during the PM peak hour with several approaches and movements operating at a LOS E or F. In particular, the westbound left turn movement experiences excessive vehicle delay during both peak periods.

At the intersection of Maple Road & Maplelawn Drive, the intersection operates at an overall LOS E during the PM peak period with the minor street approaches of Maplelawn Drive operating at a LOS F. At the unsignalized intersection of Maple Road & Axtell Drive, the minor street approaches currently operate at a LOS E and F during both peak periods.

Review of the network simulations indicates acceptable traffic operations at the intersection of Maple Road & Maplelawn Drive during both peak periods. At the intersection of Maple Road & Coolidge Highway a long vehicle queue is observed for the westbound left turn movement during the PM peak period which extends back past Axtell Drive causing long vehicle queues for the Axtell Drive approaches. Therefore, improvements at the intersection to mitigate traffic operations in the existing condition were investigated.

Table 1
Existing Intersection Operations

Intersection	Control	Approach	AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
1. Maple Road & Coolidge Highway	Signalized	EB	46.3	D	54.8	D
		WB	45.7	D	83.2	F
		NB	42.0	D	44.8	D
		SB	<u>31.4</u>	<u>C</u>	<u>37.3</u>	<u>D</u>
		Overall	41.1	D	55.4	E
2. NB Coolidge Highway & XO S. of Maple Road	Signalized	XO	58.3	E	58.9	E
		NB	<u>2.1</u>	<u>A</u>	<u>2.0</u>	<u>A</u>
		Overall	8.9	A	6.7	A
3. Maple Road & Maplelawn Drive	Signalized	EB	41.9	D	40.6	D
		WB	45.2	D	45.0	D
		NB	57.1	E	110.0	F
		SB	<u>61.5</u>	<u>E</u>	<u>135.2</u>	<u>F</u>
		Overall	45.9	D	66.1	E
4. Maple Road & Axtell Drive	STOP (Minor)	EB LT	9.4	A	15.9	C
		WB LT	10.9	B	10.4	B
		NB	36.7	E	73.4	F
		SB	65.9	F	775.4	F

First, signal timing improvements were investigated but do not sufficiently reduce vehicle delays. Subsequently, geometric improvements were evaluated. The results of this analysis indicate that dual left turn lanes should be constructed on the westbound approach. With dual westbound left turn lanes, all intersection approaches would operate acceptably at a LOS D or better during both peak periods as shown in Table 2. Additionally, review of network simulations indicates improved traffic operations and vehicle queues which are acceptably processed.

Table 2
Existing Intersection Operations With Improvements

Intersection	Control	Approach	AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
1. Maple Road & Coolidge Highway	Signalized	EB	49.9	D	49.1	D
		WB	46.6	D	54.0	D
		NB	36.5	D	44.2	D
		SB	<u>24.2</u>	<u>C</u>	<u>38.3</u>	<u>D</u>
		Overall	38.6	D	46.2	D

BACKGROUND CONDITIONS

In order to determine the applicable traffic growth rate for the existing traffic volumes to project build-out, SEMCOG historical traffic data were referenced. SEMCOG approach data along Maple Road at its intersection with Maplelawn Drive were compared to 24-hour volume approach volumes collected by F&V. The results of this comparison indicate that between 2011 and 2015, 24-hour and peak hour traffic volumes along Maple Road have decreased. Consistent with stagnant traffic growth patterns throughout southeast Michigan, the background growth rate was assumed to be zero percent for this study.

SITE TRIP GENERATION

The number of AM and PM peak hour vehicle trips that would be generated by the proposed apartment development was forecast based on data published by ITE in *Trip Generation, 9th Edition* and the *Trip Generation Handbook, 2nd Edition*. The site trip generation forecast is summarized in Table 3.

Table 3
Site Trip Generation

Land Use	ITE Code	Amount		AM Peak Hour			PM Peak Hour			Average Daily Traffic
				In	Out	Total	In	Out	Total	
Apartments	220	252	Units	25	102	127	101	55	156	1,651

SITE TRAFFIC ASSIGNMENT

The vehicle trips that would be generated by the proposed apartment development were assigned to the study road network based on existing peak hour traffic patterns, the proposed site access plan, and the methodologies published by ITE. This methodology indicates that new trips will return to their direction of origin. Based on these factors, 55% of site traffic is assumed to travel to/from the east, and 45% is assumed to travel to/from the west via Maple Road. New site-generated trips were assigned to the off-site study intersections based on existing turning movement patterns. The site-generated vehicle trips shown on Figure 4 were added to the existing traffic volumes shown on Figure 3 to calculate the future peak hour traffic volumes shown on Figure 5.

FUTURE CONDITIONS

Future peak hour vehicle delays and LOS **with the proposed apartment development** were calculated based on the existing lane use and traffic control shown on Figure 2, the proposed site access plan, the future traffic volumes shown on Figure 5, and the methodologies presented in the HCM. For this analysis, the improvements recommended under existing conditions were assumed complete. Additionally, SimTraffic simulations were utilized to evaluate network operations. The results of the analysis of future conditions are presented in Appendix C and are summarized in Table 4.

The future conditions results indicate that during the AM and PM peak hours the proposed development would not have a significant impact on the signalized study intersections. Future vehicle delays and LOS as shown in Table 4 would be similar to existing conditions and increases in vehicle delay would not be discernable. With the geometric improvements recommended under existing conditions, all approaches at the intersection of Maple Road & Coolidge Highway would continue to operate acceptably during both peak periods. It is important to note that these improvements are required to mitigate existing traffic conditions. The proposed apartment development would account for less than 2% of future peak period traffic volumes at the intersection during both peak hours.

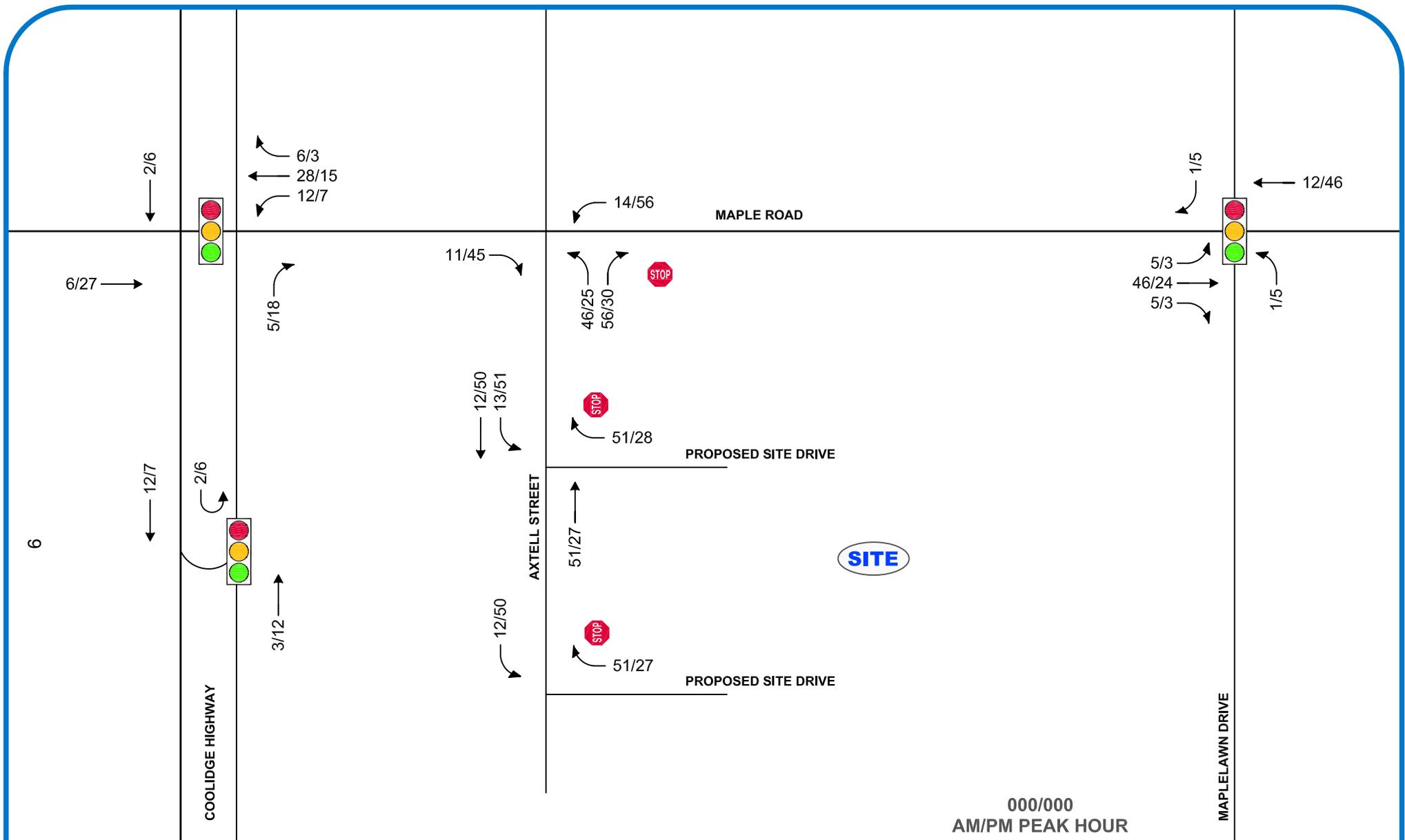


FIGURE 4
SITE-GENERATED TRAFFIC VOLUMES
 MARK OF TROY APARTMENTS TIS- CITY OF TROY, MI

LEGEND

-  SIGNALIZED INTERSECTION
 -  UNSIGNALIZED INTERSECTION
 -  TRAFFIC VOLUMES (AM/PM)
 -  ROADS
- 
 NORTH
 SCALE: NOT TO SCALE

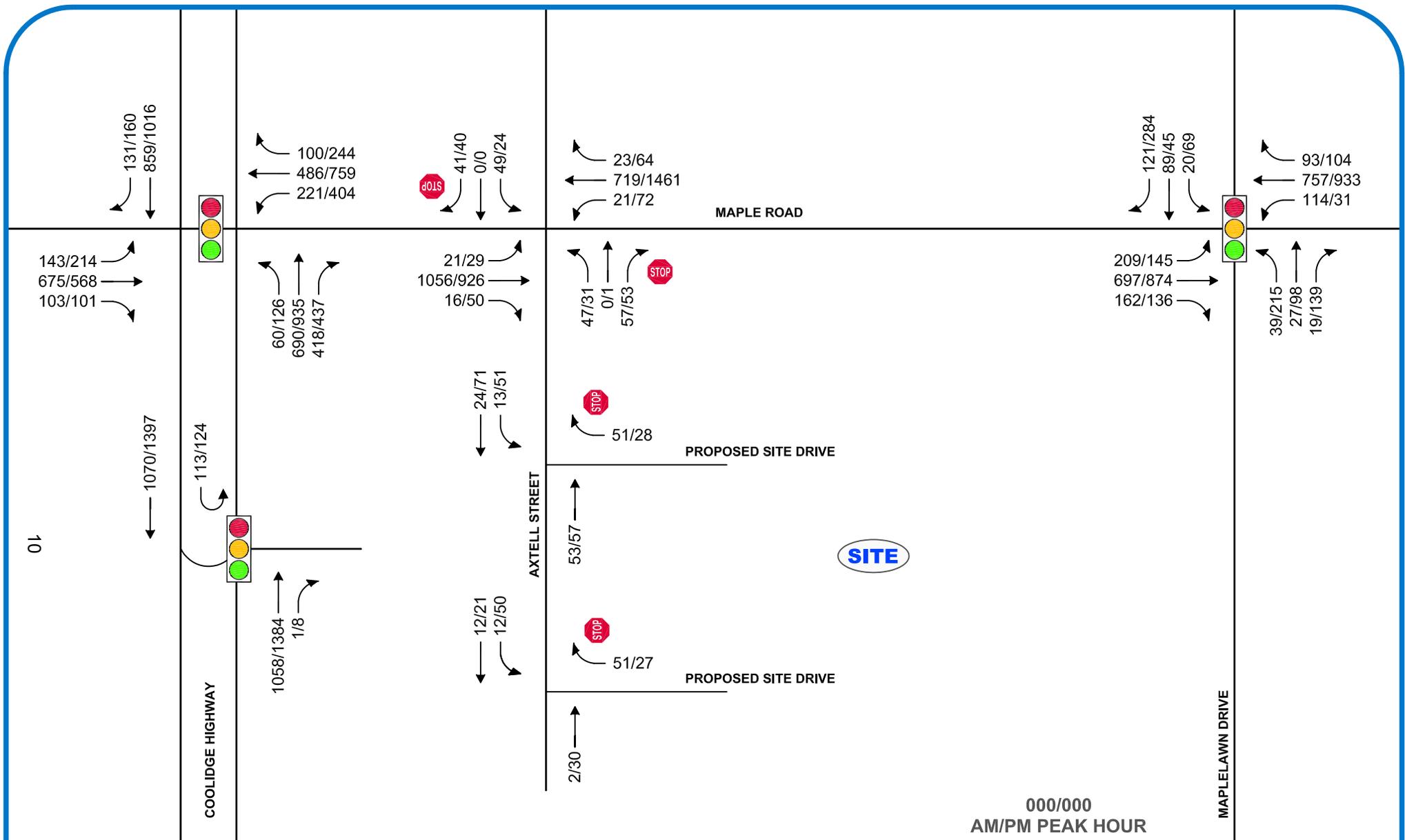


FIGURE 5
FUTURE TRAFFIC VOLUMES
 MARK OF TROY APARTMENTS TIS - CITY OF TROY, MI

LEGEND

-  SIGNALIZED INTERSECTION
 -  UNSIGNALIZED INTERSECTION
 -  TRAFFIC VOLUMES (AM/PM)
 -  ROADS
- 
 NORTH
 SCALE: NOT TO SCALE

Table 4

Future Intersection Operations

			Existing Conditions				Future Conditions			
Intersection	Control	Approach	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. Maple Road & Coolidge Highway	Signalized	EB	49.9	D	49.1	D	49.9	D	49.3	D
		WB	46.6	D	54.0	D	46.5	D	54.7	D
		NB	36.5	D	44.2	D	37.0	D	44.5	D
		SB	<u>24.2</u>	<u>C</u>	<u>38.3</u>	<u>D</u>	<u>24.7</u>	<u>C</u>	<u>38.7</u>	<u>D</u>
		Overall	38.6	D	46.2	D	39.0	D	46.7	D
2. NB Coolidge Highway & XO S. of Maple Road	Signalized	XO	58.3	E	58.9	E	58.2	E	58.8	E
		NB	<u>2.1</u>	<u>A</u>	<u>2.0</u>	<u>A</u>	<u>2.1</u>	<u>A</u>	<u>2.0</u>	<u>A</u>
		Overall	8.9	A	6.7	A	9.0	A	6.9	A
3. Maple Road & Maplelawn Drive	Signalized	EB	41.9	D	40.6	D	41.0	D	40.2	D
		WB	45.2	D	45.0	D	45.1	D	44.0	D
		NB	57.1	E	110.0	F	57.1	E	115.8	F
		SB	<u>61.5</u>	<u>E</u>	<u>135.2</u>	<u>F</u>	<u>61.6</u>	<u>E</u>	<u>140.7</u>	<u>F</u>
		Overall	45.9	D	66.1	E	45.4	D	66.9	E
4. Maple Road & Axtell Drive	STOP (Minor)	EB LT	9.4	A	15.9	C	9.4	A	15.9	C
		WB LT	10.9	B	10.4	B	11.1	B	11.3	B
		NB	36.7	E	73.4	F	317.9	F	908.0	F
		SB	65.9	F	775.4	F	121.0	F	1313.1	F
5. Axtell Drive & N. Site Drive	STOP (Minor)	WB					8.9	A	8.9	A
		NB					Free	Free		
		SB LT					7.4	A	7.5	A
6. Axtell Drive & S. Site Drive	STOP (Minor)	WB					8.5	A	8.6	A
		NB					Free	Free		
		SB LT					7.2	A	7.4	A

At the proposed site driveways to Axtell Drive all movements and approaches will operate acceptably at a LOS A during both peak periods; however, at the unsignalized intersection of Maple Road & Axtell Drive, the northbound and southbound minor street approaches will operate at a LOS F with excessive vehicle delays. At the intersection of Maple Road & Axtell Drive, long vehicle queues are observed on the northbound and southbound approaches during the PM peak period. The northbound approach queue is observed to extend back past the site driveways blocking site ingress and egress.

Therefore, the applicable traffic signal warrants outlined in the *Michigan Manual on Uniform Traffic Control Devices (MMUTCD)* were evaluated. The future traffic forecast for this study includes traffic volumes for only two hours (AM and PM peak hours). Therefore, Warrant 3 (Peak-Hour) was evaluated. The results of the warrant analysis indicate that a traffic signal would be warranted for the intersection. In order for a traffic signal to be installed at this location, the northbound Axtell Drive approach should be realigned to line up with the opposing Axtell Drive approach and should be widened to provide two approach lanes. With signalization of the Axtell Drive approach, all approaches and movements would operate acceptably at a LOS D or better except the southbound approach which would operate at a LOS E during the PM peak period; however review of the network simulations indicates vehicle queues which are acceptably processed.

Table 5
Future Intersection Operations With Improvements

Intersection	Control	Approach	AM Peak		PM Peak	
			Delay (s/veh)	LOS	Delay (s/veh)	LOS
4. Maple Road & Axtell Drive	Signalized	EB	0.7	A	10.2	B
		WB	0.4	A	1.6	A
		NB	49.4	D	53.4	D
		SB	<u>54.9</u>	<u>D</u>	<u>57.3</u>	<u>E</u>
		Overall	7.0	A	8.3	A

CONCLUSIONS

The conclusions of this Traffic Impact Study (TIS) are as follows:

1. The peak hours of existing network traffic occur between 7:45 AM and 8:45 AM and 4:45 PM to 5:45 PM.
2. The intersection of Maple Road & Coolidge Highway currently operates at an overall LOS E during the PM peak period with several approaches and movements operating at a LOS E or F.
3. At the intersection of Maple Road & Mapelawn Drive, the intersection operates at an overall LOS E with the minor street approaches operating at a LOS F during the PM peak hour. However, network simulations indicate acceptable traffic operations for these approaches and vehicle queues are observed to be acceptably processed.
4. At the intersection of Maple Road & Axtell Drive, the minor street approaches currently operate at a LOS E or F during both peak periods.
5. With the proposed existing improvements below, all approaches at the intersection of Maple Road & Coolidge Highway would operate acceptably at a LOS D or better.
6. The analysis of future conditions **with the proposed development** indicates that the signalized study intersection approaches and movements would continue to operate in a manner similar to existing conditions.
7. At the intersection of Maple Road & Axtell Drive, long vehicle queues are observed on the northbound and southbound approaches during the PM peak period.
8. With signalization the intersection of Maple Road & Axtell Drive will operate acceptably.

RECOMMENDATIONS

The following are recommended based on the results of this TIS:

Existing Conditions

1. Construct dual westbound left turn lanes at the intersection of Maple Road & Coolidge Highway.

Future Conditions

1. Align the northbound and southbound approaches of Axtell Drive.
2. Install 2-phase actuated-coordinated traffic signal at the intersection of Maple Road & Axtell Drive.
3. Provide two lanes on the northbound approach of Axtell Drive.

