AGENDA

Grand Haven Charter Township Planning Commission
Monday, July 6, 2015 – 7:30 p.m.

I. Call to Order

II. Roll Call

III. Pledge to the Flag

IV. Approval of the June 24, 2015 Meeting Minutes

V. Correspondence

VI. Public Comments/Questions on Agenda Items Only (Limited to 3 minutes)

VII. Public Hearing
   A. Rezoning application – Wagenmaker from AG to R-2
   B. PUD application – Speedway & North Star Commercial

VIII. Old Business
   A. Rezoning application – Wagenmaker from AG to R-2
   B. PUD application – Speedway & North Star Commercial

IX. Reports
   A. Attorney's Report
   B. Staff Report
   C. Other

X. Extended Public Comments/Questions on Non-Agenda Items Only (Limited to 4 minutes)

XI. Adjournment

Note: Persons wishing to speak at public hearings, on agenda items, or extended comments, must fill out a "Speakers Form" located on the counter. Completed forms must be submitted to the Zoning Administrator prior to the meeting.

SPECIAL MEETING MINUTES
GRAND HAVEN CHARTER TOWNSHIP
PLANNING COMMISSION
JUNE 24, 2015

I. CALL TO ORDER

LaMourie called the meeting of the Grand Haven Charter Township Planning Commission to order at 7:30 p.m.

II. ROLL CALL

Members present: LaMourie, Kieft, Robertson, Reenders, Gignac, and Wilson
Members absent: Kantrovich and Taylor
Also present: Fedewa

Without objection, LaMourie instructed Fedewa to record the minutes.

III. PLEDGE TO THE FLAG

IV. APPROVAL OF MINUTES

Without objection, the minutes of the June 15, 2015 meeting were approved.

V. CORRESPONDENCE – None

VI. PUBLIC COMMENTS ON AGENDA ITEMS ONLY – None

VII. NEW BUSINESS

A. Site Plan Review – Transfer Tool

Fedewa provided an overview of the Site Plan Review application through a memorandum dated June 19th.

Initial discussion by the Planning Commission included:

- Questioned why a parking study was not submitted for staff review. An explanation was provided as to why a parking study is necessary when requesting more than the maximum number of spaces.
- Requested the applicant explain how the business will compensate for the additional parking spaces if the two proposed 30,000 square foot expansions identified on the site plan are constructed.

Brent Busscher, Controller for Transfer Tool, spoke for the group of representatives. Also present was, Jim Raterink, President of Transfer Tool; Bob McFarlane, Vice President of

Operations for Lakewood Construction; Jon Tilburt, Registered Architect; and Louis Edgerton, Service Manager for Lakewood Construction.

- Provided information on the number of employees, and design of shift changes.
- Spaces near the building are reserved for customers and suppliers who travel from across the country to visit the business.
- Employee high school students during the summer months, which also increases their need for parking spaces.
- Currently, employees are parking on the grass, which is not desirable.
- Jim Raterink, President of Transfer Tool, explained their business has been growing approximately 10% each year since 2008. It is very likely to expand in the future.

Final discussions by the Planning Commission included:

- Grateful that Transfer Tool has remained in Grand Haven Township, and have plans for future expansions.
- Understands that efficiency is the key to success. Work sites are smaller than they were in the 1990's when the business was constructed. Smaller work spaces equates to more employees, which results in the need for additional parking.
- Noted that businesses do not want to expend funds to construct a parking lot unless they have too. Therefore, the request to expand parking is likely a "need," and not a "want."
- Commission requested staff review the industrial parking requirements of other communities that have a heavy manufacturing base (*such as Zeeland*). Goal is to learn if GHT parking requirements are too restrictive.

Motion by Robertson, supported by Gignac, to approve with conditions the Site Plan Review application for the Transfer Tool Products parking lot addition located at 14444 168th Avenue, based on the application meeting all the requirements of the Grand Haven Charter Township Zoning Ordinance. The approval is conditioned upon receipt of a permit from the OCWRC, and the submission of a parking needs study, which must include parking space estimates for the future expansion. **Which motion carried.**

REPORT

1. The application meets the site plan review standards of Section 23.06 of the Zoning Ordinance. Specifically, the Planning Commission finds as follows:

    A. The uses proposed will not adversely affect the public health, safety, or welfare. Uses and structures located on the site take into account topography, size of the property, the uses on adjoining property and the relationship and size of buildings to the site.

B. The site will be developed so as not to impede the normal and orderly development or improvement of surrounding property for uses permitted in this ordinance.

C. Safe, convenient, uncontested, and well defined vehicular and pedestrian circulation is provided for ingress/egress points and within the site. Drives, streets and other circulation routes are designed to promote safe and efficient traffic operations within the site and at ingress/egress points.

D. The arrangement of public or private vehicular and pedestrian connections to existing or planned streets in the area are planned to provide a safe and efficient circulation system for traffic within the township.

E. Removal or alterations of significant natural features are restricted to those areas which are reasonably necessary to develop the site in accordance with the requirements of this Ordinance. The Planning Commission has required that landscaping, buffers, and/or greenbelts be preserved and/or provided to ensure that proposed uses will be adequately buffered from one another and from surrounding public and private property.

F. Areas of natural drainage such as swales, wetlands, ponds, or swamps are protected and preserved insofar as practical in their natural state to provide areas for natural habitat, preserve drainage patterns and maintain the natural characteristics of the land.

G. The site plan provides reasonable visual and sound privacy for all dwelling units located therein and adjacent thereto. Landscaping shall be used, as appropriate, to accomplish these purposes.

H. All buildings and groups of buildings are arranged so as to permit necessary emergency vehicle access as requested by the fire department.

I. All streets and driveways are developed in accordance with the Ottawa County Road Commission specifications, as appropriate.

J. Appropriate measures have been taken to ensure that removal of surface waters will not adversely affect neighboring properties or the public storm drainage system. Provisions have been made to accommodate storm water, prevent erosion and the formation of dust.

K. Exterior lighting is arranged so that it is deflected away from adjacent properties and so it does not interfere with the vision of motorists along adjacent streets, and consists of sharp cut-off fixtures.

L. All loading and unloading areas and outside storage areas, including areas for the storage of trash, which face or are visible from residential districts or public streets, are screened.

M. Entrances and exits are provided at appropriate locations so as to maximize the convenience and safety for persons entering or leaving the site.

N. The site plans conforms to all applicable requirements of County, State, Federal, and Township statutes and ordinances.

O. The general purposes and spirit of this Ordinance and the Master Plan of the Township are maintained.

VIII. REPORTS

A. Attorney Report - None

B. Staff Report

- Community Engagement Subcommittee
  - Robertson, Wilson, and Reenders volunteered to be members

C. Other - None

IX. EXTENDED PUBLIC COMMENTS ON NON-AGENDA ITEMS ONLY – None

X. ADJOURNMENT

Without objection, the meeting adjourned at 8:00 p.m.

Respectfully submitted,

Stacey Fedewa
Acting Recording Secretary

GRAND HAVEN CHARTER TOWNSHIP

Community Development Memo

DATE: July 2, 2015

TO: Planning Commission

FROM: Stacey Fedewa, Planning & Zoning Official

RE: Robert Wagenmaker – Rezoning Application (AG to R-2)

Robert Wagenmaker has applied to rezone a 5 acre parcel (70-07-14-200-017) on the SW corner of Lincoln Street and 152nd Avenue from AG to R-2.

The rezoning application was tested against the "Three C's" evaluation method described in the 2009 Master Plan.

COMPATIBILITY

This corner lot borders Hunters Woods PUD on the western and southern lot lines. Across Lincoln Street to the north the parcel is zoned Rural Residential (RR). Across 152nd Avenue to the east the parcel is zoned R-1 Single Family Residential.

The Future Land Use map calls for the applicants parcel to be zoned Medium Density Residential (*i.e., R-1 or R-2*). Furthermore, the FLU map designates the parcels to the west and south to be MDR as well; east to be public/quasi-public (*i.e., 80 acres owned by GHAPS*); and north to be Low Density Residential.

CONSISTENCY

Proposed rezoning is consistent with the existing, and future, land uses. Additionally, the application exceeds the minimum lot size requirement of 13,000 square feet.

The applicant anticipates applying for a land division to construct 2-3 additional dwellings (*1 dwelling currently exists on the parcel*). The proposed use has less impact compared to the existing Hunters Woods PUD development that borders the corner lot on two sides.

CAPABILITY

Parcels are currently serviced with the minimum infrastructure requirements described in the Master Plan (*i.e., paved roads, natural gas, municipal water, and, if available, sanitary sewer*). Sanitary sewer is available in Hunters Woods, but gaining access may be difficult and require the purchase of private easements.

RECOMMENDATION

Based on the findings outlined above, staff recommends approval of the Robert Wagenmaker rezoning application. If the Planning Commission agrees with the aforementioned recommendation, the following motion can be offered:

> **Motion** to recommend to the Township Board approval of the Robert Wakenmaker rezoning application of parcel 70-07-14-200-017 from Agricultural (AG) to R-2 Single Family Residential based on the application meeting applicable rezoning requirements and standards of the Grand Haven Charter Township Zoning Ordinance, Master Plan, and Future Land Use Map.

Please contact me prior to the meeting if you have questions.

GRAND HAVEN CHARTER TOWNSHIP

ZONING AMENDMENT REQUEST APPLICATION

Fee - $150.00 plus a $500.00 escrow*

Applicant information

Name Robert Wagenmaker

Phone (616-638-0897 Fax (616-846-7546

Address 16755 Timber Rdg Grand Haven, Mi 49417

Owner information *(If different from applicant)*

Name

Phone Fax

Address

Property information

Address/Location 15230 Lincoln St. Grand Haven, Mi 49417

Parcel # 70-07-14-200-017

Subject Property size *(acres)* 5 *(Include a survey with the legal description)*

Zoning *(current)* AG Zoning requested R-2

Adjacent Zoning RR *North* PUD *South* R-1 *East* PUD *West*

Master Planned Zoning RR Is Request Consistent with Township Master Plan? yes

Does this property abut a Township border? No

Present use of the subject property Residential

Proposed use of the subject property Residential

Number and type of existing structures on the subject property 1 House

Is the subject property located on a paved road? yes

Is municipal water located within 2,700 feet of the subject property? yes

Is municipal sewer located within 2,700 feet of the subject property? yes

NOTE: *The architect, engineer, planner, or designer shall be responsible for utilizing the Township Ordinance books and following the requirements for zoning amendments and procedures as stated in Section 27.08. Please submit thirteen (13) copies of the required information with you application.*

I hereby attest that the information on this application form is, to the best of my knowledge, true and accurate.