Appendix A

Background Information

**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy. Dry, Temp.10's
Count By: Miovision Video VCU 340

File Name : TMC_1 Maple&Coolidge
Site Code : TMC_1
Start Date : 1/8/2015
Page No : 1

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

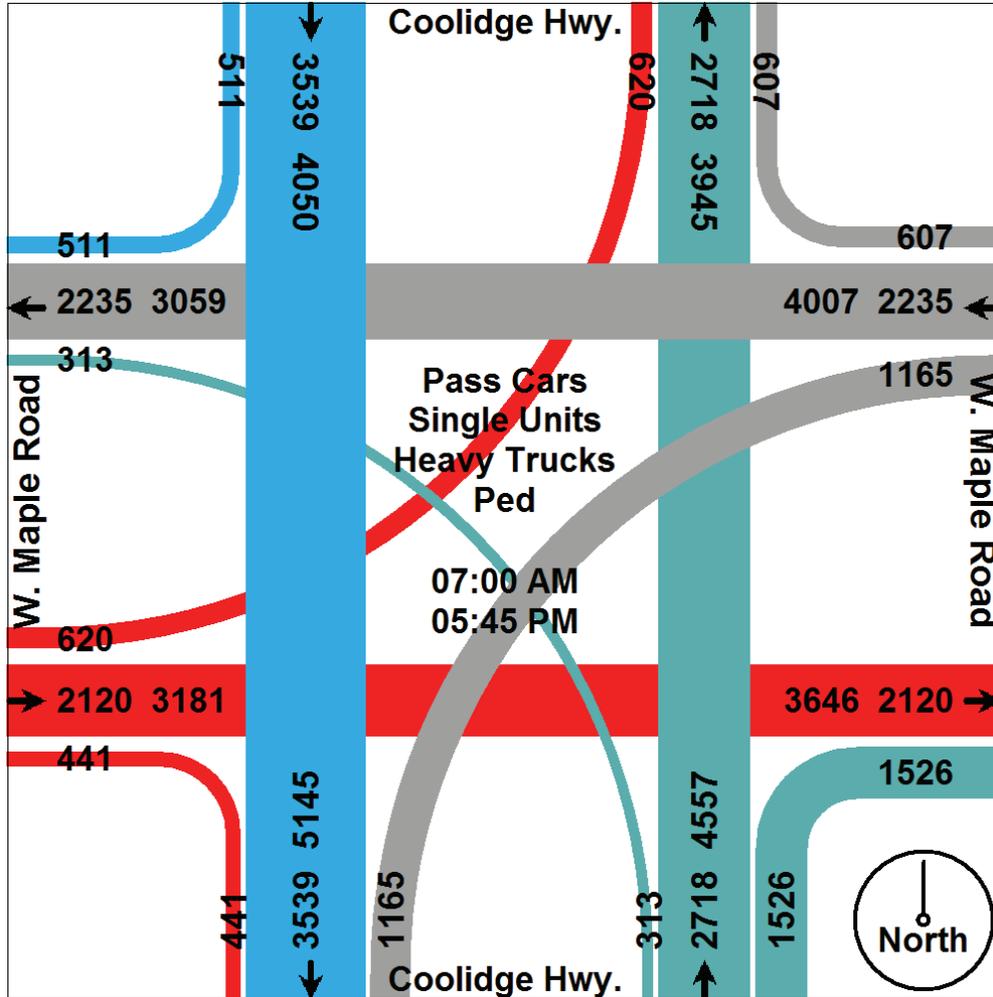
Start Time	Coolidge Hwy. Southbound					W. Maple Road Westbound					Coolidge Hwy. Northbound					W. Maple Road Eastbound					Int. Total
	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	
07:00 AM	12	172	0	0	184	14	57	40	1	112	56	46	4	0	106	16	84	16	1	117	519
07:15 AM	18	227	0	0	245	11	93	49	0	153	84	74	7	0	165	21	107	14	0	142	705
07:30 AM	37	276	0	1	314	15	107	59	0	181	87	98	8	0	193	32	117	25	0	174	862
07:45 AM	34	236	0	0	270	26	120	66	0	212	128	173	14	0	315	26	160	37	0	223	1020
Total	101	911	0	1	1013	66	377	214	1	658	355	391	33	0	779	95	468	92	1	656	3106
08:00 AM	37	230	0	0	267	21	89	55	1	166	91	167	10	0	268	23	167	44	0	234	935
08:15 AM	26	173	0	1	200	24	118	34	0	176	102	192	17	0	311	30	181	31	2	244	931
08:30 AM	34	218	0	0	252	23	119	54	0	196	86	147	18	0	251	24	137	31	0	192	891
08:45 AM	31	211	0	0	242	35	111	51	0	197	82	144	15	0	241	32	143	35	0	210	890
Total	128	832	0	1	961	103	437	194	1	735	361	650	60	0	1071	109	628	141	2	880	3647
**** BREAK ****																					
04:00 PM	29	202	0	0	231	44	152	93	0	289	113	210	34	0	357	32	115	32	0	179	1056
04:15 PM	25	204	0	0	229	45	148	91	0	284	96	204	20	0	320	36	124	39	2	201	1034
04:30 PM	41	204	0	0	245	52	189	101	0	342	104	202	22	0	328	29	117	46	0	192	1107
04:45 PM	39	209	0	0	248	56	190	99	0	345	99	237	36	0	372	29	127	34	0	190	1155
Total	134	819	0	0	953	197	679	384	0	1260	412	853	112	0	1377	126	483	151	2	762	4352
05:00 PM	37	269	0	0	306	79	189	109	0	377	102	204	28	0	334	31	130	57	0	218	1235
05:15 PM	47	294	0	0	341	48	185	87	0	320	107	244	32	0	383	24	142	58	0	224	1268
05:30 PM	37	238	0	0	275	58	180	102	0	340	95	213	25	1	334	17	134	65	0	216	1165
05:45 PM	27	176	0	0	203	56	188	75	0	319	94	163	23	0	280	39	135	56	0	230	1032
Total	148	977	0	0	1125	241	742	373	0	1356	398	824	108	1	1331	111	541	236	0	888	4700
Grand Total	511	3539	0	2	4052	607	2235	1165	2	4009	1526	2718	313	1	4558	441	2120	620	5	3186	15805
Approch %	12.6	87.3	0	0		15.1	55.7	29.1	0		33.5	59.6	6.9	0		13.8	66.5	19.5	0.2		
Total %	3.2	22.4	0	0	25.6	3.8	14.1	7.4	0	25.4	9.7	17.2	2	0	28.8	2.8	13.4	3.9	0	20.2	
Pass Cars	490	3514	0	0	4004	589	2208	1141	0	3938	1487	2694	303	0	4484	436	2090	603	0	3129	15555
% Pass Cars	95.9	99.3	0	0	98.8	97	98.8	97.9	0	98.2	97.4	99.1	96.8	0	98.4	98.9	98.6	97.3	0	98.2	98.4
Single Units	19	17	0	0	36	15	26	18	0	59	32	19	10	0	61	5	27	17	0	49	205
% Single Units	3.7	0.5	0	0	0.9	2.5	1.2	1.5	0	1.5	2.1	0.7	3.2	0	1.3	1.1	1.3	2.7	0	1.5	1.3
Heavy Trucks	2	8	0	0	10	3	1	6	0	10	7	5	0	0	12	0	3	0	0	3	35
% Heavy Trucks	0.4	0.2	0	0	0.2	0.5	0	0.5	0	0.2	0.5	0.2	0	0	0.3	0	0.1	0	0	0.1	0.2
Ped	0	0	0	2	2	0	0	0	2	2	0	0	0	1	1	0	0	0	5	5	10
% Ped	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0	0	0	0	100	0.2	0.1

Comments: Traffic study conducted during atypical weekday (Thursday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. SCATS Signalized intersection with push botton ped. signals all quadrants. SB Left turns are prohibited.

**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
 Location: Maple Road Study
 Weather: Cldy. Dry, Temp. 10's
 Count By: Miovision Video VCU 340

File Name : TMC_1 Maple&Coolidge
 Site Code : TMC_1
 Start Date : 1/8/2015
 Page No : 2

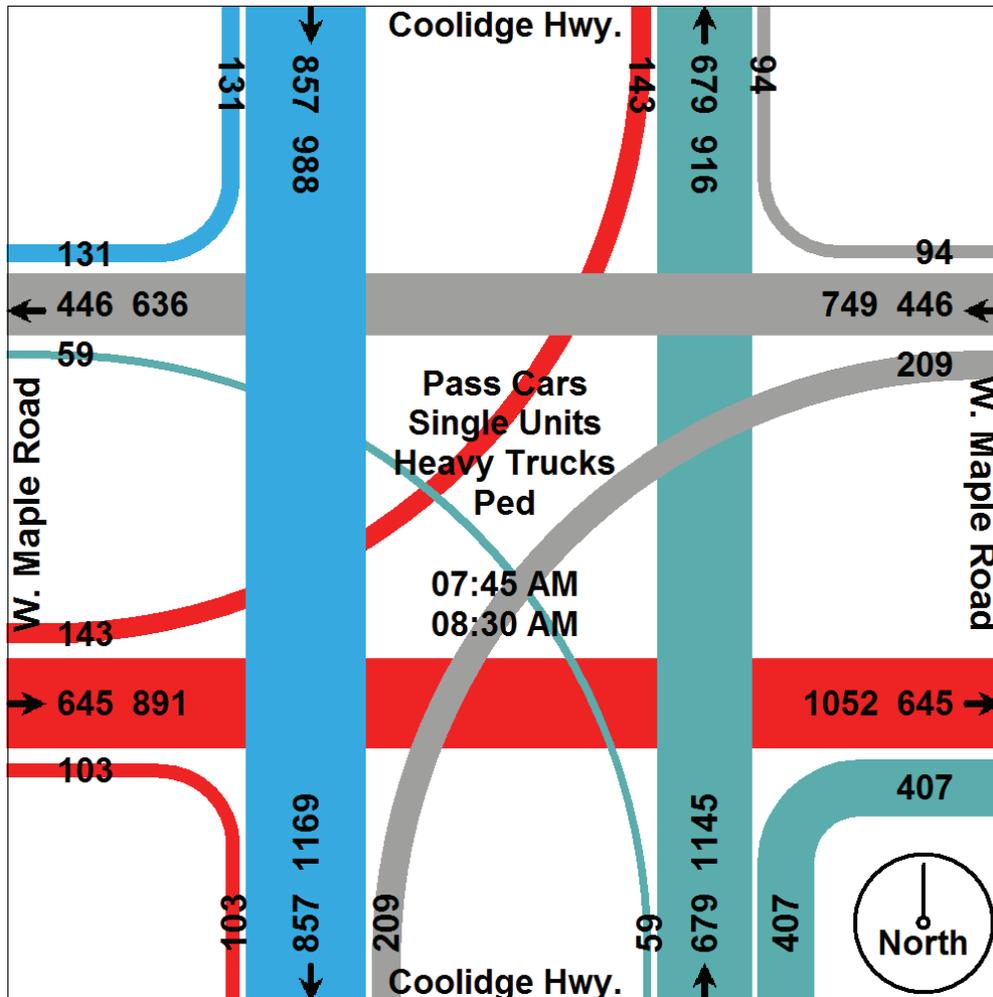


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: Miovision Video VCU 340

File Name : TMC_1 Maple&Coolidge
Site Code : TMC_1
Start Date : 1/8/2015
Page No : 3

Start Time	Coolidge Hwy. Southbound				W. Maple Road Westbound				Coolidge Hwy. Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	34	236	0	270	26	120	66	212	128	173	14	315	26	160	37	223	1020
08:00 AM	37	230	0	267	21	89	55	165	91	167	10	268	23	167	44	234	934
08:15 AM	26	173	0	199	24	118	34	176	102	192	17	311	30	181	31	242	928
08:30 AM	34	218	0	252	23	119	54	196	86	147	18	251	24	137	31	192	891
Total Volume	131	857	0	988	94	446	209	749	407	679	59	1145	103	645	143	891	3773
% App. Total	13.3	86.7	0		12.6	59.5	27.9		35.5	59.3	5.2		11.6	72.4	16		
PHF	.885	.908	.000	.915	.904	.929	.792	.883	.795	.884	.819	.909	.858	.891	.813	.920	.925
Pass Cars	124	846	0	970	89	434	204	727	398	671	53	1122	101	634	140	875	3694
% Pass Cars	94.7	98.7	0	98.2	94.7	97.3	97.6	97.1	97.8	98.8	89.8	98.0	98.1	98.3	97.9	98.2	97.9
Single Units	5	7	0	12	5	12	4	21	7	6	6	19	2	9	3	14	66
% Single Units	3.8	0.8	0	1.2	5.3	2.7	1.9	2.8	1.7	0.9	10.2	1.7	1.9	1.4	2.1	1.6	1.7
Heavy Trucks	2	4	0	6	0	0	1	1	2	2	0	4	0	2	0	2	13
% Heavy Trucks	1.5	0.5	0	0.6	0	0	0.5	0.1	0.5	0.3	0	0.3	0	0.3	0	0.2	0.3
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

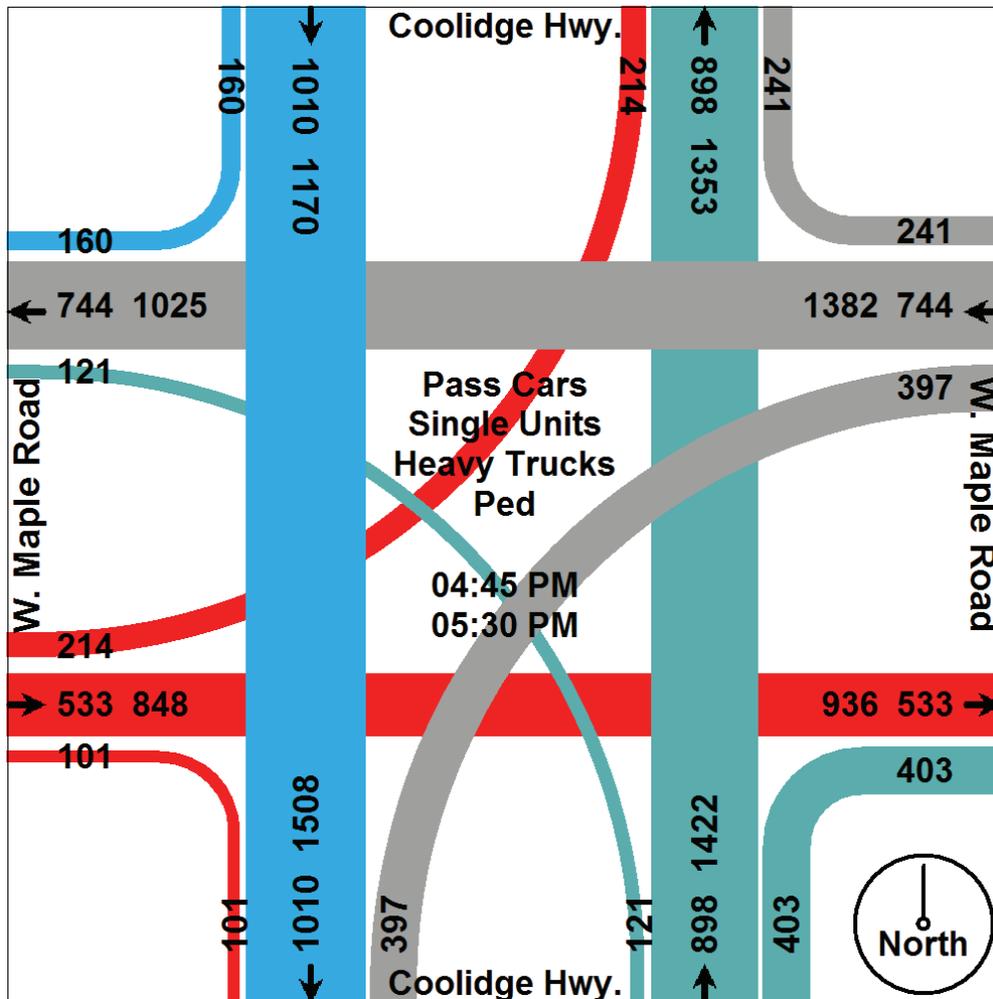


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: Miovision Video VCU 340

File Name : TMC_1 Maple&Coolidge
Site Code : TMC_1
Start Date : 1/8/2015
Page No : 4

Start Time	Coolidge Hwy. Southbound				W. Maple Road Westbound				Coolidge Hwy. Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	39	209	0	248	56	190	99	345	99	237	36	372	29	127	34	190	1155
05:00 PM	37	269	0	306	79	189	109	377	102	204	28	334	31	130	57	218	1235
05:15 PM	47	294	0	341	48	185	87	320	107	244	32	383	24	142	58	224	1268
05:30 PM	37	238	0	275	58	180	102	340	95	213	25	333	17	134	65	216	1164
Total Volume	160	1010	0	1170	241	744	397	1382	403	898	121	1422	101	533	214	848	4822
% App. Total	13.7	86.3	0		17.4	53.8	28.7		28.3	63.2	8.5		11.9	62.9	25.2		
PHF	.851	.859	.000	.858	.763	.979	.911	.916	.942	.920	.840	.928	.815	.938	.823	.946	.951
Pass Cars	156	1008	0	1164	237	741	395	1373	398	896	121	1415	101	526	210	837	4789
% Pass Cars	97.5	99.8	0	99.5	98.3	99.6	99.5	99.3	98.8	99.8	100	99.5	100	98.7	98.1	98.7	99.3
Single Units	4	2	0	6	4	3	0	7	4	2	0	6	0	7	4	11	30
% Single Units	2.5	0.2	0	0.5	1.7	0.4	0	0.5	1.0	0.2	0	0.4	0	1.3	1.9	1.3	0.6
Heavy Trucks	0	0	0	0	0	0	2	2	1	0	0	1	0	0	0	0	3
% Heavy Trucks	0	0	0	0	0	0	0.5	0.1	0.2	0	0	0.1	0	0	0	0	0.1
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: GH Board #22

File Name : TMC_2 CoolidgeXO_S Maple
Site Code : TMC_2
Start Date : 1/8/2015
Page No : 1

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

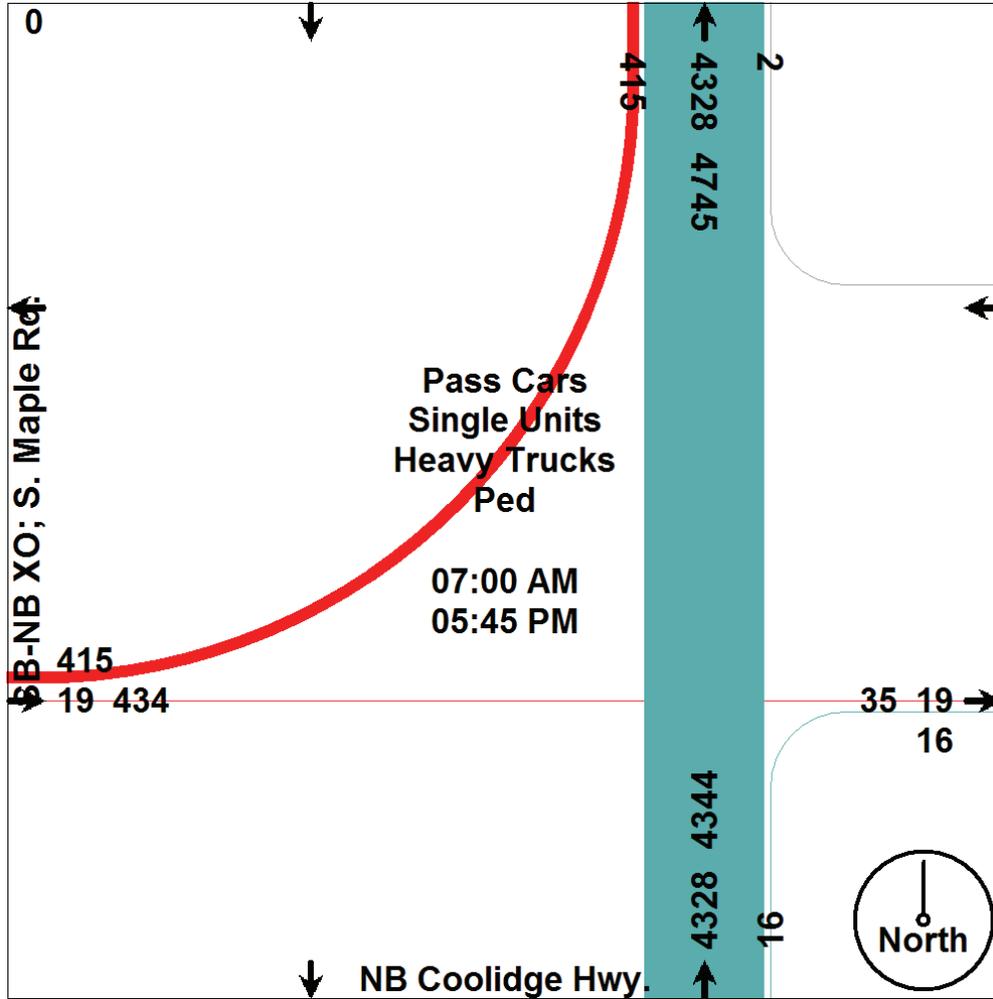
Start Time	Southbound					Westbound					NB Coolidge Hwy. Northbound					SB-NB XO					Int. Total
	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	
07:00 AM	0	0	0	0	0	0	0	0	1	1	0	100	0	0	100	0	0	13	0	13	114
07:15 AM	0	0	0	0	0	0	0	0	1	1	0	136	0	0	136	0	0	15	0	15	152
07:30 AM	0	0	0	0	0	0	0	0	0	0	1	175	0	0	176	0	0	22	0	22	198
07:45 AM	0	0	0	0	0	0	0	0	0	0	0	259	0	0	259	0	2	41	0	43	302
Total	0	0	0	0	0	0	0	0	2	2	1	670	0	0	671	0	2	91	0	93	766
08:00 AM	0	0	0	0	0	0	0	0	0	0	1	254	0	0	255	0	0	27	0	27	282
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	309	0	0	309	0	0	18	0	18	327
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	233	0	0	233	0	1	22	0	23	256
08:45 AM	0	0	0	0	0	0	0	0	0	0	1	219	0	0	220	0	1	25	0	26	246
Total	0	0	0	0	0	0	0	0	0	0	2	1015	0	0	1017	0	2	92	0	94	1111
**** BREAK ****																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	339	0	0	339	0	0	26	0	26	365
04:15 PM	0	0	0	0	0	0	0	0	1	1	2	326	0	0	328	0	3	26	0	29	358
04:30 PM	0	0	0	0	0	0	0	0	0	0	2	322	0	0	324	0	2	31	0	33	357
04:45 PM	0	0	0	0	0	0	0	0	2	2	3	353	0	0	356	0	6	22	0	28	386
Total	0	0	0	0	0	0	0	0	3	3	7	1340	0	0	1347	0	11	105	0	116	1466
05:00 PM	0	0	0	0	0	2	0	0	0	2	2	334	0	0	336	0	2	27	0	29	367
05:15 PM	0	0	0	0	0	0	0	0	0	0	1	338	0	0	339	0	0	27	0	27	366
05:30 PM	0	0	0	0	0	0	0	0	0	0	2	347	0	0	349	0	2	32	0	34	383
05:45 PM	0	0	0	0	0	0	0	0	0	0	1	284	0	0	285	0	0	41	0	41	326
Total	0	0	0	0	0	2	0	0	0	2	6	1303	0	0	1309	0	4	127	0	131	1442
Grand Total	0	0	0	0	0	2	0	0	5	7	16	4328	0	0	4344	0	19	415	0	434	4785
Approch %	0	0	0	0	0	28.6	0	0	71.4	0	0.4	99.6	0	0	0	0	4.4	95.6	0	0	
Total %	0	0	0	0	0	0	0	0	0.1	0.1	0.3	90.4	0	0	90.8	0	0.4	8.7	0	9.1	
Pass Cars	0	0	0	0	0	2	0	0	5	7	16	4262	0	0	4278	0	19	407	0	426	4711
% Pass Cars	0	0	0	0	0	100	0	0	100	100	100	98.5	0	0	98.5	0	100	98.1	0	98.2	98.5
Single Units	0	0	0	0	0	0	0	0	0	0	0	53	0	0	53	0	0	8	0	8	61
% Single Units	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0	1.2	0	0	1.9	0	1.8	1.3
Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	13	0	0	13	0	0	0	0	0	13
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0.3	0	0	0	0	0	0.3
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments: Traffic study conducted during atypical weekday (Thursday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. Signalized intersection, no ped. signals.