Signature of Applicant 6-11-15 *Date*

** To cover cost of legal and consulting fees, may be increased as necessary*

Notice

IF I PLAN TO SPLIT THE PARCEL(S) AFTER THE ZONING APPROVALS ARE GRANTED, I REALIZE THAT I MUST APPLY FOR A LAND DIVISION WITH THE ASSESSING DEPARTMENT. ALL LAND DIVISION REQUIREMENTS MUST BE CONFORMED TO BEFORE PROCEEDING WITH FURTHER DEVELOPMENT.

Signed _____ Date 6-11-15

For Office Use Only

Date Received _____ Fee Paid? _____

Materials Received: Site Plans _____ Location Map _____

Survey _____ Legal Description _____

Dated copy of approved minutes sent to applicant? _____ *Date Sent* _____

GRAND HAVEN CHARTER TOWNSHIP

Community Development Memo

DATE: July 2, 2015

TO: Planning Commission

FROM: Stacey Fedewa, Planning & Zoning Official

RE: Speedway, North Star Commercial, and Alice Bottje PUD Application

BACKGROUND

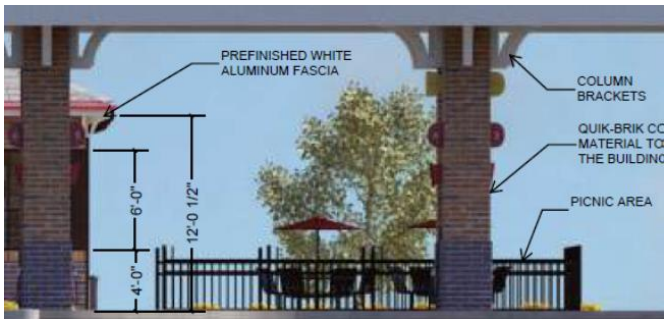
In January 2015, Speedway, North Star Commercial, and Alice Bottje submitted a PUD application to develop a portion of the site on the NW corner of Hayes Street and 172nd Avenue.

There have been several changes in the total amount of land included in the PUD. Staff anticipates the final number to be 11.772 acres, of which 3.157 will be designated open space.

Included for review are the following documents:

- Speedway Site Plans
- Nederveld Site Plans
- Elevation Drawings
- Photometric Plan
- Traffic Impact Analysis
- Parking Study
- Declaration of Restrictions and Easements (*first draft*)

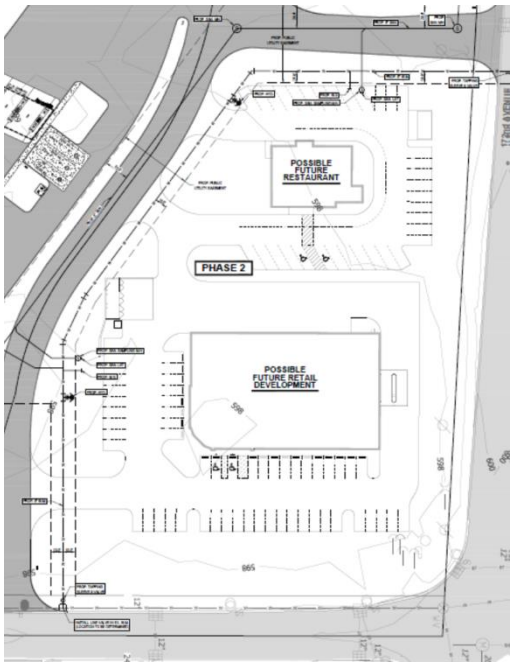
SITE CONDITIONS



The site will be developed in two phases.

Phase I will be:

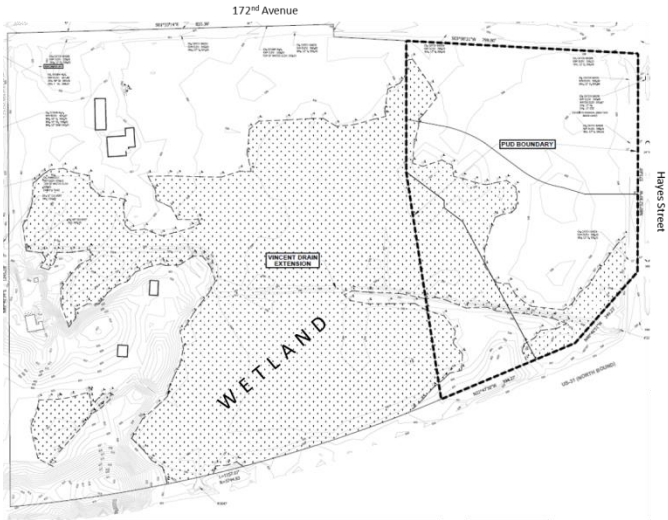
- 4.365 Acres in size
- 4,600 square foot Speedway Gas Station and Convenience Store
    - Operate 24 hours per day, 7 days per week
    - No alcohol sales proposed at this time
- Auto fueling canopy with seven pump islands (*14 fueling stations*)
- Commercial fueling canopy with four pump islands (*three fueling stations*)
- Outdoor seating area
- Ancillary sales area (*i.e., seasonal sales such as mulch*)



Phase II will be:

- 4.25 Acres in size
- Proposed future retail and commercial development
- Development will be dependent on market demand
- Will require a PUD Amendment application

OPEN SPACE DESIGNATION



As you may know, the parent parcel included a large segment of the Vincent Drain Extension, which had not been maintained. Due to neglect of the Drain, and fallow agricultural land, the wetland boundaries grew significantly. As part of this development project the applicants, in conjunction with the DEQ and OCWRC, have relocated and cleaned the Drain.

Currently, the site plans propose 2.157 acres of designated open space. However, it is staff's understanding that North Star Commercial and Alice Bottje intend to purchase an additional acre of wetland (*DEQ Permit obtained for this project calls for a wetland mitigation area of 1.05*

acres). Staff anticipates a portion of the 3.157 acres will be conveyed to the OCWRC to maintain the Drain, and the remainder will act as the mitigated wetland and include a conservation easement (*will likely require a revision to existing DEQ Permit 14-70-0075-P*).

ZONING COMPLIANCE	
Section 19.07.12 – Gasoline Stations	Full Compliance
Chapter 15A – US-31 Overlay District	Partial Compliance • 15A.08.2 – Front yard greenbelt shall be landscaped with vegetation that has an approved wetland rating • 15A.10.8 – Monument Sign (*see Requested Departures*) • 15A.10.10 – Parking exceeds maximum (*see Parking Study*)
Chapter 17 – Planned Unit Development District	Partial Compliance • Signage (*see Requested Departures*) • Designated open space conveyance
Chapter 20 – General Provisions	Partial Compliance • 20.03.2.H – Height of fuel canopies exceeds the maximum 14 feet (*see Requested Departures*)
Chapter 20A – Outdoor Lighting Requirements	Partial Compliance • Canopy lighting on S, W, and E walls shall be fully recessed.
Chapter 21 – Schedule of District Regulations	Full Compliance
Chapter 23 – Site Plan Review	Full Compliance
Chapter 24 – Parking, Loading Spaces, and Signs	Partial Compliance • Requested Ground Sign is larger than permitted (*see Requested Departures*) • Requesting additional Wall Sign with Manual Message Board (*see Requested Departures*)
Items included, but not required	• Outdoor seating area with ornamental steel fence • Ancillary sales area with ornamental steel fence • Decorative bollards • Exceptional landscaping

REQUESTED DEPARTURES

As required by Section 17.03.3.D, the applicant is required to provide a list of departures from the Zoning Ordinance regulations. Per Attorney Bultje, the Planning Commission has discretion to approve departures for a PUD project.

Zoning Ordinance Section	Strict Compliance Regulation	Requested Departure
24.12.12	1. A manual message board may comprise up to 25% of the sign area, but not exceeding 12 ft^2 of a wall sign. 2. Only 1 manual message board shall be permitted on a lot or parcel.	1. Requesting the entire wall sign be a manual message board, rather than only 25%. Proposed signs are each 40 ft^2. A wall sign can encompass up to 10% of the total wall area (*less windows and doors*) — maximum size for a wall sign on front is 72 ft^2 and rear is 100 ft^2. 2. Requesting a total of 2 manual message boards. One facing the auto canopy fueling station. The second facing the commercial canopy fueling station.
24.13	1. Total size of sign for a Gasoline Station is 50 ft^2. However, if constructed to monument standards, Section 15A.10.8 permits a 10% size bonus, which allows a total size of 55 ft^2. 2. Maximum height is 6 feet. 3. Must be setback 15 ft from any property line.	1. Requesting a total size of 72 ft^2. 2. Requesting a total height of 7'10". 3. Proposed sign location is setback 20 ft from property line, and 32 ft from the road edge. Requested departure still meets the requirements of the Clear Vision Ordinance.
20.03.2.H	Height of the canopy roof shall not exceed 14 ft and shall be open on all sides. Staff notes FHWA requires a 14 foot vertical clearance for overhead structures on local roads (*i.e., road surface to lowest point of overhead structure*).	Requesting each canopy has 16'6" of vertical clearance, plus 4' roof height, which totals 20'6" in overall height. Lowering the roof height will impact the drive aisle due to the corbels on the canopy columns.
15A.10.10	1 space per 200 ft^2 UFA = 12.5 spaces	Requesting 28 spaces. See parking study.

PLEASE NOTE: the **Township must specify in its findings the benefits received from having the project constructed as a PUD, with more liberal allowances, rather than as a special land use in the C-1 District, in strict compliance with the gas station requirements**. Not doing so could result in the Township having a difficult time enforcing the zoning ordinance in the future. It is the responsibility of the applicant to explain the benefit the Township receives for each departure that is requested.

ITEMS OF CONSIDERATION

1. Lastly, the applicants are requesting the Planning Commission grant a waiver of Section 20.11.5, "all business, commercial, and industrial uses and structures shall be screened along the rear or interior lot line which is adjacent to another parcel zoned R-5 or higher. However, if the use (and all structures incident thereto) are setback at least 200 feet from the adjacent residentially zoned parcel, then the screening requirements of this Section may be waived as a condition of the site plan review by the Planning Commission, and such waiver shall end whenever the 200 foot setback is reduced by placement of other structures or uses therein." Currently, there is *over 1,000 feet* between the northern boundary line of the PUD and the nearest structure.

2. Due to the various lot line adjustments, the drafting of certain legal documents has not been completed. The execution of these documents is contingent upon approval of the Planning Commission and Township Board.

    a. The land divisions have been conditionally approved by staff and Attorney Bultje (*the PUD must be approved and rezoned by the Planning Commission and Township before the division is finalized*), but the parcel numbers and legal descriptions will be adjusted again when the designated open space boundaries are finalized.

    b. Subsequently, the open space and title conveyances will occur.