**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
 Location: Maple Road Study
 Weather: Cldy, Dry, Temp. 10's
 Count By: GH Board #22

File Name : TMC_2 CoolidgeXO_S Maple
 Site Code : TMC_2
 Start Date : 1/8/2015
 Page No : 2

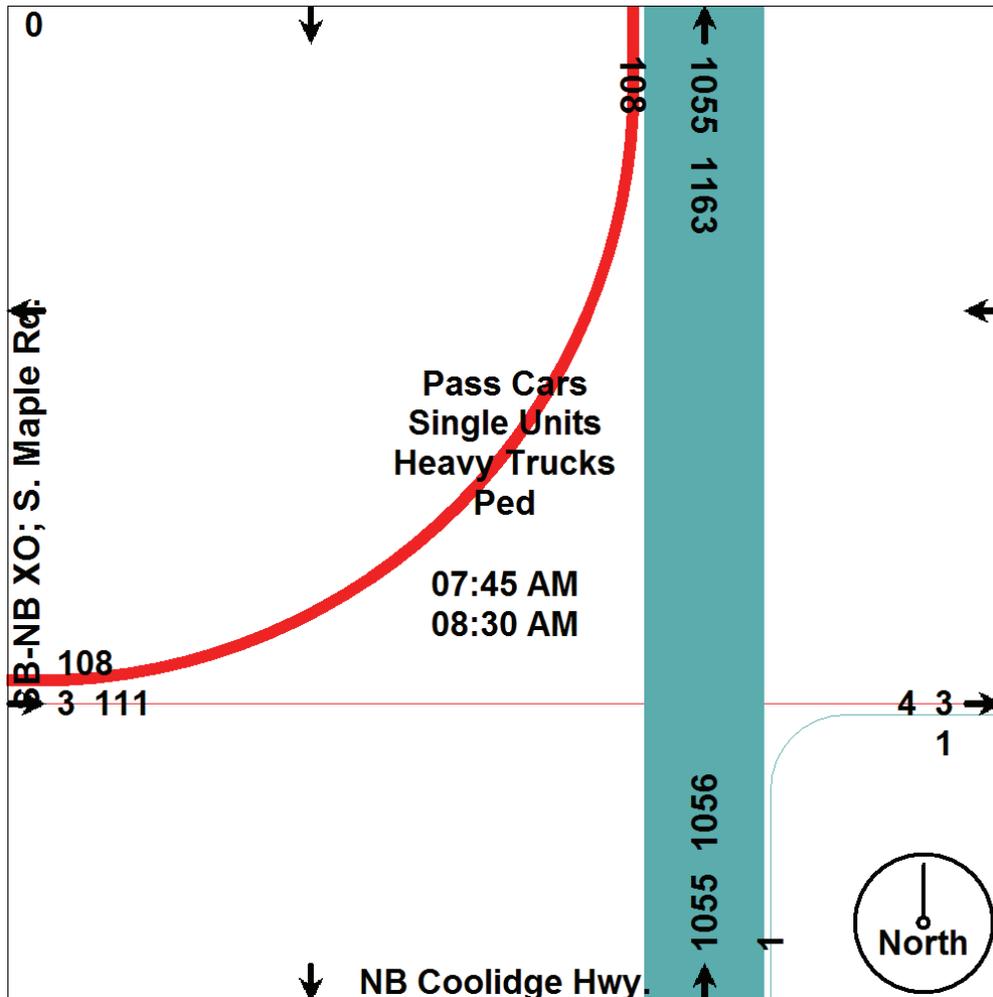


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: GH Board #22

File Name : TMC_2 CoolidgeXO_S Maple
Site Code : TMC_2
Start Date : 1/8/2015
Page No : 3

Start Time	Southbound				Westbound				NB Coolidge Hwy. Northbound				SB-NB XO				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	0	0	0	0	0	0	0	0	0	259	0	259	0	2	41	43	302
08:00 AM	0	0	0	0	0	0	0	0	1	254	0	255	0	0	27	27	282
08:15 AM	0	0	0	0	0	0	0	0	0	309	0	309	0	0	18	18	327
08:30 AM	0	0	0	0	0	0	0	0	0	233	0	233	0	1	22	23	256
Total Volume	0	0	0	0	0	0	0	0	1	1055	0	1056	0	3	108	111	1167
% App. Total	0	0	0	0	0	0	0	0	0.1	99.9	0	100.0	0	2.7	97.3	100.0	100.0
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.250	.854	.000	.854	.000	.375	.659	.645	.892
Pass Cars	0	0	0	0	0	0	0	0	1	1036	0	1037	0	3	106	109	1146
% Pass Cars	0	0	0	0	0	0	0	0	100	98.2	0	98.2	0	100	98.1	98.2	98.2
Single Units	0	0	0	0	0	0	0	0	0	14	0	14	0	0	2	2	16
% Single Units	0	0	0	0	0	0	0	0	0	1.3	0	1.3	0	0	1.9	1.8	1.4
Heavy Trucks	0	0	0	0	0	0	0	0	0	5	0	5	0	0	0	0	5
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0.4
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

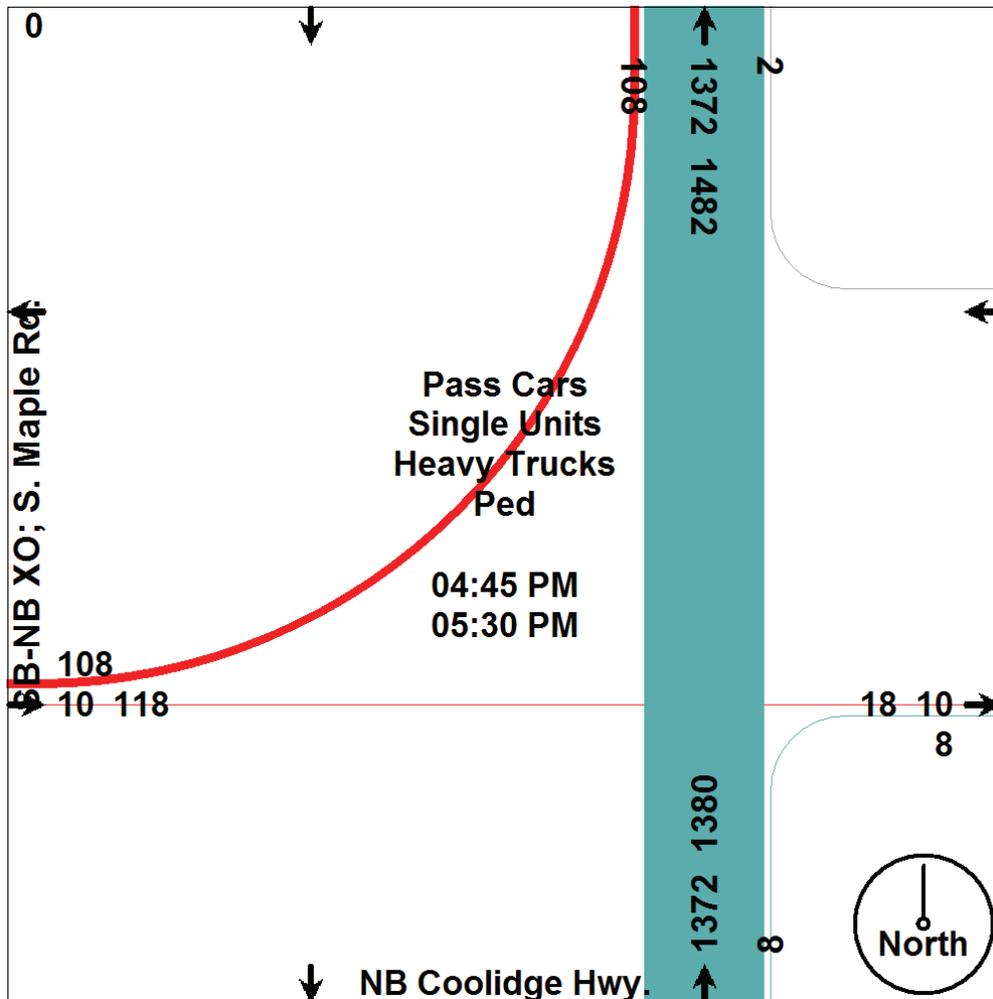


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: GH Board #22

File Name : TMC_2 CoolidgeXO_S Maple
Site Code : TMC_2
Start Date : 1/8/2015
Page No : 4

Start Time	Southbound				Westbound				NB Coolidge Hwy. Northbound				SB-NB XO				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	0	0	0	0	0	0	0	3	353	0	356	0	6	22	28	384
05:00 PM	0	0	0	0	2	0	0	2	2	334	0	336	0	2	27	29	367
05:15 PM	0	0	0	0	0	0	0	0	1	338	0	339	0	0	27	27	366
05:30 PM	0	0	0	0	0	0	0	0	2	347	0	349	0	2	32	34	383
Total Volume	0	0	0	0	2	0	0	2	8	1372	0	1380	0	10	108	118	1500
% App. Total	0	0	0	0	100	0	0	100	0.6	99.4	0	99.4	0	8.5	91.5	91.5	99.4
PHF	.000	.000	.000	.000	.250	.000	.000	.250	.667	.972	.000	.969	.000	.417	.844	.868	.977
Pass Cars	0	0	0	0	2	0	0	2	8	1364	0	1372	0	10	107	117	1491
% Pass Cars	0	0	0	0	100	0	0	100	100	99.4	0	99.4	0	100	99.1	99.2	99.4
Single Units	0	0	0	0	0	0	0	0	0	7	0	7	0	0	1	1	8
% Single Units	0	0	0	0	0	0	0	0	0	0.5	0	0.5	0	0	0.9	0.8	0.5
Heavy Trucks	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.1
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
 Location: Maple Road Study
 Weather: Cldy, Dry, Temp.10's
 Count By: DMM Board #21

File Name : TMC_3 Maple&Axtell
 Site Code : TMC_3
 Start Date : 1/8/2015
 Page No : 1

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

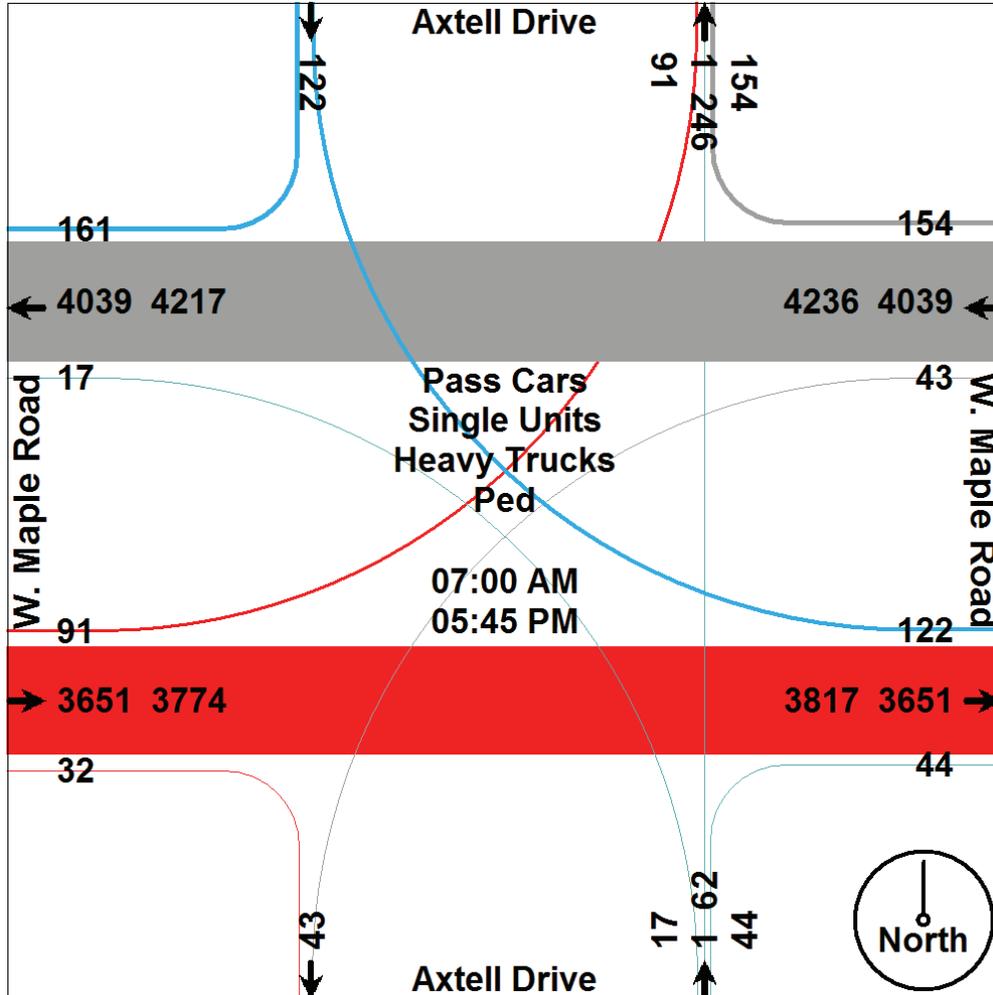
Start Time	Axtell Drive Southbound					W. Maple Road Westbound					Axtell Drive Northbound					W. Maple Road Eastbound					Int. Total
	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	
07:00 AM	3	0	4	0	7	2	112	1	0	115	0	0	0	0	0	0	129	3	0	132	254
07:15 AM	15	0	6	1	22	4	130	1	0	135	0	0	0	0	0	2	173	2	0	177	334
07:30 AM	11	0	7	0	18	3	187	1	0	191	0	0	1	0	1	4	190	7	0	201	411
07:45 AM	11	0	11	0	22	5	176	1	0	182	0	0	0	0	0	3	283	2	0	288	492
Total	40	0	28	1	69	14	605	4	0	623	0	0	1	0	1	9	775	14	0	798	1491
08:00 AM	8	0	15	0	23	7	184	3	0	194	0	0	0	0	0	1	262	5	0	268	485
08:15 AM	8	0	10	0	18	6	172	0	0	178	1	0	1	0	2	0	265	8	0	273	471
08:30 AM	14	0	13	0	27	5	187	3	0	195	0	0	0	0	0	1	246	6	0	253	475
08:45 AM	18	0	9	0	27	7	197	4	0	208	0	0	0	0	0	1	241	1	0	243	478
Total	48	0	47	0	95	25	740	10	0	775	1	0	1	0	2	3	1014	20	0	1037	1909
**** BREAK ****																					
04:00 PM	9	0	8	0	17	13	293	2	0	308	7	0	3	0	10	2	249	11	0	262	597
04:15 PM	11	0	4	0	15	9	300	4	0	313	7	0	2	0	9	5	208	4	0	217	554
04:30 PM	10	0	8	0	18	12	370	2	0	384	4	0	3	0	7	1	255	6	0	262	671
04:45 PM	15	0	8	0	23	7	322	2	0	331	8	1	2	0	11	1	202	5	0	208	573
Total	45	0	28	0	73	41	1285	10	0	1336	26	1	10	0	37	9	914	26	0	949	2395
05:00 PM	11	0	4	1	16	23	408	7	0	438	8	0	1	0	9	1	236	10	0	247	710
05:15 PM	4	0	4	1	9	22	361	5	0	388	3	0	0	0	3	2	233	8	0	243	643
05:30 PM	8	0	5	1	14	14	325	2	0	341	2	0	2	1	5	5	252	7	0	264	624
05:45 PM	5	0	6	0	11	15	315	5	0	335	4	0	2	0	6	3	227	6	0	236	588
Total	28	0	19	3	50	74	1409	19	0	1502	17	0	5	1	23	11	948	31	0	990	2565
Grand Total	161	0	122	4	287	154	4039	43	0	4236	44	1	17	1	63	32	3651	91	0	3774	8360
Approch %	56.1	0	42.5	1.4		3.6	95.3	1	0		69.8	1.6	27	1.6		0.8	96.7	2.4	0		
Total %	1.9	0	1.5	0	3.4	1.8	48.3	0.5	0	50.7	0.5	0	0.2	0	0.8	0.4	43.7	1.1	0	45.1	
Pass Cars	160	0	118	4	282	152	3987	40	0	4179	36	1	17	1	55	30	3603	86	0	3719	8235
% Pass Cars	99.4	0	96.7	100	98.3	98.7	98.7	93	0	98.7	81.8	100	100	100	87.3	93.8	98.7	94.5	0	98.5	98.5
Single Units	1	0	4	0	5	2	42	2	0	46	2	0	0	0	2	1	37	3	0	41	94
% Single Units	0.6	0	3.3	0	1.7	1.3	1	4.7	0	1.1	4.5	0	0	0	3.2	3.1	1	3.3	0	1.1	1.1
Heavy Trucks	0	0	0	0	0	0	10	1	0	11	6	0	0	0	6	1	11	2	0	14	31
% Heavy Trucks	0	0	0	0	0	0	0.2	2.3	0	0.3	13.6	0	0	0	9.5	3.1	0.3	2.2	0	0.4	0.4
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Comments: Traffic study conducted during atypical weekday (Thursday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. Signalized intersection with ped. signals all quadrants. Push buttons for south & north legs.