RECOMMENDATION

Based on the findings outlined above, staff recommends conditional approval of the Speedway, North Star Commercial, and Alice Bottje PUD application. If the Planning Commission agrees with the aforementioned recommendation, the following motion can be offered:

> **Motion** to recommend to the Township Board approval with conditions of the Speedway, North Star Commercial, and Alice Bottje Planned Unit Development proposal based on the application meeting applicable PUD and US-31 Area Overlay Zone requirements and standards set forth by the Grand Haven Charter Township Zoning Ordinance. Approval shall be conditioned upon:

1. Approval and compliance with all requirements set forth by the DEQ, OCWRC, and OCRC. No building permits shall be issued until all permits have been obtained.
2. The legal descriptions of the PUD boundaries shall be finalized, thus, permitting the finalization of the land division application. This includes the necessary title conveyances.
3. The designated open space conveyance shall be reviewed, and approved by Township Attorney Bultje. The Developers shall submit a copy of the document recorded at the Ottawa County Register of Deeds. No building permits shall be issued until the condition is met.
4. The Declaration of Restrictions and Easements shall be reviewed, and approved by Township Attorney Bultje. The Developers shall submit a copy of the document recorded at the Ottawa County Register of Deeds. No building permits shall be issued until the condition is met.
5. The Developers shall enter into a PUD Contract with the Township. The Contract shall be reviewed and approved by the Township Board prior to the issuance of building permits.
6. The Developers shall enter into a Special Assessment Private Road Maintenance Agreement with the Township. The Agreement shall be reviewed and approved by the Township Board prior to the issuance of building permits.
7. Applicants shall supply documentation that confirms the vegetation proposed to be planted in the wetland is appropriately rated (*i.e., native vegetation suitable to thrive in a wetland environment*).
8. Exterior lighting (*noted as S4 on the photometric plan*) shall be fully recessed.
9. Luminaire Numbers 11, 12, 13, 15, and 17 (*as described on page 1 of 5 of the photometric plan*) shall include side shielding toward the property line to meet the Section 20A.8.1 Exemption 3 regulations.

Please contact me prior to the meeting with questions or concerns.

REPORT

Pursuant to the provisions of the Grand Haven Charter Township (the "Township") Zoning Ordinance (the "Zoning Ordinance"), the following report of the Grand Haven Charter Township Planning Commission (the "Planning Commission") concerning an application by Speedway LLC, North Star Commercial, and Alice Bottje (the "Developers") for approval of a Planned Unit Development (the "Project" or the "PUD").

The Project will consist of two phases. The first phase including a Speedway gas station and convenience store with auto and commercial fueling canopies. The second phase will be future commercial and retail development. The Project as recommended for approval is shown on a final site plans, last revised 6/29/2015 (the "Final Site Plan"), presently on file with the Township.

The purpose of this report is to state the recommendation of the Planning Commission concerning the Project, the basis for the Planning Commission's recommendation, and the Planning Commissions recommendation that the Developers PUD be approved as outlined in the above motion. The Developers shall comply with all of the documentation submitted to the Township for this Project. In recommending the approval of the proposed PUD application, the Planning Commission makes the following findings pursuant to Section 17.04.3 of the Zoning Ordinance:

1. The Project meets the site plan review standards of Section 23.06 of the Zoning Ordinance. Specifically, pursuant to Section 23.06.7, the Planning Commission finds as follows:

    A. The uses proposed will not adversely affect the public health, safety, or welfare. Uses and structures located on the site take into account topography, size of the property, the uses on adjoining property and the relationship and size of buildings to the site.

    B. The site will be developed so as not to impede the normal and orderly development or improvement of surrounding property for uses permitted in this ordinance.

    C. Safe, convenient, uncontested, and well defined vehicular and pedestrian circulation is provided for ingress/egress points and within the site. Drives, streets and other circulation routes are designed to promote safe and efficient traffic operations within the site and at ingress/egress points.

    D. The arrangement of public or private vehicular and pedestrian connections to existing or planned streets in the area are planned to provide a safe and efficient circulation system for traffic within the township.

    E. Removal or alterations of significant natural features are restricted to those areas which are reasonably necessary to develop the site in accordance with the requirements of this Ordinance. The Planning Commission has required that landscaping, buffers, and/or greenbelts be preserved and/or provided to ensure that proposed uses will be adequately buffered from one another and from surrounding public and private property.

    F. Areas of natural drainage such as swales, wetlands, ponds, or swamps are protected and preserved insofar as practical in their natural state to provide areas for natural habitat, preserve drainage patterns and maintain the natural characteristics of the land.

    G. The site plans provide reasonable visual and sound privacy for all dwelling units located therein and adjacent thereto. Landscaping shall be used, as appropriate, to accomplish these purposes.

    H. All buildings and groups of buildings are arranged so as to permit necessary emergency vehicle access as requested by the fire department.

    I. All streets and driveways are developed in accordance with the Ottawa County Road Commission specifications, as appropriate.

J. Appropriate measures have been taken to ensure that removal of surface waters will not adversely affect neighboring properties or the public storm drainage system. Provisions have been made to accommodate storm water, prevent erosion and the formation of dust.

K. Exterior lighting is arranged so that it is deflected away from adjacent properties and so it does not interfere with the vision of motorists along adjacent streets, and consists of sharp cut-off fixtures.

L. All loading and unloading areas and outside storage areas, including areas for the storage of trash, which face or are visible from residential districts or public streets, are screened.

M. Entrances and exits are provided at appropriate locations so as to maximize the convenience and safety for persons entering or leaving the site.

N. The site plans conform to all applicable requirements of County, State, Federal, and Township statutes and ordinances.

O. The general purposes and spirit of this Ordinance and the Master Plan of the Township are maintained.

2. The Planning Commission finds the Project meets the intent for a PUD, as described in Section 17.01.3 of the Zoning Ordinance. By approving this Project as a PUD, the Township has been able to negotiate various amenities and design characteristics as well as additional restrictions with the Developers, which the Township would not have been able to negotiate if the PUD Chapter of the Zoning Ordinance was not used. The Developers were granted the following departures from the zoning ordinance based on the defined benefits received by the Township:

   A. Departures and benefits will be described here.

3. Compared to what could have been constructed by right, the Project has been designed to accomplish the following objectives from Section 17.01.4 of the Zoning Ordinance:

   A. The Project will encourage the use of land in accordance with its natural character and adaptability;

   B. The Project will promote the conservation of natural features and resources through the preservation of required open space;

   C. The Project will promote innovation in land use planning and development;

   D. The Project will promote the enhancement of housing and traffic circulation for the residents of the Township;

   E. The Project will promote greater compatibility of design and better use between neighboring properties;

   F. The Project will promote more economical and efficient use of the land while providing harmonious variety of housing choices; and

   G. The Project will promote the preservation of open space.

4. The Project meets the following qualification requirements of Section 17.02 of the Zoning Ordinance:

A. The Project meets the minimum size of five (5) acres of contiguous land.

B. The Project exhibits significant natural features encompassing more than 25% of the land area, which will be preserved as a result of the PUD plan.

C. The PUD design substantially moves forward the Intent and Objectives of Section 17.01 of the Zoning Ordinance.

5. The Planning Commission also finds the Project complies with the general PUD Design Considerations of Section 17.05 of the Zoning Ordinance:

A. The storm water management system for the Project and the drainage facilities will properly accommodate storm water on the site, will prevent run off to adjacent properties, and are consistent with the Township's groundwater protection strategies.

B. The Project will not interfere with or unduly burden the water supply facilities, the sewage collection and disposal systems, or other public services such as school facilities, park and recreation facilities, etc.

C. Utility services within the Project shall be underground. This includes but is not limited to electricity, gas lines, telephone, cable television, public water and sanitary sewer.

D. The internal road system in the Project is designed to limit destruction of existing natural vegetation and to decrease the possibility of erosion.

E. Vehicular circulation, traffic and parking areas have been planned and located to minimize effects on occupants and users of the Project and to minimize hazards to adjacent properties and roadways.

F. Parking requirements for each use have been determined to be in accordance with Chapter 24 (Parking, Loading Space, and Signs).

G. Street lighting will be installed in the same manner as required under the Township’s Subdivision Control Ordinance.

H. Buildings in the Project have been sited to protect natural resources. Natural features such as natural grade, trees, vegetation, water bodies and others have been incorporated into the Final Site Plan.

I. The predominant building materials have been found to be those characteristic of Grand Haven Charter Township such as brick, wood, native stone and tinted/textured concrete masonry units and/or glass products.

J. Landscaping, natural features, open space and other site amenities have been located in the Project to be convenient for occupants of, and visitors to, the PUD.

K. The Project is reasonably compatible with the natural environment of the site and the adjacent premises.

L. The Project will not unduly interfere with the provision of adequate light or air, nor will it overcrowd land or cause an unreasonably severe concentration of population.

M. Exterior lighting within the Project complies with Chapter 20A for an LZ 3 zone.

N. The Project will not have a substantially detrimental effect upon or substantially impair the value of neighborhood property, as long as all of the standards and conditions of this approval of the Project are satisfied.

O. The Project is in compliance with all applicable Federal, State, County, and local laws and regulations. Any other permits for development that may be required by other agencies shall be available to the Township Board before construction is commenced.

P. The Project meets the access provision regulations.

Q. The driveways providing access to corner lots shall gain access from the lesser traveled of the two intersecting streets.

R. The Project satisfies the minimum open space of 25% required by the Zoning Ordinance.

S. The open space in the Project is large enough and properly dimensioned to contribute to the purpose and objectives of the PUD.

T. The open space in the Project consists of contiguous land area which is restricted to non-development uses.

U. The open space shall remain under common ownership or control.

V. The open space shall be set aside by a means of conveyance approved by the Township Board, which conveyance satisfies the requirements of Section 17.05.5.G of the Zoning Ordinance.

W. The Project is consistent with the goals and objectives of the Master Land Use Plan. Specifically, it is consistent with the Master Plan designation of the property in question.

6. The Planning Commission also finds the Project complies with the US-31 and M-45 Area Overlay Zone findings and statement of purpose found in Section 15A.01 of the Zoning Ordinance:

   A. Accommodates a variety of uses permitted by the underlying zoning, but ensure such uses are designed to achieve an attractive built and natural environment.

   B. Provides architectural and site design standards that are more demanding than required elsewhere in the Township in order to promote harmonious development and complement the natural characteristics in the western sections of the Township.

   C. Promotes public safety and efficient flow of vehicular traffic by minimizing conflicts from turning movements resulting from the proliferation of unnecessary curb cuts and driveways.

   D. Ensures safe access by emergency vehicles.

   E. Encourages efficient flow of traffic by minimizing the disruption and conflicts between through traffic and turning movements.

   F. Preserve the capacity along US-31/M-45 and other roads in the Overlay Zone by limiting and controlling the number and location of driveways, and requiring alternate means of access through shared driveways, service drives, and access via cross streets.

G. Reduces the number and severity of crashes by improving traffic operations and safety.

H. Requires coordinated access among adjacent lands where possible.

I. Provides landowners with reasonable access, although the access may be restricted to a shared driveway, service drive, or via a side street, or the number and location of access points may not be the arrangement most desired by the landowner or applicant.