**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
 Location: Maple Road Study
 Weather: Cldy. Dry, Temp. 10's
 Count By: DMM Board #21

File Name : TMC_3 Maple&Axtell
 Site Code : TMC_3
 Start Date : 1/8/2015
 Page No : 2

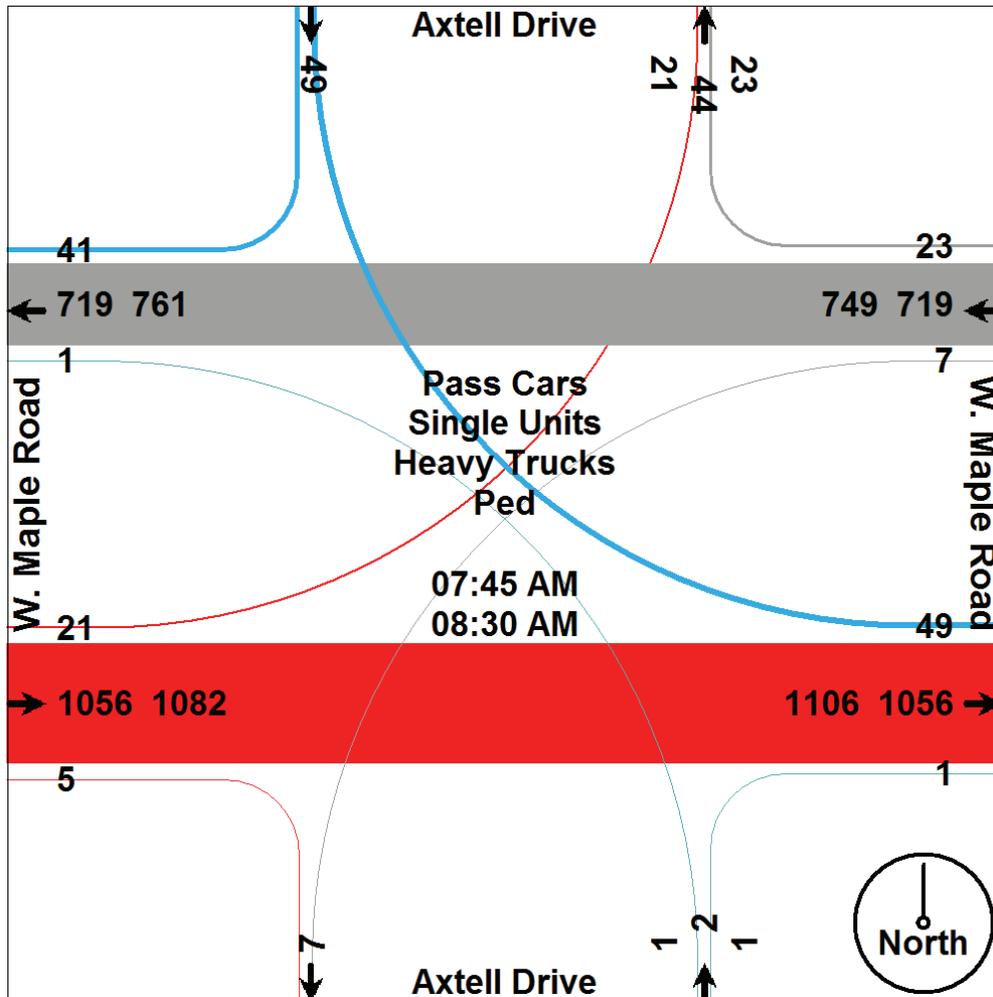


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: DMM Board #21

File Name : TMC_3 Maple&Axtell
Site Code : TMC_3
Start Date : 1/8/2015
Page No : 3

Start Time	Axtell Drive Southbound				W. Maple Road Westbound				Axtell Drive Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	11	0	11	22	5	176	1	182	0	0	0	0	3	283	2	288	492
08:00 AM	8	0	15	23	7	184	3	194	0	0	0	0	1	262	5	268	485
08:15 AM	8	0	10	18	6	172	0	178	1	0	1	2	0	265	8	273	471
08:30 AM	14	0	13	27	5	187	3	195	0	0	0	0	1	246	6	253	475
Total Volume	41	0	49	90	23	719	7	749	1	0	1	2	5	1056	21	1082	1923
% App. Total	45.6	0	54.4		3.1	96	0.9		50	0	50		0.5	97.6	1.9		
PHF	.732	.000	.817	.833	.821	.961	.583	.960	.250	.000	.250	.250	.417	.933	.656	.939	.977
Pass Cars	40	0	47	87	23	707	7	737	0	0	1	1	5	1044	19	1068	1893
% Pass Cars	97.6	0	95.9	96.7	100	98.3	100	98.4	0	0	100	50.0	100	98.9	90.5	98.7	98.4
Single Units	1	0	2	3	0	10	0	10	1	0	0	1	0	10	2	12	26
% Single Units	2.4	0	4.1	3.3	0	1.4	0	1.3	100	0	0	50.0	0	0.9	9.5	1.1	1.4
Heavy Trucks	0	0	0	0	0	2	0	2	0	0	0	0	0	2	0	2	4
% Heavy Trucks	0	0	0	0	0	0.3	0	0.3	0	0	0	0	0	0.2	0	0.2	0.2
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

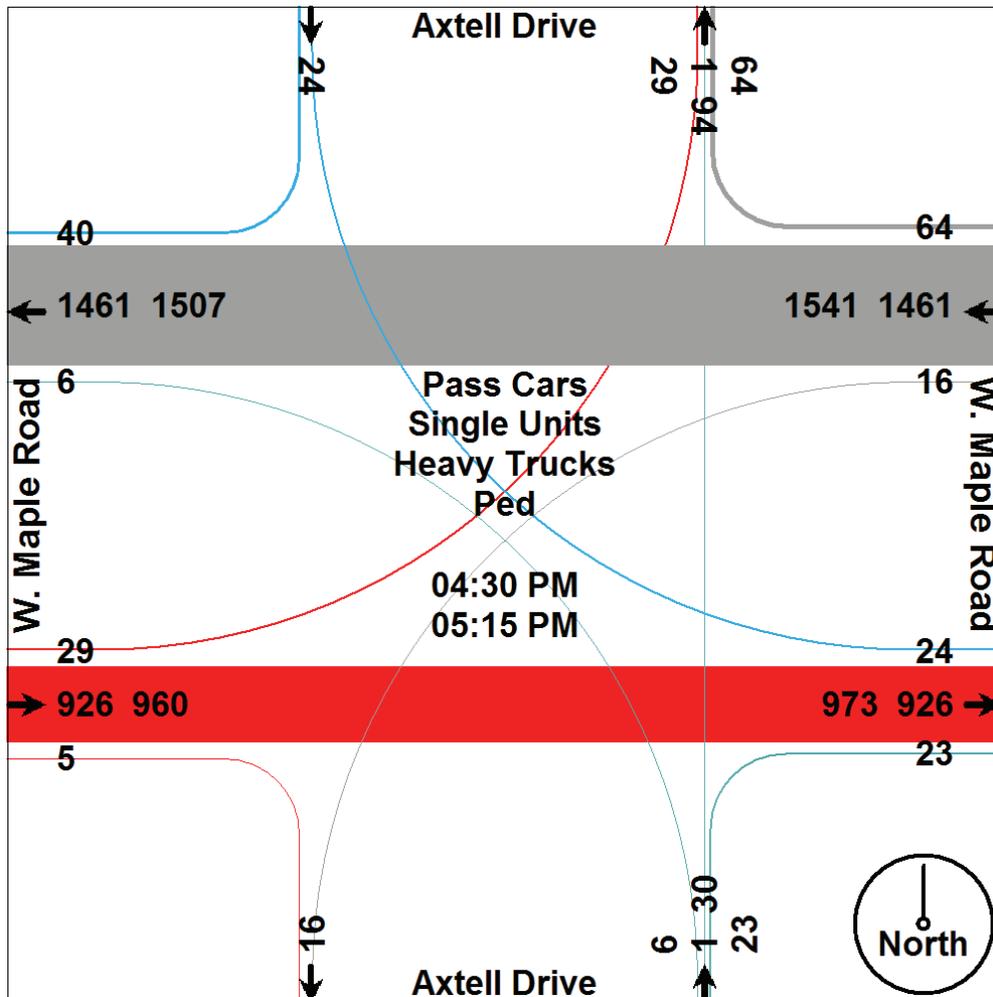


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: DMM Board #21

File Name : TMC_3 Maple&Axtell
Site Code : TMC_3
Start Date : 1/8/2015
Page No : 4

Start Time	Axtell Drive Southbound				W. Maple Road Westbound				Axtell Drive Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	10	0	8	18	12	370	2	384	4	0	3	7	1	255	6	262	671
04:45 PM	15	0	8	23	7	322	2	331	8	1	2	11	1	202	5	208	573
05:00 PM	11	0	4	15	23	408	7	438	8	0	1	9	1	236	10	247	709
05:15 PM	4	0	4	8	22	361	5	388	3	0	0	3	2	233	8	243	642
Total Volume	40	0	24	64	64	1461	16	1541	23	1	6	30	5	926	29	960	2595
% App. Total	62.5	0	37.5		4.2	94.8	1		76.7	3.3	20		0.5	96.5	3		
PHF	.667	.000	.750	.696	.696	.895	.571	.880	.719	.250	.500	.682	.625	.908	.725	.916	.915
Pass Cars	40	0	23	63	63	1454	15	1532	20	1	6	27	4	914	29	947	2569
% Pass Cars	100	0	95.8	98.4	98.4	99.5	93.8	99.4	87.0	100	100	90.0	80.0	98.7	100	98.6	99.0
Single Units	0	0	1	1	1	4	0	5	0	0	0	0	0	11	0	11	17
% Single Units	0	0	4.2	1.6	1.6	0.3	0	0.3	0	0	0	0	0	1.2	0	1.1	0.7
Heavy Trucks	0	0	0	0	0	3	1	4	3	0	0	3	1	1	0	2	9
% Heavy Trucks	0	0	0	0	0	0.2	6.3	0.3	13.0	0	0	10.0	20.0	0.1	0	0.2	0.3
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy. Dry, Temp.10's
Count By: Miovision Video VCU 24L

File Name : TMC_4 Maple&Maplelawn
Site Code : TMC_4
Start Date : 1/8/2015
Page No : 1

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

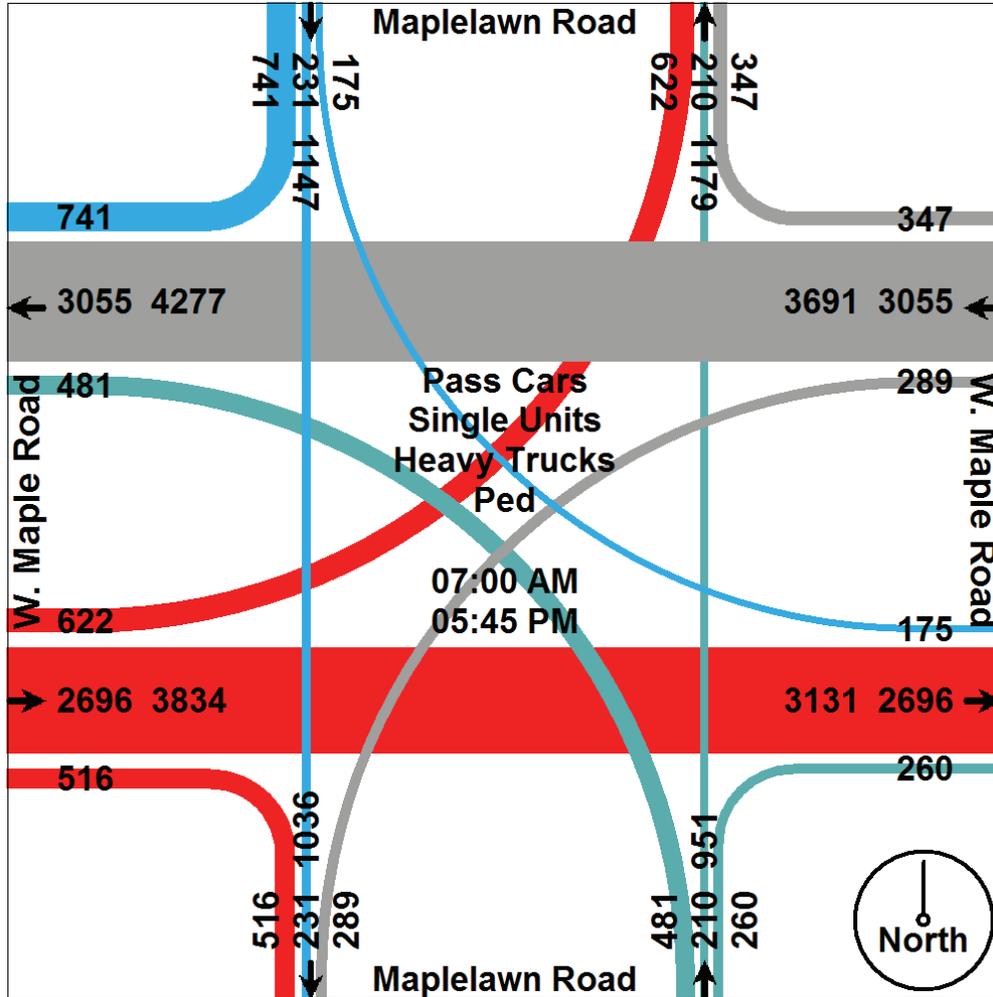
Start Time	Maplelawn Road Southbound					W. Maple Road Westbound					Maplelawn Road Northbound					W. Maple Road Eastbound					Int. Total
	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	
07:00 AM	25	16	2	0	43	11	106	35	0	152	6	3	6	0	15	23	80	22	0	125	335
07:15 AM	30	11	2	0	43	12	140	34	0	186	1	3	7	0	11	40	96	29	0	165	405
07:30 AM	30	17	2	1	50	20	165	32	0	217	7	5	14	0	26	40	110	44	0	194	487
07:45 AM	34	23	6	0	63	20	202	44	0	266	5	10	9	0	24	51	155	49	0	255	608
Total	119	67	12	1	199	63	613	145	0	821	19	21	36	0	76	154	441	144	0	739	1835
08:00 AM	21	25	2	0	48	17	176	29	0	222	4	7	12	0	23	45	163	52	0	260	553
08:15 AM	35	21	8	0	64	32	190	20	0	242	2	6	8	0	16	34	169	56	0	259	581
08:30 AM	30	20	4	0	54	24	177	21	0	222	8	4	9	1	22	27	164	47	1	239	537
08:45 AM	33	15	3	0	51	21	201	8	0	230	8	4	14	0	26	21	139	45	0	205	512
Total	119	81	17	0	217	94	744	78	0	916	22	21	43	1	87	127	635	200	1	963	2183
**** BREAK ****																					
04:00 PM	59	6	20	0	85	26	200	7	0	233	17	13	53	0	83	31	220	30	0	281	682
04:15 PM	51	13	18	0	82	18	210	8	0	236	27	23	45	0	95	28	179	29	0	236	649
04:30 PM	58	6	19	2	85	29	227	9	1	266	36	19	51	0	106	31	218	40	0	289	746
04:45 PM	64	15	11	0	90	28	214	5	0	247	34	25	54	0	113	42	189	33	0	264	714
Total	232	40	68	2	342	101	851	29	1	982	114	80	203	0	397	132	806	132	0	1070	2791
05:00 PM	83	13	17	0	113	22	240	13	1	276	41	30	54	0	125	27	240	28	0	295	809
05:15 PM	74	11	22	0	107	25	206	4	0	235	28	24	51	1	104	33	203	41	1	278	724
05:30 PM	49	6	13	0	68	22	210	5	0	237	23	20	45	0	88	26	188	42	0	256	649
05:45 PM	65	13	26	0	104	20	191	15	0	226	13	14	49	0	76	17	183	35	0	235	641
Total	271	43	78	0	392	89	847	37	1	974	105	88	199	1	393	103	814	146	1	1064	2823
Grand Total	741	231	175	3	1150	347	3055	289	2	3693	260	210	481	2	953	516	2696	622	2	3836	9632
Approch %	64.4	20.1	15.2	0.3		9.4	82.7	7.8	0.1		27.3	22	50.5	0.2		13.5	70.3	16.2	0.1		
Total %	7.7	2.4	1.8	0	11.9	3.6	31.7	3	0	38.3	2.7	2.2	5	0	9.9	5.4	28	6.5	0	39.8	
Pass Cars	730	229	172	0	1131	344	2998	286	0	3628	254	210	474	0	938	510	2631	614	0	3755	9452
% Pass Cars	98.5	99.1	98.3	0	98.3	99.1	98.1	99	0	98.2	97.7	100	98.5	0	98.4	98.8	97.6	98.7	0	97.9	98.1
Single Units	11	1	1	0	13	3	53	2	0	58	4	0	5	0	9	4	48	7	0	59	139
% Single Units	1.5	0.4	0.6	0	1.1	0.9	1.7	0.7	0	1.6	1.5	0	1	0	0.9	0.8	1.8	1.1	0	1.5	1.4
Heavy Trucks	0	1	2	0	3	0	4	1	0	5	2	0	2	0	4	2	17	1	0	20	32
% Heavy Trucks	0	0.4	1.1	0	0.3	0	0.1	0.3	0	0.1	0.8	0	0.4	0	0.4	0.4	0.6	0.2	0	0.5	0.3
Ped	0	0	0	3	3	0	0	0	2	2	0	0	0	2	2	0	0	0	2	2	9
% Ped	0	0	0	100	0.3	0	0	0	100	0.1	0	0	0	100	0.2	0	0	0	100	0.1	0.1

Comments: Traffic study conducted during atypical weekday (Thursday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. SCATS controlled signalized intersection with ped. signals all quadrants. Push buttons for east & west legs.

**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
 Location: Maple Road Study
 Weather: Cldy. Dry, Temp. 10's
 Count By: Miovision Video VCU 24L

File Name : TMC_4 Maple&Maplelawn
 Site Code : TMC_4
 Start Date : 1/8/2015
 Page No : 2

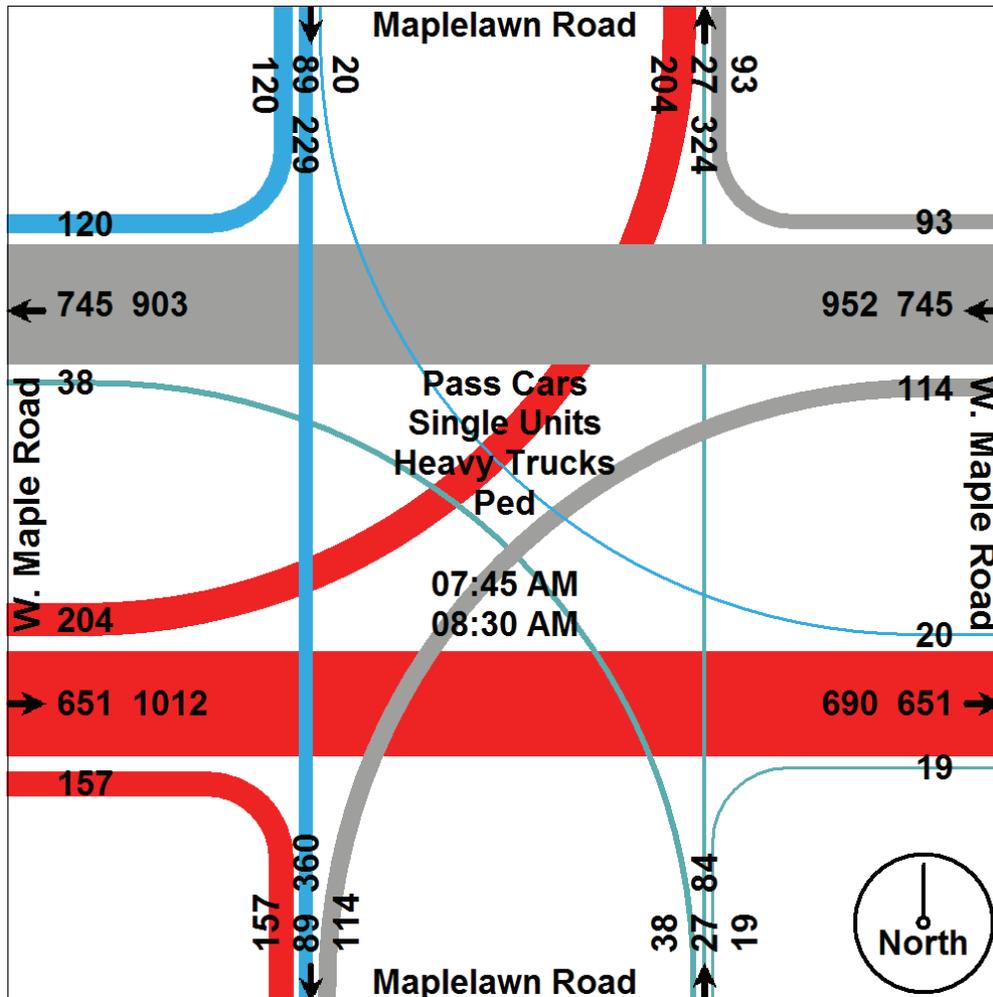


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: Miovision Video VCU 24L

File Name : TMC_4 Maple&Maplelawn
Site Code : TMC_4
Start Date : 1/8/2015
Page No : 3

Start Time	Maplelawn Road Southbound				W. Maple Road Westbound				Maplelawn Road Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	34	23	6	63	20	202	44	266	5	10	9	24	51	155	49	255	608
08:00 AM	21	25	2	48	17	176	29	222	4	7	12	23	45	163	52	260	553
08:15 AM	35	21	8	64	32	190	20	242	2	6	8	16	34	169	56	259	581
08:30 AM	30	20	4	54	24	177	21	222	8	4	9	21	27	164	47	238	535
Total Volume	120	89	20	229	93	745	114	952	19	27	38	84	157	651	204	1012	2277
% App. Total	52.4	38.9	8.7		9.8	78.3	12		22.6	32.1	45.2		15.5	64.3	20.2		
PHF	.857	.890	.625	.895	.727	.922	.648	.895	.594	.675	.792	.875	.770	.963	.911	.973	.936
Pass Cars	119	88	20	227	92	724	112	928	19	27	36	82	154	631	204	989	2226
% Pass Cars	99.2	98.9	100	99.1	98.9	97.2	98.2	97.5	100	100	94.7	97.6	98.1	96.9	100	97.7	97.8
Single Units	1	1	0	2	1	21	1	23	0	0	2	2	3	12	0	15	42
% Single Units	0.8	1.1	0	0.9	1.1	2.8	0.9	2.4	0	0	5.3	2.4	1.9	1.8	0	1.5	1.8
Heavy Trucks	0	0	0	0	0	0	1	1	0	0	0	0	0	8	0	8	9
% Heavy Trucks	0	0	0	0	0	0	0.9	0.1	0	0	0	0	0	1.2	0	0.8	0.4
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