J. Requires demonstration that prior to approval of any land divisions, the resultant parcels is accessible through compliance with the access standards herein.

K. Preserves woodlands, view sheds, and other natural features along the corridor.

L. Ensures that distractions to motorists are minimized by avoiding blight and clutter while providing property owners and businesses with appropriate design flexibility and visibility.

M. Implements the goals expressed in the US-31/M-45 Corridor Study.

N. Establishes uniform standards to ensure fair and equal application.

O. Addresses situations where existing development within the Overlay Zone does not conform to the standards of this chapter.

P. Promotes a more coordinated development review process with the Michigan Department of Transportation and the Ottawa County Road Commission.

NEW BUILD #1830

C4600-RIGHT HAND QUIK-BRIK V1.0

US-31 & HAYES STREET

OTTAWA COUNTY

GRAND HAVEN, MI

OWNER:

Speedway®

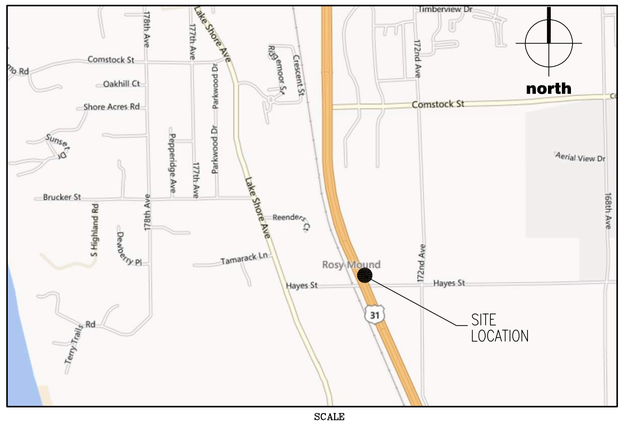
500 SPEEDWAY DRIVE
ENON, OH 45323
937-864-3000

ENGINEERING AND PROJECT MANAGEMENT:

Speedway®

CONSTRUCTION DEPARTMENT

500 SPEEDWAY DRIVE
ENON, OH 45323
937-864-3000



SCALE
1 inch = 1000 ft.

811
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CODE DATA

THE BUILDING DESIGN SHALL COMPLY WITH THE FOLLOWING CODES:
MBC – 2012 MICHIGAN BUILDING CODE
ADA – AMERICANS WITH DISABILITIES ACT
NEC – 2011 MICHIGN ELECTRICAL CODE
2009 MICHIGAN PLUMBING CODE
2009 MECHANICAL CODE

TYPE OF PROJECT: NEW BUILD

TYPE OF EXTERIOR BUILDING: CUSTOM WITH QUIK-BRIK AND STONE MASONRY

USE AND OCCUPANCY CLASSIFICATION – CHAPTER 3
USE GROUP M SECTION 309
CALCULATED OCCUPANT LOAD: 46

GENERAL BUILDING HEIGHTS AND AREAS CHAPTER 5
TABLE 503: 1 STORY (40'), 9000 S.F. ALLOWED.

TYPE OF CONSTRUCTION CHAPTER 6
SECTION 602.5 VB

SITE SPECIFIC

1830-CV	COVER SHEET
1830-CD	DEMOLITION PLAN
1830-CS	PLOT PLAN
1830-CG	GRADING PLAN
1830-CG4	PRE/POST DRAINAGE PLAN
1830-CG5	STORM DRAINAGE PLAN
1830-CF	CUT/FILL PLAN
1830-CE	SOIL EROSION AND SEDIMENT CONTROL PLAN
1830-CU	PIPING AND UTILITIES PLAN
1830-CU2	STORM SEWER PROFILES
1830-SS	SIGNAGE PLAN
1830-SS1	CANOPY STRIPPING PLAN
1830-CR	CIRCULATION PLAN
1830-LA	LANDSCAPE PLAN

CIVIL SUPPORT

STD-CP-1	PAVEMENT AND CURBING DETAILS
STD-CP-2	RETAINING WALL AND FENCE DETAILS
1830-PS-1	DRAINAGE AND UTILITY DETAILS
1830-PS-2	AQUA SWIRL DETAILS
STD-SB-1	STANDARD CANOPY BASE DETAIL
DS-SS	DIRECTIONAL SINAGE ENTER AND EXIT DETAIL
STD-SS-2E2.3	QUIK-BRIK DUMPSTER ENCLOSURE
STD-QS-1	YARD EQUIPMENT INSTALLATION
1830-CC-DET	CANOPY COLUMN DETAILS

STRUCTURAL BUILDING

STRUCTURAL SUPPORT

ARCHITECTURAL BUILDING

ARCHITECTURAL SUPPORT

PLUMBING & MECHANICAL BUILDING

PLUMBING & MECHANICAL SUPPORT

ELECTRICAL BUILDING

ELECTRICAL SUPPORT

THIRD PARTY ENGINEERING SUPPORT

SURVEY TOPOGRAPHIC SURVEY PROVIDED BY INLAND SEAS (COMPLETED ON DEC 11, 2014)
SURVEY TOPOGRAPHIC SURVEY PROVIDED BY NEDERVELD (COMPLETED ON APR 29, 2013)

NOT INCLUDED WITH THIS SUBMITTAL
GEOTECH REPORT PROVIDED BY CTL ENGINEERING (COMPLETED ON APR 10, 2015)
PHOTOMETRIC PLAN WILL BE PROVIDED BY RED LEONARD ASSOCIATES