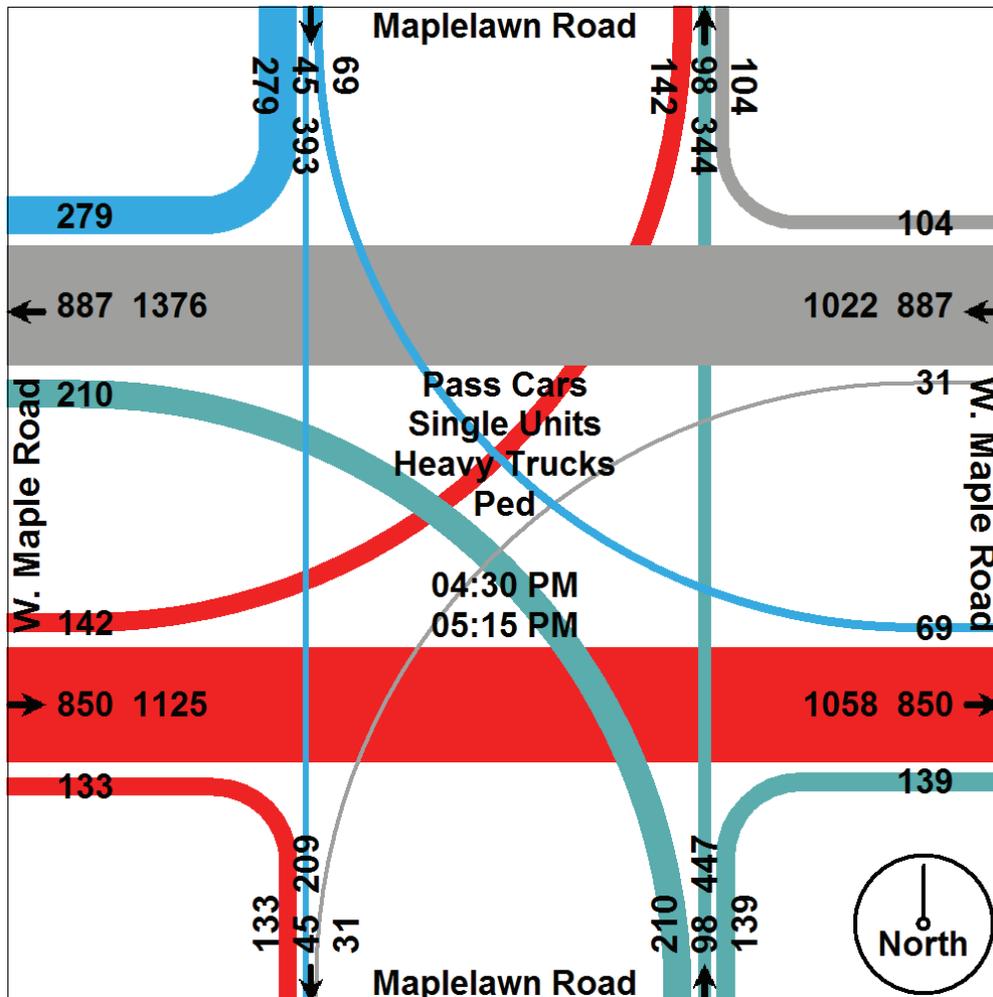


**Traffic Study Performed For:
 FLEIS & VANDENBRINK**

Project: City of Troy
Location: Maple Road Study
Weather: Cldy, Dry, Temp.10's
Count By: Miovision Video VCU 24L

File Name : TMC_4 Maple&Maplelawn
Site Code : TMC_4
Start Date : 1/8/2015
Page No : 4

Start Time	Maplelawn Road Southbound				W. Maple Road Westbound				Maplelawn Road Northbound				W. Maple Road Eastbound				Int. Total
	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:30 PM																	
04:30 PM	58	6	19	83	29	227	9	265	36	19	51	106	31	218	40	289	743
04:45 PM	64	15	11	90	28	214	5	247	34	25	54	113	42	189	33	264	714
05:00 PM	83	13	17	113	22	240	13	275	41	30	54	125	27	240	28	295	808
05:15 PM	74	11	22	107	25	206	4	235	28	24	51	103	33	203	41	277	722
Total Volume	279	45	69	393	104	887	31	1022	139	98	210	447	133	850	142	1125	2987
% App. Total	71	11.5	17.6		10.2	86.8	3		31.1	21.9	47		11.8	75.6	12.6		
PHF	.840	.750	.784	.869	.897	.924	.596	.929	.848	.817	.972	.894	.792	.885	.866	.953	.924
Pass Cars	275	45	68	388	103	885	31	1019	138	98	208	444	132	832	138	1102	2953
% Pass Cars	98.6	100	98.6	98.7	99.0	99.8	100	99.7	99.3	100	99.0	99.3	99.2	97.9	97.2	98.0	98.9
Single Units	4	0	0	4	1	1	0	2	1	0	0	1	1	14	4	19	26
% Single Units	1.4	0	0	1.0	1.0	0.1	0	0.2	0.7	0	0	0.2	0.8	1.6	2.8	1.7	0.9
Heavy Trucks	0	0	1	1	0	1	0	1	0	0	2	2	0	4	0	4	8
% Heavy Trucks	0	0	1.4	0.3	0	0.1	0	0.1	0	0	1.0	0.4	0	0.5	0	0.4	0.3
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, TDC

Project: Troy_Maple Road Study
 Count Type: 24 Hr. ATR Approach Count
 Weather: Cldy. Dry 10' Degs.
 Count By: M.Match Pav't : Asphalt 3 Lanes

7504 Sawgrass Drive, Washington MI. 48094 PH. (586) 786-5407

Traffic Study Performed For: **FLEIS VANDENBRINK**

Maple_Maplelawn_EB
 W. Maple Road
 (450' West of Maplelawn Rd.)
 Station ID: Eastbound
 Site Code: ATR 1 EB
 Date Start: 07-Jan-15

Start Time	Mon 05-Jan-15	Tue	Wed	Thu	Fri	Average Day	Sat	Sun	Week Average
12:00 AM	*	*	*	35	*	35	*	*	35
01:00	*	*	*	22	*	22	*	*	22
02:00	*	*	*	27	*	27	*	*	27
03:00	*	*	*	11	*	11	*	*	11
04:00	*	*	*	23	*	23	*	*	23
05:00	*	*	*	76	*	76	*	*	76
06:00	*	*	*	287	*	287	*	*	287
07:00	*	*	*	704	*	704	*	*	704
08:00	*	*	*	969	*	969	*	*	969
09:00	*	*	*	772	*	772	*	*	772
10:00	*	*	*	721	*	721	*	*	721
11:00	*	*	*	881	*	881	*	*	881
12:00 PM	*	*	*	1052	*	1052	*	*	1052
01:00	*	*	*	1039	*	1039	*	*	1039
02:00	*	*	*	993	*	993	*	*	993
03:00	*	*	*	1043	*	1043	*	*	1043
04:00	*	*	1088	1075	*	1082	*	*	1082
05:00	*	*	1111	1064	*	1088	*	*	1088
06:00	*	*	868	820	*	844	*	*	844
07:00	*	*	592	*	*	592	*	*	592
08:00	*	*	380	*	*	380	*	*	380
09:00	*	*	285	*	*	285	*	*	285
10:00	*	*	174	*	*	174	*	*	174
11:00	*	*	93	*	*	93	*	*	93
Total	0	0	4591	11614	0	13193	0	0	13193
% Avg. WkDay	0.0%	0.0%	34.8%	88.0%	0.0%	100.0%			
% Avg. Week	0.0%	0.0%	34.8%	88.0%	0.0%	100.0%	0.0%	0.0%	
AM Peak	-	-	-	08:00	-	08:00	-	-	08:00
Vol.	-	-	-	969	-	969	-	-	969
PM Peak	-	-	17:00	16:00	-	17:00	-	-	17:00
Vol.	-	-	1111	1075	-	1088	-	-	1088
Total	0	0	4591	11614	0	13193	0	0	13193
ADT	ADT 13,192		AADT 13,192						

Traffic Data Collection, TDC

Project: Troy_Maple Road Study
 Count Type: 24 Hr. ATR Approach Count
 Weather: Cldy. Dry 10' Degs.
 Count By: M.Match Pav't : Asphalt 3 Lanes

7504 Sawgrass Drive, Washington MI. 48094 PH. (586) 786-5407

Traffic Study Performed For: **FLEIS VANDENBRINK**

Maple_Maplelawn_WB
 W. Maple Road
 (400' East of Maplelawn Rd.)
 Station ID: Westbound
 Site Code: ATR 1 WB
 Date Start: 07-Jan-15

Start Time	Mon 05-Jan-15	Tue	Wed	Thu	Fri	Average Day	Sat	Sun	Week Average
12:00 AM	*	*	*	49	*	49	*	*	49
01:00	*	*	*	21	*	21	*	*	21
02:00	*	*	*	21	*	21	*	*	21
03:00	*	*	*	15	*	15	*	*	15
04:00	*	*	*	27	*	27	*	*	27
05:00	*	*	*	107	*	107	*	*	107
06:00	*	*	*	286	*	286	*	*	286
07:00	*	*	*	686	*	686	*	*	686
08:00	*	*	*	926	*	926	*	*	926
09:00	*	*	*	804	*	804	*	*	804
10:00	*	*	*	729	*	729	*	*	729
11:00	*	*	*	787	*	787	*	*	787
12:00 PM	*	*	*	929	*	929	*	*	929
01:00	*	*	*	847	*	847	*	*	847
02:00	*	*	*	832	*	832	*	*	832
03:00	*	*	*	859	*	859	*	*	859
04:00	*	*	*	925	*	925	*	*	925
05:00	*	*	988	966	*	977	*	*	977
06:00	*	*	811	771	*	791	*	*	791
07:00	*	*	541	*	*	541	*	*	541
08:00	*	*	376	*	*	376	*	*	376
09:00	*	*	278	*	*	278	*	*	278
10:00	*	*	131	*	*	131	*	*	131
11:00	*	*	79	*	*	79	*	*	79
Total	0	0	3204	10587	0	12023	0	0	12023
% Avg. WkDay	0.0%	0.0%	26.6%	88.1%	0.0%	100.0%			
% Avg. Week	0.0%	0.0%	26.6%	88.1%	0.0%	100.0%	0.0%	0.0%	
AM Peak	-	-	-	08:00	-	08:00	-	-	08:00
Vol.	-	-	-	926	-	926	-	-	926
PM Peak	-	-	17:00	17:00	-	17:00	-	-	17:00
Vol.	-	-	988	966	-	977	-	-	977
Total	0	0	3204	10587	0	12023	0	0	12023
ADT	ADT 11,980		AADT 11,980						



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SEMCOG Road Segment Report



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By Subject

By Community

Services

Coolidge Rd from Meijer Dr to Maple Rd E

PR 693006 from mile point 0.387 to mile point 1.088

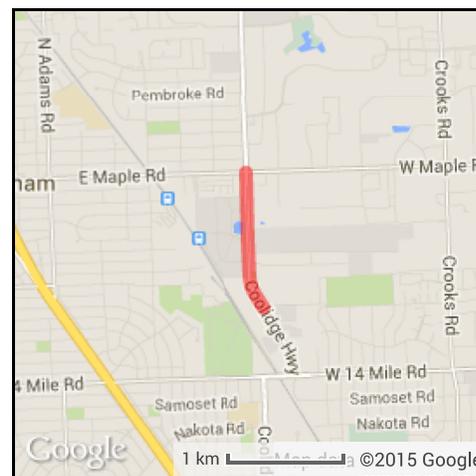
FALINK ID: 2869

Community: Royal Oak, Troy

County: Oakland

Functional Class: 16 - Urban Minor Arterial

[Street View](#)



Direction: -

Length: 0.701 miles

Number Lanes, 2013: 2

Posted Speed: 35 (Source:MSP)

Route Classification: Not a route

Annual Crash Average, 2009-2013: [26](#)

Traffic Volume, 2013: - (Default AADT)
AADT values are derived from [Traffic Counts](#).

Pavement Type, 2013: Concrete

Pavement Rating, 2013: Fair

Pavement Rating, 2011: Fair

Corridor Priorities

Type: Regional

Safety: No High Crash Locations

Pavement: Medium

Bridges: Medium

Congestion: Low

Short-Range (TIP) Projects

No TIP projects for this segment.

Long-Range Projects

[#10574](#) - Capacity Improvement

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Data by Subject

SEMCOG Road Segment Report



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[Street View](#)

Maple Rd W from Coolidge Rd to Crooks Rd

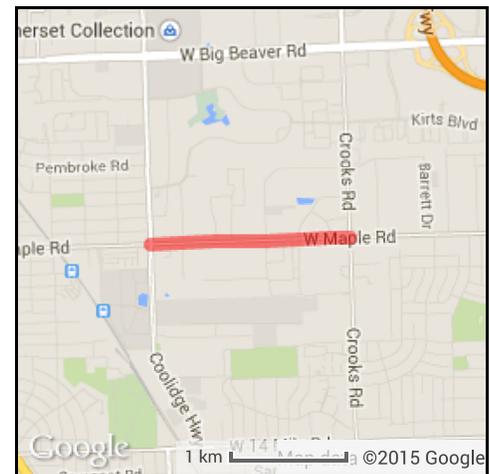
PR 683906 from mile point 15.223 to mile point 16.227

FALINK ID: 2735

Community: Troy

County: Oakland

Functional Class: 14 - Urban Other Principal Arterial (non-freeway)



Direction: -

Length: 1.004 miles

Number Lanes, 2013: 5

Posted Speed: 40 (Source:TCO)

Route Classification: Not a route

Annual Crash Average, 2009-2013: [32](#)

Traffic Volume, 2013: - (Default AADT)
AADT values are derived from [Traffic Counts](#).

Pavement Type, 2013: Asphalt

Pavement Rating, 2013: Fair

Pavement Rating, 2011: Fair

Corridor Priorities

Type: Regional

Safety: Low

Pavement: Medium

Bridges: Medium

Congestion: Less than 15% of Corridor Congested

Short-Range (TIP) Projects

No TIP projects for this segment.

Long-Range Projects

No long-range projects for this segment.

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Road Commission for Oakland County

3518 Weekly Volume Report - Mon 05/30/2011 - Sun 06/05/2011

Location ID:	3518
Located On:	MAPLE
Direction	EB
Community:	Troy
AADT:	13235

Type:	SPOT
AT:	Maplelawn
Period:	Mon 05/30/2011 - Sun 06/05/2011

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM					64			64
1:00 AM					24			24
2:00 AM					31			31
3:00 AM					18			18
4:00 AM					23			23
5:00 AM					72			72
6:00 AM					349			349
7:00 AM					835			835
8:00 AM					1086			1086
9:00 AM					888			888
10:00 AM				846				846
11:00 AM				1076				1076
12:00 PM				1311				1311
1:00 PM				1188				1188
2:00 PM				1083				1083
3:00 PM				1094				1094
4:00 PM				1207				1207
5:00 PM				1182				1182
6:00 PM				940				940
7:00 PM				783				783
8:00 PM				701				701
9:00 PM				456				456
10:00 PM				251				251
11:00 PM				134				134
Total	0	0	0	12252	3390	0	0	
24HrTotal					15642			15642
AM Pk Hr								
AM Peak								0
PM Pk Hr								
PM Peak								0
% Peak Hr								
% Peak Hr					8.38%			8.38%

Road Commission for Oakland County

3519 Weekly Volume Report - Mon 05/30/2011 - Sun 06/05/2011

Location ID:	3519
Located On:	MAPLE
Direction	WB
Community:	Troy
AADT:	12888

Type:	SPOT
AT:	Maplelawn
Period:	Mon 05/30/2011 - Sun 06/05/2011

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg
12:00 AM					71			71
1:00 AM					45			45
2:00 AM					45			45
3:00 AM					25			25
4:00 AM					26			26
5:00 AM					117			117
6:00 AM					441			441
7:00 AM					974			974
8:00 AM					1223			1223
9:00 AM					904			904
10:00 AM				945				945
11:00 AM				1043				1043
12:00 PM				1198				1198
1:00 PM				1037				1037
2:00 PM				1050				1050
3:00 PM				1030				1030
4:00 PM				1080				1080
5:00 PM				1148				1148
6:00 PM				861				861
7:00 PM				696				696
8:00 PM				568				568
9:00 PM				380				380
10:00 PM				237				237
11:00 PM				106				106
Total	0	0	0	11379	3871	0	0	
24HrTotal					15250			15250
AM Pk Hr								
AM Peak								0
PM Pk Hr								
PM Peak								0
% Peak Hr								
% Peak Hr					7.86%			7.86%

Appendix B

Existing Traffic Conditions

Level of Service Criteria for Stop Sign Controlled Intersections

The level of service criteria are given in Table 17-2. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. . . .

Exhibit 17-2. Level of Service Criteria for TWSC Intersections

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

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

The proposed level of service criteria for TWSC intersections are somewhat different from the criteria used in Chapter 16 for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, several driver behavior considerations combine to make delays at signalized intersections less onerous than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, where drivers on the minor approaches to unsignalized intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized than signalized intersections. For these reasons, it is considered that the total delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. . . .

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

Source: Highway Capacity Manual, 2000. Transportation Research Board, National Research Council

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle for a 15-min analysis period. The criteria are given in Exhibit 16-2. Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

LOS A describes operations with very low delay, up to 10 sec per vehicle. This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

LOS B describes operations with delay greater than 10 and up to 20 sec per vehicle. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.

Exhibit 16-2. Level-of-Service Criteria for Signalized Intersections

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

LOS C describes operations with delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Source: Highway Capacity Manual, 2000. Transportation Research Board, National Research Council

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Existing Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	143	669	103	209	458	94	60	690	413	0	857	131
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	1942	1942	1942	1961	1961	1961	0	1961	2000
Adj Flow Rate, veh/h	155	727	112	238	520	107	66	758	454	0	932	142
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	0	3	0
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	3	3	3	2	2	2	0	2	2
Cap, veh/h	186	949	424	267	1105	494	87	1693	756	0	1688	256
Arrive On Green	0.10	0.25	0.25	0.14	0.30	0.30	0.02	0.15	0.15	0.00	0.36	0.36
Sat Flow, veh/h	1867	3725	1665	1849	3689	1649	1867	3725	1664	0	4867	712
Grp Volume(v), veh/h	155	727	112	238	520	107	66	758	454	0	708	366
Grp Sat Flow(s),veh/h/ln	1867	1863	1665	1849	1845	1649	1867	1863	1664	0	1784	1834
Q Serve(g_s), s	9.8	21.7	6.5	15.2	13.8	5.8	4.2	22.2	30.6	0.0	19.0	19.1
Cycle Q Clear(g_c), s	9.8	21.7	6.5	15.2	13.8	5.8	4.2	22.2	30.6	0.0	19.0	19.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.39
Lane Grp Cap(c), veh/h	186	949	424	267	1105	494	87	1693	756	0	1284	660
V/C Ratio(X)	0.84	0.77	0.26	0.89	0.47	0.22	0.76	0.45	0.60	0.00	0.55	0.55
Avail Cap(c_a), veh/h	297	1121	501	294	1110	496	143	1693	756	0	1284	660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	53.1	41.4	35.7	50.4	34.3	31.5	58.4	37.3	40.8	0.0	30.7	30.7
Incr Delay (d2), s/veh	10.7	2.7	0.3	25.7	0.3	0.2	12.9	0.9	3.5	0.0	0.5	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.6	11.5	3.0	9.6	7.1	2.7	2.5	11.7	14.8	0.0	9.4	9.8
LnGrp Delay(d),s/veh	63.8	44.1	36.1	76.1	34.6	31.7	71.3	38.1	44.3	0.0	31.2	31.7
LnGrp LOS	E	D	D	E	C	C	E	D	D		C	C
Approach Vol, veh/h		994			865			1278			1074	
Approach Delay, s/veh		46.3			45.7			42.0			31.4	
Approach LOS		D			D			D			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		60.3	23.2	36.5	11.4	49.0	17.8	41.8				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 47	19.1	36.1	* 9.2	* 32	19.1	36.1				
Max Q Clear Time (g_c+I1), s		32.6	17.2	23.7	6.2	21.1	11.8	15.8				
Green Ext Time (p_c), s		11.0	0.1	6.9	0.0	8.7	0.2	9.2				
Intersection Summary												
HCM 2010 Ctrl Delay			41.1									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary
 2: NB Coolidge Highway & XO S. of Maple Road

Existing Conditions
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	108	3	0	0	0	0	0	1055	1	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1961	1961	0				0	1961	2000			
Adj Flow Rate, veh/h	170	0	0				0	1241	1			
Adj No. of Lanes	2	1	0				0	3	0			
Peak Hour Factor	0.65	0.65	0.65				0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0				0	2	2			
Cap, veh/h	246	129	0				0	4676	4			
Arrive On Green	0.07	0.00	0.00				0.00	0.85	0.85			
Sat Flow, veh/h	3735	1961	0				0	5701	4			
Grp Volume(v), veh/h	170	0	0				0	802	440			
Grp Sat Flow(s),veh/h/ln	1867	1961	0				0	1784	1960			
Q Serve(g_s), s	5.3	0.0	0.0				0.0	5.3	5.3			
Cycle Q Clear(g_c), s	5.3	0.0	0.0				0.0	5.3	5.3			
Prop In Lane	1.00		0.00				0.00		0.00			
Lane Grp Cap(c), veh/h	246	129	0				0	3021	1659			
V/C Ratio(X)	0.69	0.00	0.00				0.00	0.27	0.27			
Avail Cap(c_a), veh/h	1086	570	0				0	3021	1659			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	54.8	0.0	0.0				0.0	1.8	1.8			
Incr Delay (d2), s/veh	3.4	0.0	0.0				0.0	0.2	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.9	0.0	0.0				0.0	2.7	3.0			
LnGrp Delay(d),s/veh	58.3	0.0	0.0				0.0	2.0	2.2			
LnGrp LOS	E							A	A			
Approach Vol, veh/h		170						1242				
Approach Delay, s/veh		58.3						2.1				
Approach LOS		E						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		107.0		13.0								
Change Period (Y+Rc), s		* 5.4		5.1								
Max Green Setting (Gmax), s		* 75		34.9								
Max Q Clear Time (g_c+I1), s		7.3		7.3								
Green Ext Time (p_c), s		11.2		0.6								
Intersection Summary												
HCM 2010 Ctrl Delay			8.9									
HCM 2010 LOS			A									

Notes

User approved volume balancing among the lanes for turning movement.

HCM 2010 Signalized Intersection Summary
 3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road

Existing Conditions
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	204	651	157	114	745	93	38	27	19	20	89	120
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	1961	1961	2000	1961	1961	2000	1980	1980	2000
Adj Flow Rate, veh/h	215	685	165	127	828	103	43	31	22	22	99	133
Adj No. of Lanes	1	2	1	1	2	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.90	0.90	0.90	0.88	0.88	0.88	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	1	1	1
Cap, veh/h	754	913	408	904	1037	129	106	129	83	232	185	165
Arrive On Green	0.37	0.25	0.25	0.43	0.31	0.31	0.02	0.06	0.06	0.06	0.10	0.10
Sat Flow, veh/h	1867	3725	1665	1867	3335	415	1867	2177	1392	1886	1881	1678
Grp Volume(v), veh/h	215	685	165	127	462	469	43	26	27	22	99	133
Grp Sat Flow(s),veh/h/ln	1867	1863	1665	1867	1863	1887	1867	1863	1707	1886	1881	1678
Q Serve(g_s), s	4.8	20.4	10.0	0.0	27.3	27.3	0.0	1.6	1.8	0.0	6.0	9.3
Cycle Q Clear(g_c), s	4.8	20.4	10.0	0.0	27.3	27.3	0.0	1.6	1.8	0.0	6.0	9.3
Prop In Lane	1.00		1.00	1.00		0.22	1.00		0.82	1.00		1.00
Lane Grp Cap(c), veh/h	754	913	408	904	579	587	106	111	102	232	185	165
V/C Ratio(X)	0.29	0.75	0.40	0.14	0.80	0.80	0.40	0.23	0.27	0.10	0.54	0.81
Avail Cap(c_a), veh/h	754	1953	873	904	976	989	170	234	215	232	237	211
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.8	41.9	37.9	18.3	37.9	37.9	57.1	53.8	53.9	49.2	51.5	53.0
Incr Delay (d2), s/veh	0.2	5.6	3.0	0.1	11.0	10.9	2.5	1.1	1.4	0.2	2.4	16.2
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	4.8	11.2	4.9	2.4	15.8	16.0	1.5	0.9	0.9	0.7	3.3	5.1
LnGrp Delay(d),s/veh	25.0	47.5	40.9	18.4	48.9	48.8	59.5	54.9	55.3	49.4	53.9	69.2
LnGrp LOS	C	D	D	B	D	D	E	D	E	D	D	E
Approach Vol, veh/h		1065			1058			96			254	
Approach Delay, s/veh		41.9			45.2			57.1			61.5	
Approach LOS		D			D			E			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	57.9	35.5	8.9	17.7	50.0	43.4	13.5	13.0				
Change Period (Y+Rc), s	6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9				
Max Green Setting (Gmax), s	63	* 63	7.1	15.1	* 11	* 63	7.1	15.1				
Max Q Clear Time (g_c+1), s	12.0	22.4	2.0	11.3	6.8	29.3	2.0	3.8				
Green Ext Time (p_c), s	0.7	7.0	0.0	0.4	0.3	8.0	0.0	0.1				

Intersection Summary

HCM 2010 Ctrl Delay	45.9
HCM 2010 LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	3.7											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	21	1056	5	7	719	23	1	0	1	49	0	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	95	95	95	60	60	60	83	83	83
Heavy Vehicles, %	1	1	1	2	2	2	2	2	2	3	3	3
Mvmt Flow	22	1123	5	7	757	24	2	0	2	59	0	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	781	0	0	1129	0	0	1564	1967	564	1390	1957	391
Stage 1	-	-	-	-	-	-	1171	1171	-	784	784	-
Stage 2	-	-	-	-	-	-	393	796	-	606	1173	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.54	6.54	6.94	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.56	5.56	-
Follow-up Hdwy	2.21	-	-	2.22	-	-	3.52	4.02	3.32	3.53	4.03	3.33
Pot Cap-1 Maneuver	839	-	-	615	-	-	75	62	469	101	62	605
Stage 1	-	-	-	-	-	-	205	265	-	350	400	-
Stage 2	-	-	-	-	-	-	603	397	-	448	262	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	839	-	-	615	-	-	67	60	469	98	60	605
Mov Cap-2 Maneuver	-	-	-	-	-	-	67	60	-	98	60	-
Stage 1	-	-	-	-	-	-	200	258	-	341	395	-
Stage 2	-	-	-	-	-	-	547	392	-	435	255	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	36.7	65.9
HCM LOS			E	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	117	839	-	-	615	-	-	159
HCM Lane V/C Ratio	0.028	0.027	-	-	0.012	-	-	0.682
HCM Control Delay (s)	36.7	9.4	-	-	10.9	-	-	65.9
HCM Lane LOS	E	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	0.1	0.1	-	-	0	-	-	4

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Existing Conditions
 PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	214	541	101	397	744	241	126	935	419	0	1010	160
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1980	1980	1980	1980	1980	1980	1980	1980	1980	0	1980	2000
Adj Flow Rate, veh/h	225	569	106	432	809	262	135	1005	451	0	1174	186
Adj No. of Lanes	1	2	1	1	2	1	1	2	1	0	3	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.86	0.86	0.86
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	0	1	1
Cap, veh/h	257	692	309	363	903	403	160	1794	803	0	1617	256
Arrive On Green	0.14	0.18	0.18	0.19	0.24	0.24	0.03	0.16	0.16	0.00	0.34	0.34
Sat Flow, veh/h	1886	3762	1680	1886	3762	1681	1886	3762	1683	0	4885	746
Grp Volume(v), veh/h	225	569	106	432	809	262	135	1005	451	0	899	461
Grp Sat Flow(s),veh/h/ln	1886	1881	1680	1886	1881	1681	1886	1881	1683	0	1802	1849
Q Serve(g_s), s	14.0	17.4	6.6	23.1	25.0	16.8	8.6	29.6	29.7	0.0	26.2	26.2
Cycle Q Clear(g_c), s	14.0	17.4	6.6	23.1	25.0	16.8	8.6	29.6	29.7	0.0	26.2	26.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.40
Lane Grp Cap(c), veh/h	257	692	309	363	903	403	160	1794	803	0	1238	635
V/C Ratio(X)	0.87	0.82	0.34	1.19	0.90	0.65	0.84	0.56	0.56	0.00	0.73	0.73
Avail Cap(c_a), veh/h	363	850	379	363	903	403	160	1794	803	0	1238	635
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	50.8	47.1	42.6	48.5	44.2	41.1	57.5	38.9	39.0	0.0	34.4	34.5
Incr Delay (d2), s/veh	15.4	5.4	0.7	109.7	11.5	3.6	31.3	1.3	2.8	0.0	2.2	4.2
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	8.4	9.6	3.1	23.1	14.5	8.2	5.9	15.8	14.5	0.0	13.4	14.1
LnGrp Delay(d),s/veh	66.2	52.5	43.3	158.1	55.7	44.7	88.8	40.2	41.8	0.0	36.6	38.6
LnGrp LOS	E	D	D	F	E	D	F	D	D		D	D
Approach Vol, veh/h		900			1503			1591			1360	
Approach Delay, s/veh		54.8			83.2			44.8			37.3	
Approach LOS		D			F			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		63.0	29.0	28.0	16.0	47.0	22.3	34.7				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 52	23.1	27.1	* 10	* 36	23.1	27.1				
Max Q Clear Time (g_c+I1), s		31.7	25.1	19.4	10.6	28.2	16.0	27.0				
Green Ext Time (p_c), s		16.8	0.0	2.6	0.0	7.3	0.4	0.1				
Intersection Summary												
HCM 2010 Ctrl Delay			55.4									
HCM 2010 LOS			E									
Notes												
User approved pedestrian interval to be less than phase max green.												

HCM 2010 Signalized Intersection Summary
 2: NB Coolidge Highway & XO S. of Maple Road

Existing Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	108	10	0	0	0	0	0	1372	8	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1980	1980	0				0	1980	2000			
Adj Flow Rate, veh/h	132	0	0				0	1444	8			
Adj No. of Lanes	2	1	0				0	3	0			
Peak Hour Factor	0.87	0.87	0.87				0.95	0.95	0.95			
Percent Heavy Veh, %	1	1	0				0	1	1			
Cap, veh/h	206	108	0				0	4760	26			
Arrive On Green	0.05	0.00	0.00				0.00	0.86	0.86			
Sat Flow, veh/h	3772	1980	0				0	5726	31			
Grp Volume(v), veh/h	132	0	0				0	938	514			
Grp Sat Flow(s),veh/h/ln	1886	1980	0				0	1802	1975			
Q Serve(g_s), s	4.1	0.0	0.0				0.0	6.0	6.0			
Cycle Q Clear(g_c), s	4.1	0.0	0.0				0.0	6.0	6.0			
Prop In Lane	1.00		0.00				0.00		0.02			
Lane Grp Cap(c), veh/h	206	108	0				0	3092	1694			
V/C Ratio(X)	0.64	0.00	0.00				0.00	0.30	0.30			
Avail Cap(c_a), veh/h	1097	576	0				0	3092	1694			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	55.6	0.0	0.0				0.0	1.6	1.6			
Incr Delay (d2), s/veh	3.3	0.0	0.0				0.0	0.3	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.2	0.0	0.0				0.0	3.0	3.4			
LnGrp Delay(d),s/veh	58.9	0.0	0.0				0.0	1.9	2.1			
LnGrp LOS	E							A	A			
Approach Vol, veh/h		132						1452				
Approach Delay, s/veh		58.9						2.0				
Approach LOS		E						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		108.4		11.6								
Change Period (Y+Rc), s		* 5.4		5.1								
Max Green Setting (Gmax), s		* 75		34.9								
Max Q Clear Time (g_c+I1), s		8.0		6.1								
Green Ext Time (p_c), s		14.5		0.4								
Intersection Summary												
HCM 2010 Ctrl Delay			6.7									
HCM 2010 LOS			A									
Notes												
User approved volume balancing among the lanes for turning movement.												

HCM 2010 Signalized Intersection Summary
 3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road

Existing Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	142	850	133	31	887	104	210	98	139	69	45	279
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	2000	2000	2000	1980	1980	2000	1980	1980	2000
Adj Flow Rate, veh/h	149	895	140	33	954	112	236	110	156	79	52	321
Adj No. of Lanes	1	2	1	1	2	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.89	0.89	0.89	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	499	1158	517	595	1186	139	203	218	194	300	299	267
Arrive On Green	0.22	0.31	0.31	0.25	0.35	0.35	0.08	0.12	0.12	0.12	0.16	0.16
Sat Flow, veh/h	1867	3725	1663	1905	3426	402	1886	1881	1674	1886	1881	1677
Grp Volume(v), veh/h	149	895	140	33	529	537	236	110	156	79	52	321
Grp Sat Flow(s),veh/h/ln	1867	1863	1663	1905	1900	1928	1886	1881	1674	1886	1881	1677
Q Serve(g_s), s	1.8	26.1	7.6	0.0	30.3	30.3	9.1	6.6	10.9	0.0	2.9	19.1
Cycle Q Clear(g_c), s	1.8	26.1	7.6	0.0	30.3	30.3	9.1	6.6	10.9	0.0	2.9	19.1
Prop In Lane	1.00		1.00	1.00		0.21	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	499	1158	517	595	658	668	203	218	194	300	299	267
V/C Ratio(X)	0.30	0.77	0.27	0.06	0.80	0.80	1.16	0.51	0.81	0.26	0.17	1.20
Avail Cap(c_a), veh/h	499	1922	858	595	980	995	203	299	267	300	299	267
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.1	37.5	31.1	27.3	35.5	35.5	54.1	49.8	51.7	46.4	43.6	50.5
Incr Delay (d2), s/veh	0.3	5.0	1.3	0.0	10.1	9.9	113.9	1.8	11.9	0.5	0.3	121.3
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	0.0	14.2	3.7	0.8	17.7	18.0	13.1	3.5	5.7	2.3	1.5	17.8
LnGrp Delay(d),s/veh	36.4	42.5	32.4	27.3	45.6	45.5	168.0	51.7	63.6	46.8	43.9	171.8
LnGrp LOS	D	D	C	C	D	D	F	D	E	D	D	F
Approach Vol, veh/h		1184			1099			502			452	
Approach Delay, s/veh		40.6			45.0			110.0			135.2	
Approach LOS		D			D			F			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	36.6	43.4	15.0	25.0	32.3	47.7	20.2	19.8				
Change Period (Y+Rc), s	6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9				
Max Green Setting (Gmax), s	62	* 62	9.1	19.1	* 5.9	* 62	9.1	19.1				
Max Q Clear Time (g_c+I), s	12.0	28.1	11.1	21.1	3.8	32.3	2.0	12.9				
Green Ext Time (p_c), s	0.2	9.2	0.0	0.0	0.1	9.3	0.6	0.8				

Intersection Summary

HCM 2010 Ctrl Delay	66.1
HCM 2010 LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	25.5											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	29	926	5	16	1461	64	6	1	23	24	0	40
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	68	68	68	70	70	70
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	2	2	2
Mvmt Flow	32	1007	5	18	1660	73	9	1	34	34	0	57

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1733	0	0	1012	0	0	1938	2841	508	2300	2808	868
Stage 1	-	-	-	-	-	-	1072	1072	-	1733	1733	-
Stage 2	-	-	-	-	-	-	866	1769	-	567	1075	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.21	-	-	2.21	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	364	-	-	687	-	-	39	17	510	~21	18	296
Stage 1	-	-	-	-	-	-	235	295	-	91	141	-
Stage 2	-	-	-	-	-	-	314	135	-	476	294	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	363	-	-	686	-	-	29	15	509	~17	16	296
Mov Cap-2 Maneuver	-	-	-	-	-	-	29	15	-	~17	16	-
Stage 1	-	-	-	-	-	-	214	269	-	83	137	-
Stage 2	-	-	-	-	-	-	246	131	-	402	268	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.1	73.4	\$ 775.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	94	363	-	-	686	-	-	41
HCM Lane V/C Ratio	0.469	0.087	-	-	0.027	-	-	2.23
HCM Control Delay (s)	73.4	15.9	-	-	10.4	-	-	\$ 775.4
HCM Lane LOS	F	C	-	-	B	-	-	F
HCM 95th %tile Q(veh)	2	0.3	-	-	0.1	-	-	9.8

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

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Existing Conditions W / Improvements
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	143	669	103	209	458	94	60	690	413	0	857	131
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	1942	1942	1942	1961	1961	1961	0	1961	2000
Adj Flow Rate, veh/h	155	727	112	238	520	107	66	758	454	0	932	142
Adj No. of Lanes	1	2	1	2	2	1	1	2	1	0	3	0
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	3	3	3	2	2	2	0	2	2
Cap, veh/h	185	889	397	307	830	371	87	1971	881	0	2037	309
Arrive On Green	0.10	0.24	0.24	0.09	0.23	0.23	0.02	0.17	0.17	0.00	0.43	0.43
Sat Flow, veh/h	1867	3725	1665	3588	3689	1648	1867	3725	1665	0	4867	712
Grp Volume(v), veh/h	155	727	112	238	520	107	66	758	454	0	708	366
Grp Sat Flow(s),veh/h/ln	1867	1863	1665	1794	1845	1648	1867	1863	1665	0	1784	1834
Q Serve(g_s), s	9.8	22.2	6.6	7.8	15.3	6.5	4.2	21.6	29.7	0.0	16.8	16.9
Cycle Q Clear(g_c), s	9.8	22.2	6.6	7.8	15.3	6.5	4.2	21.6	29.7	0.0	16.8	16.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.39
Lane Grp Cap(c), veh/h	185	889	397	307	830	371	87	1971	881	0	1550	797
V/C Ratio(X)	0.84	0.82	0.28	0.77	0.63	0.29	0.76	0.38	0.52	0.00	0.46	0.46
Avail Cap(c_a), veh/h	282	966	431	541	956	427	159	1971	881	0	1550	797
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	53.1	43.2	37.3	53.7	41.9	38.5	58.4	32.2	35.6	0.0	24.0	24.0
Incr Delay (d2), s/veh	12.5	5.2	0.4	4.2	1.0	0.4	12.8	0.6	2.2	0.0	0.2	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	5.7	12.1	3.1	4.0	7.9	3.0	2.5	11.3	14.2	0.0	8.3	8.6
LnGrp Delay(d),s/veh	65.6	48.4	37.7	57.9	43.0	39.0	71.2	32.8	37.7	0.0	24.2	24.4
LnGrp LOS	E	D	D	E	D	D	E	C	D		C	C
Approach Vol, veh/h		994			865			1278			1074	
Approach Delay, s/veh		49.9			46.6			36.5			24.2	
Approach LOS		D			D			D			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		69.3	16.2	34.5	11.4	57.9	17.8	32.9				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 53	18.1	31.1	* 10	* 37	18.1	31.1				
Max Q Clear Time (g_c+I1), s		31.7	9.8	24.2	6.2	18.9	11.8	17.3				
Green Ext Time (p_c), s		14.6	0.5	4.5	0.0	13.0	0.2	7.4				
Intersection Summary												
HCM 2010 Ctrl Delay			38.6									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Existing Conditions W / Improvements
 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	214	541	101	397	744	241	126	935	419	0	1010	160
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1980	1980	1980	1980	1980	1980	1980	1980	1980	0	1980	2000
Adj Flow Rate, veh/h	225	569	106	432	809	262	135	1005	451	0	1174	186
Adj No. of Lanes	1	2	1	2	2	1	1	2	1	0	3	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.86	0.86	0.86
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	0	1	1
Cap, veh/h	255	916	409	500	921	412	165	1780	796	0	1589	252
Arrive On Green	0.14	0.24	0.24	0.14	0.24	0.24	0.03	0.16	0.16	0.00	0.34	0.34
Sat Flow, veh/h	1886	3762	1681	3659	3762	1681	1886	3762	1683	0	4885	746
Grp Volume(v), veh/h	225	569	106	432	809	262	135	1005	451	0	899	461
Grp Sat Flow(s),veh/h/ln	1886	1881	1681	1829	1881	1681	1886	1881	1683	0	1802	1849
Q Serve(g_s), s	14.1	16.2	6.1	13.9	24.8	16.7	8.5	29.7	29.8	0.0	26.4	26.4
Cycle Q Clear(g_c), s	14.1	16.2	6.1	13.9	24.8	16.7	8.5	29.7	29.8	0.0	26.4	26.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.40
Lane Grp Cap(c), veh/h	255	916	409	500	921	412	165	1780	796	0	1216	624
V/C Ratio(X)	0.88	0.62	0.26	0.86	0.88	0.64	0.82	0.56	0.57	0.00	0.74	0.74
Avail Cap(c_a), veh/h	300	944	422	582	944	422	192	1780	796	0	1216	624
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	50.9	40.5	36.6	50.7	43.6	40.5	57.3	39.2	39.2	0.0	35.1	35.1
Incr Delay (d2), s/veh	22.5	1.2	0.3	11.5	9.3	3.1	21.2	1.3	2.9	0.0	2.4	4.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	8.5	2.9	7.8	14.1	8.1	5.4	15.8	14.5	0.0	13.5	14.3
LnGrp Delay(d),s/veh	73.4	41.7	37.0	62.2	52.9	43.6	78.5	40.5	42.1	0.0	37.5	39.7
LnGrp LOS	E	D	D	E	D	D	E	D	D		D	D
Approach Vol, veh/h		900			1503			1591			1360	
Approach Delay, s/veh		49.1			54.0			44.2			38.3	
Approach LOS		D			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		62.6	22.3	35.1	16.3	46.3	22.1	35.3				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 53	19.1	30.1	* 12	* 35	19.1	30.1				
Max Q Clear Time (g_c+I1), s		31.8	15.9	18.2	10.5	28.4	16.1	26.8				
Green Ext Time (p_c), s		17.5	0.5	7.6	0.0	6.2	0.2	2.6				
Intersection Summary												
HCM 2010 Ctrl Delay			46.2									
HCM 2010 LOS			D									
Notes												
User approved pedestrian interval to be less than phase max green.												

1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	All
Vehicles Exited	144	676	104	205	471	92	56	699	428	868	126	3869
Hourly Exit Rate	144	676	104	205	471	92	56	699	428	868	126	3869
Input Volume	143	669	103	210	470	94	60	694	413	857	131	3843
% of Volume	101	101	101	98	100	98	93	101	104	101	96	101

2: NB Coolidge Highway & XO S. of Maple Road Performance by movement

Movement	EBL	EBT	NBT	NBR	All
Vehicles Exited	119	3	1059	1	1182
Hourly Exit Rate	119	3	1059	1	1182
Input Volume	108	3	1055	1	1167
% of Volume	110	109	100	100	101

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Exited	206	663	165	119	745	91	38	26	18	21	92	119
Hourly Exit Rate	206	663	165	119	745	91	38	26	18	21	92	119
Input Volume	204	654	157	114	745	93	38	27	19	20	89	120
% of Volume	101	101	105	104	100	98	101	95	95	106	103	99

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	All
Vehicles Exited	2303
Hourly Exit Rate	2303
Input Volume	2280
% of Volume	101

4: Axtell Drive & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBR	All
Vehicles Exited	22	1088	7	5	723	25	0	2	49	40	1961
Hourly Exit Rate	22	1088	7	5	723	25	0	2	49	40	1961
Input Volume	21	1068	5	7	726	23	1	1	49	41	1943
% of Volume	104	102	140	71	100	108	0	160	99	98	101

Total Zone Performance

Vehicles Exited	39
Hourly Exit Rate	39
Input Volume	9233
% of Volume	0

1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	All
Vehicles Exited	200	515	101	209	513	163	124	933	424	1014	163	4359
Hourly Exit Rate	200	515	101	209	513	163	124	933	424	1014	163	4359
Input Volume	214	541	101	397	752	241	126	935	419	1010	160	4895
% of Volume	94	95	100	53	68	68	98	100	101	100	102	89

2: NB Coolidge Highway & XO S. of Maple Road Performance by movement

Movement	EBL	EBT	NBT	NBR	All
Vehicles Exited	96	10	1386	9	1501
Hourly Exit Rate	96	10	1386	9	1501
Input Volume	108	10	1372	8	1499
% of Volume	89	95	101	112	100

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Exited	138	811	135	26	783	93	130	74	110	56	37	188
Hourly Exit Rate	138	811	135	26	783	93	130	74	110	56	37	188
Input Volume	142	850	133	31	887	104	210	98	139	69	45	279
% of Volume	97	95	101	85	88	90	62	76	79	81	82	67

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	All
Vehicles Exited	2581
Hourly Exit Rate	2581
Input Volume	2988
% of Volume	86

4: Axtell Drive & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Vehicles Exited	30	906	6	8	963	43	5	1	21	7	11	2001
Hourly Exit Rate	30	906	6	8	963	43	5	1	21	7	11	2001
Input Volume	29	926	5	16	1477	64	6	1	23	24	40	2610
% of Volume	103	98	120	51	65	67	83	100	92	29	28	77

Total Zone Performance

Vehicles Exited	13
Hourly Exit Rate	13
Input Volume	11992
% of Volume	0

1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	All
Vehicles Exited	138	668	101	208	467	89	62	690	414	859	135	3831
Hourly Exit Rate	138	668	101	208	467	89	62	690	414	859	135	3831
Input Volume	143	669	103	210	470	94	60	694	413	857	131	3843
% of Volume	97	100	98	99	99	94	103	99	100	100	103	100

2: NB Coolidge Highway & XO S. of Maple Road Performance by movement

Movement	EBL	EBT	NBT	NBR	All
Vehicles Exited	103	4	1062	2	1171
Hourly Exit Rate	103	4	1062	2	1171
Input Volume	108	3	1055	1	1167
% of Volume	95	145	101	200	100

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Exited	203	651	158	108	750	92	36	28	20	19	88	117
Hourly Exit Rate	203	651	158	108	750	92	36	28	20	19	88	117
Input Volume	204	654	157	114	745	93	38	27	19	20	89	120
% of Volume	100	100	101	95	101	99	95	103	105	96	99	97

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	All
Vehicles Exited	2270
Hourly Exit Rate	2270
Input Volume	2280
% of Volume	100

4: Axtell Drive & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBR	SBL	SBR	All
Vehicles Exited	20	1069	6	6	721	26	1	2	47	40	1938
Hourly Exit Rate	20	1069	6	6	721	26	1	2	47	40	1938
Input Volume	21	1068	5	7	726	23	1	1	49	41	1943
% of Volume	94	100	120	86	99	112	80	160	95	98	100

Total Zone Performance

Vehicles Exited	39
Hourly Exit Rate	39
Input Volume	9233
% of Volume	0

1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBT	SBR	All
Vehicles Exited	210	537	102	362	724	236	127	915	415	1018	153	4799
Hourly Exit Rate	210	537	102	362	724	236	127	915	415	1018	153	4799
Input Volume	214	541	101	397	752	241	126	935	419	1010	160	4895
% of Volume	98	99	101	91	96	98	101	98	99	101	96	98

2: NB Coolidge Highway & XO S. of Maple Road Performance by movement

Movement	EBL	EBT	NBT	NBR	All
Vehicles Exited	105	11	1347	8	1471
Hourly Exit Rate	105	11	1347	8	1471
Input Volume	108	10	1372	8	1499
% of Volume	97	105	98	100	98

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vehicles Exited	131	845	128	33	885	107	205	99	138	72	41	269
Hourly Exit Rate	131	845	128	33	885	107	205	99	138	72	41	269
Input Volume	142	850	133	31	887	104	210	98	139	69	45	279
% of Volume	92	99	96	107	100	103	98	101	99	104	91	96

3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road Performance by movement

Movement	All
Vehicles Exited	2953
Hourly Exit Rate	2953
Input Volume	2988
% of Volume	99

4: Axtell Drive & Maple Road Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR	All
Vehicles Exited	28	918	5	15	1448	63	6	1	19	15	23	2541
Hourly Exit Rate	28	918	5	15	1448	63	6	1	19	15	23	2541
Input Volume	29	926	5	16	1477	64	6	1	23	24	40	2610
% of Volume	97	99	100	95	98	98	100	100	84	62	58	97

Total Zone Performance

Vehicles Exited	24
Hourly Exit Rate	24
Input Volume	11992
% of Volume	0

Appendix C

Future Traffic Conditions

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Future Conditions
 AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	143	675	103	221	486	100	60	690	418	0	859	131
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	1942	1942	1942	1961	1961	1961	0	1961	2000
Adj Flow Rate, veh/h	155	734	112	251	552	114	66	758	459	0	934	142
Adj No. of Lanes	1	2	1	2	2	1	1	2	1	0	3	0
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.91	0.91	0.91	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	3	3	3	2	2	2	0	2	2
Cap, veh/h	185	895	400	320	850	380	87	1951	872	0	2013	305
Arrive On Green	0.10	0.24	0.24	0.09	0.23	0.23	0.02	0.17	0.17	0.00	0.43	0.43
Sat Flow, veh/h	1867	3725	1665	3588	3689	1648	1867	3725	1665	0	4868	711
Grp Volume(v), veh/h	155	734	112	251	552	114	66	758	459	0	710	366
Grp Sat Flow(s),veh/h/ln	1867	1863	1665	1794	1845	1648	1867	1863	1665	0	1784	1834
Q Serve(g_s), s	9.8	22.4	6.6	8.2	16.2	6.9	4.2	21.6	30.1	0.0	17.0	17.1
Cycle Q Clear(g_c), s	9.8	22.4	6.6	8.2	16.2	6.9	4.2	21.6	30.1	0.0	17.0	17.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.39
Lane Grp Cap(c), veh/h	185	895	400	320	850	380	87	1951	872	0	1531	787
V/C Ratio(X)	0.84	0.82	0.28	0.78	0.65	0.30	0.76	0.39	0.53	0.00	0.46	0.47
Avail Cap(c_a), veh/h	282	966	431	541	956	427	159	1951	872	0	1531	787
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	53.1	43.1	37.1	53.5	41.8	38.2	58.4	32.6	36.1	0.0	24.4	24.4
Incr Delay (d2), s/veh	12.5	5.4	0.4	4.2	1.3	0.4	12.8	0.6	2.3	0.0	0.2	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	5.7	12.2	3.1	4.3	8.4	3.2	2.5	11.3	14.5	0.0	8.4	8.7
LnGrp Delay(d),s/veh	65.6	48.5	37.5	57.7	43.1	38.6	71.2	33.2	38.4	0.0	24.6	24.9
LnGrp LOS	E	D	D	E	D	D	E	C	D		C	C
Approach Vol, veh/h		1001			917			1283			1076	
Approach Delay, s/veh		49.9			46.5			37.0			24.7	
Approach LOS		D			D			D			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		68.6	16.6	34.7	11.4	57.3	17.8	33.6				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 53	18.1	31.1	* 10	* 37	18.1	31.1				
Max Q Clear Time (g_c+1), s		32.1	10.2	24.4	6.2	19.1	11.8	18.2				
Green Ext Time (p_c), s		14.5	0.5	4.5	0.0	12.9	0.2	7.2				
Intersection Summary												
HCM 2010 Ctrl Delay			39.0									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary
 2: NB Coolidge Highway & XO S. of Maple Road

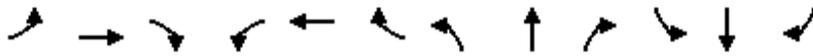
Future Conditions
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	3	0	0	0	0	0	1058	1	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1961	1961	0				0	1961	2000			
Adj Flow Rate, veh/h	173	0	0				0	1245	1			
Adj No. of Lanes	2	1	0				0	3	0			
Peak Hour Factor	0.65	0.65	0.65				0.85	0.85	0.85			
Percent Heavy Veh, %	2	2	0				0	2	2			
Cap, veh/h	250	131	0				0	4672	4			
Arrive On Green	0.07	0.00	0.00				0.00	0.85	0.85			
Sat Flow, veh/h	3735	1961	0				0	5701	4			
Grp Volume(v), veh/h	173	0	0				0	804	442			
Grp Sat Flow(s),veh/h/ln	1867	1961	0				0	1784	1960			
Q Serve(g_s), s	5.4	0.0	0.0				0.0	5.4	5.4			
Cycle Q Clear(g_c), s	5.4	0.0	0.0				0.0	5.4	5.4			
Prop In Lane	1.00		0.00				0.00		0.00			
Lane Grp Cap(c), veh/h	250	131	0				0	3018	1658			
V/C Ratio(X)	0.69	0.00	0.00				0.00	0.27	0.27			
Avail Cap(c_a), veh/h	1086	570	0				0	3018	1658			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	54.8	0.0	0.0				0.0	1.8	1.8			
Incr Delay (d2), s/veh	3.4	0.0	0.0				0.0	0.2	0.4			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.9	0.0	0.0				0.0	2.7	3.0			
LnGrp Delay(d),s/veh	58.2	0.0	0.0				0.0	2.1	2.2			
LnGrp LOS	E							A	A			
Approach Vol, veh/h		173						1246				
Approach Delay, s/veh		58.2						2.1				
Approach LOS		E						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		106.9		13.1								
Change Period (Y+Rc), s		* 5.4		5.1								
Max Green Setting (Gmax), s		* 75		34.9								
Max Q Clear Time (g_c+I1), s		7.4		7.4								
Green Ext Time (p_c), s		11.2		0.6								
Intersection Summary												
HCM 2010 Ctrl Delay			9.0									
HCM 2010 LOS			A									
Notes												
User approved volume balancing among the lanes for turning movement.												

HCM 2010 Signalized Intersection Summary
 3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road

Future Conditions
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	209	697	162	114	757	93	39	27	19	20	89	121
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	1961	1961	2000	1961	1961	2000	1980	1980	2000
Adj Flow Rate, veh/h	220	734	171	127	841	103	44	31	22	22	99	134
Adj No. of Lanes	1	2	1	1	2	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.90	0.90	0.90	0.88	0.88	0.88	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	1	1	1
Cap, veh/h	754	973	435	874	1052	129	106	129	83	232	186	166
Arrive On Green	0.36	0.26	0.26	0.42	0.31	0.31	0.02	0.06	0.06	0.06	0.10	0.10
Sat Flow, veh/h	1867	3725	1665	1867	3342	409	1867	2177	1392	1886	1881	1678
Grp Volume(v), veh/h	220	734	171	127	469	475	44	26	27	22	99	134
Grp Sat Flow(s),veh/h/ln	1867	1863	1665	1867	1863	1888	1867	1863	1707	1886	1881	1678
Q Serve(g_s), s	4.5	21.8	10.1	0.0	27.7	27.7	0.0	1.6	1.8	0.0	6.0	9.4
Cycle Q Clear(g_c), s	4.5	21.8	10.1	0.0	27.7	27.7	0.0	1.6	1.8	0.0	6.0	9.4
Prop In Lane	1.00		1.00	1.00		0.22	1.00		0.82	1.00		1.00
Lane Grp Cap(c), veh/h	754	973	435	874	586	594	106	111	102	232	186	166
V/C Ratio(X)	0.29	0.75	0.39	0.15	0.80	0.80	0.41	0.23	0.27	0.09	0.53	0.81
Avail Cap(c_a), veh/h	754	1953	873	874	976	990	170	234	215	232	237	211
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	40.8	36.5	19.4	37.6	37.6	57.1	53.8	53.9	49.2	51.4	53.0
Incr Delay (d2), s/veh	0.2	5.4	2.7	0.1	10.9	10.8	2.5	1.1	1.4	0.2	2.4	16.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	5.0	11.9	5.0	2.5	16.0	16.2	1.5	0.9	0.9	0.7	3.3	5.1
LnGrp Delay(d),s/veh	25.2	46.2	39.1	19.4	48.6	48.4	59.6	54.9	55.3	49.4	53.8	69.4
LnGrp LOS	C	D	D	B	D	D	E	D	E	D	D	E
Approach Vol, veh/h		1125			1071			97			255	
Approach Delay, s/veh		41.0			45.1			57.1			61.6	
Approach LOS		D			D			E			E	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	5.9	37.5	8.9	17.7	49.5	43.9	13.6	13.0				
Change Period (Y+Rc), s	6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9				
Max Green Setting (Gmax), s	63	* 63	7.1	15.1	* 11	* 63	7.1	15.1				
Max Q Clear Time (g_c+1/2), s	12.0	23.8	2.0	11.4	6.5	29.7	2.0	3.8				
Green Ext Time (p_c), s	0.7	7.6	0.0	0.4	0.3	8.1	0.0	0.1				

Intersection Summary

HCM 2010 Ctrl Delay	45.4
HCM 2010 LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	30.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	21	1056	16	21	719	23	47	0	57	49	0	41
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	95	95	95	60	60	60	83	83	83
Heavy Vehicles, %	1	1	1	2	2	2	2	2	2	3	3	3
Mvmt Flow	22	1123	17	22	757	24	78	0	95	59	0	49

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	781	0	0	1140	0	0	1600	2002	570	1419	1998	391
Stage 1	-	-	-	-	-	-	1177	1177	-	813	813	-
Stage 2	-	-	-	-	-	-	423	825	-	606	1185	-
Critical Hdwy	4.12	-	-	4.14	-	-	7.54	6.54	6.94	7.56	6.56	6.96
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.56	5.56	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.56	5.56	-
Follow-up Hdwy	2.21	-	-	2.22	-	-	3.52	4.02	3.32	3.53	4.03	3.33
Pot Cap-1 Maneuver	839	-	-	609	-	-	~ 71	59	465	96	59	605
Stage 1	-	-	-	-	-	-	203	263	-	336	388	-
Stage 2	-	-	-	-	-	-	579	385	-	448	259	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	839	-	-	609	-	-	~ 62	55	465	73	55	605
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 62	55	-	73	55	-
Stage 1	-	-	-	-	-	-	198	256	-	327	374	-
Stage 2	-	-	-	-	-	-	513	371	-	347	252	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.3	\$ 317.9	121
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	118	839	-	-	609	-	-	122
HCM Lane V/C Ratio	1.469	0.027	-	-	0.036	-	-	0.889
HCM Control Delay (s)	\$ 317.9	9.4	-	-	11.1	-	-	121
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	12.2	0.1	-	-	0.1	-	-	5.6

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

Intersection	
Int Delay, s/veh	3.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	51	53	0	13	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	60	60	94	94
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	0	55	88	0	14	26

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	141	88	0	0	88	0
Stage 1	88	-	-	-	-	-
Stage 2	53	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	854	973	-	-	1514	-
Stage 1	938	-	-	-	-	-
Stage 2	972	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	846	973	-	-	1514	-
Mov Cap-2 Maneuver	846	-	-	-	-	-
Stage 1	938	-	-	-	-	-
Stage 2	963	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	8.9		0		2.6
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 973	1514	-
HCM Lane V/C Ratio	-	- 0.057	0.009	-
HCM Control Delay (s)	-	- 8.9	7.4	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0.2	0	-

Intersection	
Int Delay, s/veh	6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	51	2	0	12	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	60	60	94	94
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	0	55	3	0	13	13

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	41	3	0	0	3	0
Stage 1	3	-	-	-	-	-
Stage 2	38	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	973	1084	-	-	1626	-
Stage 1	1023	-	-	-	-	-
Stage 2	987	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	965	1084	-	-	1626	-
Mov Cap-2 Maneuver	965	-	-	-	-	-
Stage 1	1023	-	-	-	-	-
Stage 2	979	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	8.5		0		3.6
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 1084	1626	-
HCM Lane V/C Ratio	-	- 0.051	0.008	-
HCM Control Delay (s)	-	- 8.5	7.2	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0.2	0	-

HCM 2010 Signalized Intersection Summary
 1: Coolidge Highway (Push Buttons) (SCATS) & Maple Road

Future Conditions
 PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	214	568	101	404	759	244	126	935	437	0	1016	160
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1980	1980	1980	1980	1980	1980	1980	1980	1980	0	1980	2000
Adj Flow Rate, veh/h	225	598	106	439	825	265	135	1005	470	0	1181	186
Adj No. of Lanes	1	2	1	2	2	1	1	2	1	0	3	0
Peak Hour Factor	0.95	0.95	0.95	0.92	0.92	0.92	0.93	0.93	0.93	0.86	0.86	0.86
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	0	1	1
Cap, veh/h	255	916	409	506	927	414	165	1774	794	0	1583	249
Arrive On Green	0.14	0.24	0.24	0.14	0.25	0.25	0.03	0.16	0.16	0.00	0.34	0.34
Sat Flow, veh/h	1886	3762	1681	3659	3762	1681	1886	3762	1683	0	4890	742
Grp Volume(v), veh/h	225	598	106	439	825	265	135	1005	470	0	903	464
Grp Sat Flow(s),veh/h/ln	1886	1881	1681	1829	1881	1681	1886	1881	1683	0	1802	1849
Q Serve(g_s), s	14.1	17.2	6.1	14.1	25.4	16.9	8.5	29.7	31.2	0.0	26.7	26.7
Cycle Q Clear(g_c), s	14.1	17.2	6.1	14.1	25.4	16.9	8.5	29.7	31.2	0.0	26.7	26.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	0.00		0.40
Lane Grp Cap(c), veh/h	255	916	409	506	927	414	165	1774	794	0	1211	621
V/C Ratio(X)	0.88	0.65	0.26	0.87	0.89	0.64	0.82	0.57	0.59	0.00	0.75	0.75
Avail Cap(c_a), veh/h	300	944	422	582	944	422	192	1774	794	0	1211	621
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33	0.33	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	50.9	40.8	36.7	50.6	43.6	40.4	57.3	39.3	39.9	0.0	35.3	35.3
Incr Delay (d2), s/veh	22.5	1.6	0.3	11.9	10.4	3.2	21.2	1.3	3.2	0.0	2.6	4.9
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	8.9	9.1	2.9	8.0	14.5	8.2	5.4	15.8	15.3	0.0	13.7	14.5
LnGrp Delay(d),s/veh	73.4	42.4	37.0	62.5	54.0	43.6	78.5	40.6	43.2	0.0	37.9	40.2
LnGrp LOS	E	D	D	E	D	D	E	D	D		D	D
Approach Vol, veh/h		929			1529			1610			1367	
Approach Delay, s/veh		49.3			54.7			44.5			38.7	
Approach LOS		D			D			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s		62.4	22.5	35.1	16.3	46.1	22.1	35.5				
Change Period (Y+Rc), s		* 5.8	5.9	5.9	* 5.8	* 5.8	5.9	5.9				
Max Green Setting (Gmax), s		* 53	19.1	30.1	* 12	* 35	19.1	30.1				
Max Q Clear Time (g_c+I1), s		33.2	16.1	19.2	10.5	28.7	16.1	27.4				
Green Ext Time (p_c), s		16.6	0.5	7.3	0.0	6.0	0.2	2.2				
Intersection Summary												
HCM 2010 Ctrl Delay			46.7									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary
 2: NB Coolidge Highway & XO S. of Maple Road

Future Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	114	10	0	0	0	0	0	1384	8	0	0	0
Number	7	4	14				5	2	12			
Initial Q (Qb), veh	0	0	0				0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00				1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1980	1980	0				0	1980	2000			
Adj Flow Rate, veh/h	139	0	0				0	1457	8			
Adj No. of Lanes	2	1	0				0	3	0			
Peak Hour Factor	0.87	0.87	0.87				0.95	0.95	0.95			
Percent Heavy Veh, %	1	1	0				0	1	1			
Cap, veh/h	213	112	0				0	4749	26			
Arrive On Green	0.06	0.00	0.00				0.00	0.86	0.86			
Sat Flow, veh/h	3772	1980	0				0	5726	30			
Grp Volume(v), veh/h	139	0	0				0	946	519			
Grp Sat Flow(s),veh/h/ln	1886	1980	0				0	1802	1975			
Q Serve(g_s), s	4.3	0.0	0.0				0.0	6.2	6.2			
Cycle Q Clear(g_c), s	4.3	0.0	0.0				0.0	6.2	6.2			
Prop In Lane	1.00		0.00				0.00		0.02			
Lane Grp Cap(c), veh/h	213	112	0				0	3085	1690			
V/C Ratio(X)	0.65	0.00	0.00				0.00	0.31	0.31			
Avail Cap(c_a), veh/h	1097	576	0				0	3085	1690			
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00			
Upstream Filter(I)	1.00	0.00	0.00				0.00	1.00	1.00			
Uniform Delay (d), s/veh	55.4	0.0	0.0				0.0	1.7	1.7			
Incr Delay (d2), s/veh	3.3	0.0	0.0				0.0	0.3	0.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln	2.4	0.0	0.0				0.0	3.1	3.5			
LnGrp Delay(d),s/veh	58.8	0.0	0.0				0.0	1.9	2.2			
LnGrp LOS	E							A	A			
Approach Vol, veh/h		139						1465				
Approach Delay, s/veh		58.8						2.0				
Approach LOS		E						A				
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		108.1		11.9								
Change Period (Y+Rc), s		* 5.4		5.1								
Max Green Setting (Gmax), s		* 75		34.9								
Max Q Clear Time (g_c+I1), s		8.2		6.3								
Green Ext Time (p_c), s		14.8		0.5								
Intersection Summary												
HCM 2010 Ctrl Delay			6.9									
HCM 2010 LOS			A									
Notes												
User approved volume balancing among the lanes for turning movement.												

HCM 2010 Signalized Intersection Summary
 3: Maplelawn Drive (Push Buttons) (SCATS) & Maple Road

Future Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	874	136	31	933	104	215	98	139	69	45	284
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1961	1961	1961	2000	2000	2000	1980	1980	2000	1980	1980	2000
Adj Flow Rate, veh/h	153	920	143	33	1003	112	242	110	156	79	52	326
Adj No. of Lanes	1	2	1	1	2	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.93	0.93	0.93	0.89	0.89	0.89	0.87	0.87	0.87
Percent Heavy Veh, %	2	2	2	0	0	0	1	1	1	1	1	1
Cap, veh/h	470	1188	530	576	1242	139	203	218	194	300	299	267
Arrive On Green	0.20	0.32	0.32	0.25	0.36	0.36	0.08	0.12	0.12	0.12	0.16	0.16
Sat Flow, veh/h	1867	3725	1664	1905	3447	385	1886	1881	1674	1886	1881	1677
Grp Volume(v), veh/h	153	920	143	33	553	562	242	110	156	79	52	326
Grp Sat Flow(s),veh/h/ln	1867	1863	1664	1905	1900	1931	1886	1881	1674	1886	1881	1677
Q Serve(g_s), s	2.3	26.8	7.7	0.0	31.5	31.5	9.1	6.6	10.9	0.0	2.9	19.1
Cycle Q Clear(g_c), s	2.3	26.8	7.7	0.0	31.5	31.5	9.1	6.6	10.9	0.0	2.9	19.1
Prop In Lane	1.00		1.00	1.00		0.20	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	470	1188	530	576	685	696	203	218	194	300	299	267
V/C Ratio(X)	0.33	0.77	0.27	0.06	0.81	0.81	1.19	0.51	0.81	0.26	0.17	1.22
Avail Cap(c_a), veh/h	470	1922	858	576	980	996	203	299	267	300	299	267
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	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.6	37.0	30.5	28.3	34.6	34.6	54.1	49.8	51.7	46.4	43.6	50.5
Incr Delay (d2), s/veh	0.4	5.0	1.2	0.0	9.9	9.8	124.6	1.8	11.9	0.5	0.3	128.5
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	4.2	14.6	3.7	0.8	18.3	18.6	13.7	3.5	5.7	2.3	1.5	18.3
LnGrp Delay(d),s/veh	38.0	41.9	31.7	28.4	44.5	44.4	178.7	51.7	63.6	46.8	43.9	179.0
LnGrp LOS	D	D	C	C	D	D	F	D	E	D	D	F
Approach Vol, veh/h		1216			1148			508			457	
Approach Delay, s/veh		40.2			44.0			115.8			140.7	
Approach LOS		D			D			F			F	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	35.6	44.4	15.0	25.0	30.7	49.3	20.2	19.8				
Change Period (Y+Rc), s	6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9				
Max Green Setting (Gmax), s	62	* 62	9.1	19.1	* 5.9	* 6.1	9.1	19.1				
Max Q Clear Time (g_c+I), s	12.0	28.8	11.1	21.1	4.3	33.5	2.0	12.9				
Green Ext Time (p_c), s	0.2	9.5	0.0	0.0	0.1	9.7	0.6	0.8				

Intersection Summary

HCM 2010 Ctrl Delay	66.9
HCM 2010 LOS	E

Notes

User approved pedestrian interval to be less than phase max green.

Intersection												
Int Delay, s/veh	75.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	29	926	50	72	1461	64	31	1	53	24	0	40
Conflicting Peds, #/hr	2	0	0	0	0	2	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	150	-	-	150	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	88	88	88	68	68	68	70	70	70
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	2	2	2
Mvmt Flow	32	1007	54	82	1660	73	46	1	78	34	0	57

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1733	0	0	1061	0	0	2091	2994	532	2427	2984	868
Stage 1	-	-	-	-	-	-	1097	1097	-	1860	1860	-
Stage 2	-	-	-	-	-	-	994	1897	-	567	1124	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.21	-	-	2.21	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	364	-	-	658	-	-	~ 30	13	492	~ 17	14	296
Stage 1	-	-	-	-	-	-	227	287	-	76	121	-
Stage 2	-	-	-	-	-	-	263	116	-	476	279	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	363	-	-	657	-	-	~ 20	10	491	~ 11	11	296
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 20	10	-	~ 11	11	-
Stage 1	-	-	-	-	-	-	207	262	-	69	106	-
Stage 2	-	-	-	-	-	-	185	102	-	362	254	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.5	\$ 908	\$ 1313.1
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	48	363	-	-	657	-	-	28
HCM Lane V/C Ratio	2.604	0.087	-	-	0.125	-	-	3.265
HCM Control Delay (s)	\$ 908	15.9	-	-	11.3	-	-	\$ 1313.1
HCM Lane LOS	F	C	-	-	B	-	-	F
HCM 95th %tile Q(veh)	13.2	0.3	-	-	0.4	-	-	11

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

Intersection	
Int Delay, s/veh	2.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	28	57	0	51	71
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	60	60	94	94
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	0	30	95	0	54	76

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	279	95	0	0	95	0
Stage 1	95	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	713	964	-	-	1505	-
Stage 1	931	-	-	-	-	-
Stage 2	850	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	687	964	-	-	1505	-
Mov Cap-2 Maneuver	687	-	-	-	-	-
Stage 1	931	-	-	-	-	-
Stage 2	819	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	8.9		0		3.1
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	- 964	1505	-
HCM Lane V/C Ratio	-	- 0.032	0.036	-
HCM Control Delay (s)	-	- 8.9	7.5	0
HCM Lane LOS	-	- A	A	A
HCM 95th %tile Q(veh)	-	- 0.1	0.1	-

Intersection	
Int Delay, s/veh	4.2

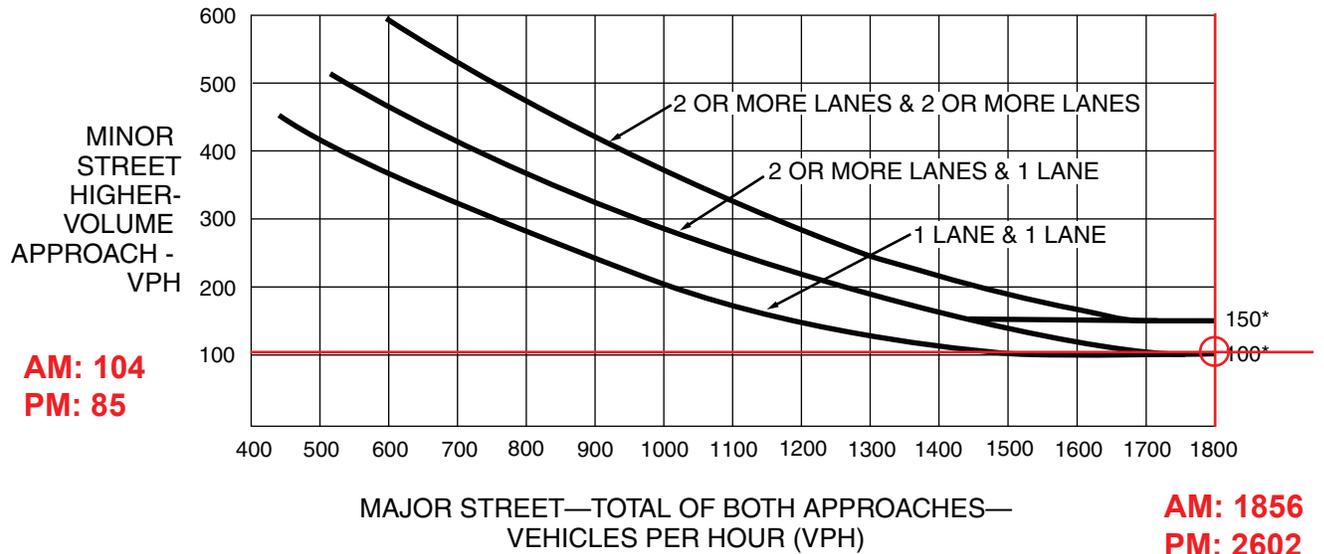
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	0	27	30	0	50	21
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	60	60	94	94
Heavy Vehicles, %	1	1	2	1	1	2
Mvmt Flow	0	29	50	0	53	22

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	179	50	0	0	50	0
Stage 1	50	-	-	-	-	-
Stage 2	129	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	813	1021	-	-	1563	-
Stage 1	975	-	-	-	-	-
Stage 2	899	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	785	1021	-	-	1563	-
Mov Cap-2 Maneuver	785	-	-	-	-	-
Stage 1	975	-	-	-	-	-
Stage 2	868	-	-	-	-	-

Approach	WB		NB		SB
HCM Control Delay, s	8.6		0		5.2
HCM LOS	A				

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	1021	1563	-
HCM Lane V/C Ratio	-	-	0.029	0.034	-
HCM Control Delay (s)	-	-	8.6	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

Figure 4C-3. Warrant 3, Peak Hour

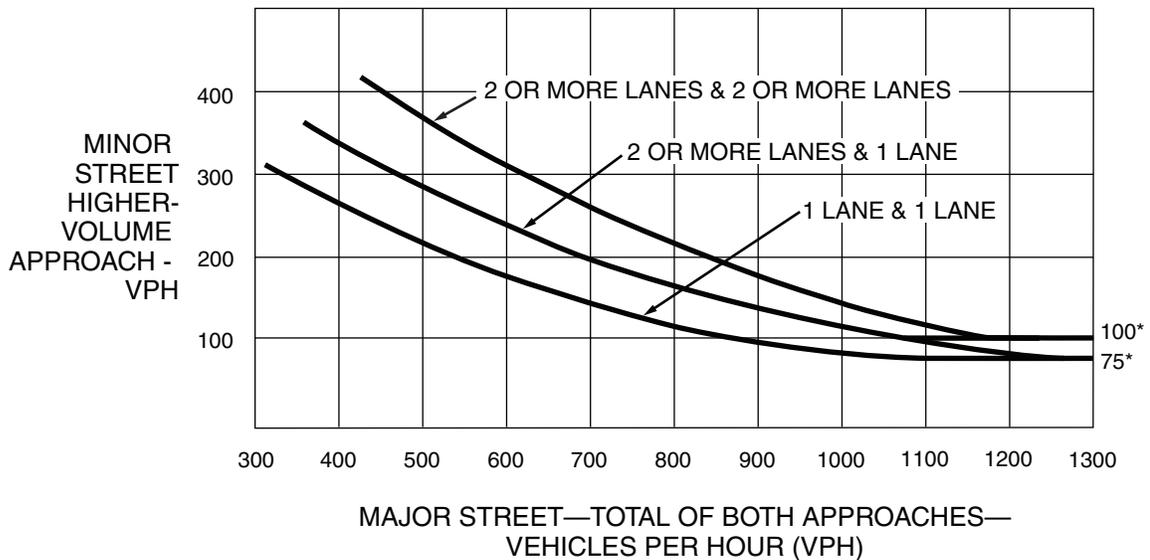


*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

SIGNAL WARRANTED BASED ON AM CONDITION

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



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

HCM 2010 Signalized Intersection Summary
4: Axtell Drive & Maple Road

Future Conditions W / Improvements
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	21	1056	16	21	719	23	47	0	57	49	0	41
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1980	1980	2000	1961	1961	2000	1961	1961	2000	2000	1942	2000
Adj Flow Rate, veh/h	22	1123	17	22	757	24	78	0	95	59	0	49
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.94	0.94	0.94	0.95	0.95	0.95	0.60	0.60	0.60	0.83	0.83	0.83
Percent Heavy Veh, %	1	1	1	2	2	2	2	2	2	3	3	3
Cap, veh/h	594	2914	44	438	2831	90	215	0	220	108	14	63
Arrive On Green	1.00	1.00	1.00	1.00	1.00	1.00	0.13	0.00	0.13	0.13	0.00	0.13
Sat Flow, veh/h	696	3794	57	491	3686	117	1351	0	1667	470	103	475
Grp Volume(v), veh/h	22	557	583	22	382	399	78	0	95	108	0	0
Grp Sat Flow(s),veh/h/ln	696	1881	1970	491	1863	1940	1351	0	1667	1048	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	6.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	6.3	13.1	0.0	0.0
Prop In Lane	1.00		0.03	1.00		0.06	1.00		1.00	0.55		0.45
Lane Grp Cap(c), veh/h	594	1445	1513	438	1431	1490	215	0	220	185	0	0
V/C Ratio(X)	0.04	0.39	0.39	0.05	0.27	0.27	0.36	0.00	0.43	0.59	0.00	0.00
Avail Cap(c_a), veh/h	594	1445	1513	438	1431	1490	352	0	389	329	0	0
HCM Platoon Ratio	2.00	2.00	2.00	2.00	2.00	2.00	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	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	48.5	0.0	47.9	51.9	0.0	0.0
Incr Delay (d2), s/veh	0.1	0.8	0.7	0.2	0.5	0.4	1.0	0.0	1.3	2.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.3	0.3	0.0	0.2	0.2	2.5	0.0	3.0	3.7	0.0	0.0
LnGrp Delay(d),s/veh	0.1	0.8	0.7	0.2	0.5	0.4	49.6	0.0	49.3	54.9	0.0	0.0
LnGrp LOS	A	A	A	A	A	A	D		D	D		
Approach Vol, veh/h		1162			803			173			108	
Approach Delay, s/veh		0.7			0.4			49.4			54.9	
Approach LOS		A			A			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		98.2		21.8		98.2		21.8				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		80.0		28.0		80.0		28.0				
Max Q Clear Time (g_c+I1), s		2.0		15.1		2.0		9.7				
Green Ext Time (p_c), s		21.4		1.2		21.4		1.4				
Intersection Summary												
HCM 2010 Ctrl Delay				7.0								
HCM 2010 LOS				A								

HCM 2010 Signalized Intersection Summary
4: Axtell Drive & Maple Road

Future Conditions W / Improvements
PM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 						 	
Volume (veh/h)	29	926	50	72	1461	64	31	1	53	24	0	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1980	1980	2000	1980	1980	2000	1961	1961	2000	2000	1961	2000
Adj Flow Rate, veh/h	32	1007	54	82	1660	73	46	1	78	34	0	57
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	0	1	0
Peak Hour Factor	0.92	0.92	0.92	0.88	0.88	0.88	0.68	0.68	0.68	0.70	0.70	0.70
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	2	2	2
Cap, veh/h	286	2925	157	407	2957	129	162	2	156	69	14	70
Arrive On Green	0.54	0.54	0.54	1.00	1.00	1.00	0.09	0.09	0.09	0.09	0.00	0.09
Sat Flow, veh/h	281	3632	195	535	3672	161	1341	21	1649	297	144	740
Grp Volume(v), veh/h	32	522	539	82	847	886	46	0	79	91	0	0
Grp Sat Flow(s),veh/h/ln	281	1881	1946	535	1881	1952	1341	0	1670	1182	0	0
Q Serve(g_s), s	6.8	18.8	18.8	4.4	0.0	0.0	0.0	0.0	5.4	4.2	0.0	0.0
Cycle Q Clear(g_c), s	6.8	18.8	18.8	23.2	0.0	0.0	5.1	0.0	5.4	9.6	0.0	0.0
Prop In Lane	1.00		0.10	1.00		0.08	1.00		0.99	0.37		0.63
Lane Grp Cap(c), veh/h	286	1515	1567	407	1515	1572	162	0	158	153	0	0
V/C Ratio(X)	0.11	0.34	0.34	0.20	0.56	0.56	0.28	0.00	0.50	0.59	0.00	0.00
Avail Cap(c_a), veh/h	286	1515	1567	407	1515	1572	203	0	209	199	0	0
HCM Platoon Ratio	0.67	0.67	0.67	2.00	2.00	2.00	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	0.00
Uniform Delay (d), s/veh	6.9	9.7	9.7	2.3	0.0	0.0	51.5	0.0	51.6	53.7	0.0	0.0
Incr Delay (d2), s/veh	0.8	0.6	0.6	1.1	1.5	1.5	1.0	0.0	2.4	3.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	10.1	10.4	0.8	0.6	0.6	1.5	0.0	2.6	3.1	0.0	0.0
LnGrp Delay(d),s/veh	7.7	10.3	10.3	3.4	1.5	1.5	52.4	0.0	54.0	57.3	0.0	0.0
LnGrp LOS	A	B	B	A	A	A	D		D	E		
Approach Vol, veh/h		1093			1815			125				91
Approach Delay, s/veh		10.2			1.6			53.4				57.3
Approach LOS		B			A			D				E
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		102.6		17.4		102.6		17.4				
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0				
Max Green Setting (Gmax), s		93.0		15.0		93.0		15.0				
Max Q Clear Time (g_c+I1), s		20.8		11.6		25.2		7.4				
Green Ext Time (p_c), s		48.4		0.3		46.5		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			8.3									
HCM 2010 LOS			A									