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STATE OF MICHIGAN
KEVIN J. COUGHLIN
ENGINEER
No. 62010841390
LICENSED PROFESSIONAL ENGINEER
6/29/15

Speedway®
Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

REVISIONS

NO.		DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDOT REVIEW	11/19/14	11/19/14	11/19/14
	DRAW / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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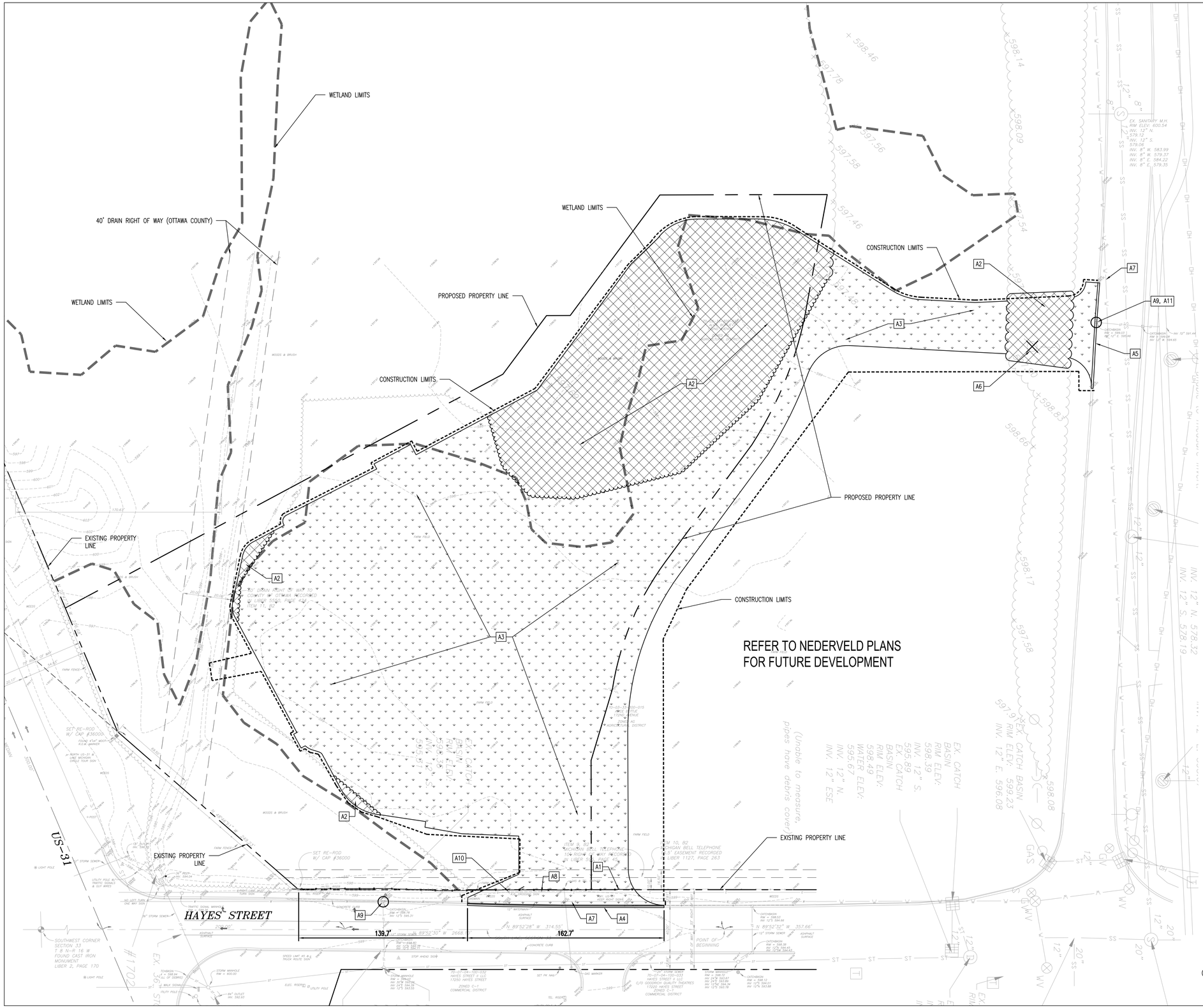
COVER SHEET
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	NONE

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO.
1830-CV



DEMOLITION PLAN NOTES

1. CLEAR ENTIRE SITE AND PROPERLY DISPOSE OF ALL MATERIALS UNLESS OTHERWISE SPECIFIED ON THE PLANS OR BY THE OWNER'S REPRESENTATIVE.
2. CONTRACTOR SHALL NOTIFY THE OWNER OF ANY UNFORSEEN CONDITIONS.
3. THE PROPERTY CORNERS SHALL BE MARKED BY OWNER AND PROTECTED AND MAINTAINED BY CONTRACTOR.
4. IF DAMAGED AS A RESULT OF THIS CONTRACT, ANY ITEMS TO REMAIN SHALL BE REPLACED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
5. CONTRACTOR SHALL NOTIFY LOCAL UTILITIES 72 HRS. PRIOR TO DEMOLITION.
6. CONTRACTOR SHALL COORDINATE DEMOLITION WORK WITH ALL UTILITIES AND COMPLY WITH REGULATIONS AND STANDARDS FOR EACH UTILITY.
7. WHEN REMOVING EXISTING UTILITY, CAP UTILITY AT THE MAIN.
8. CONTRACTOR SHALL PROVIDE BARRIERS, PERIMETER FENCING, PARTITIONS, PLANKING, BRACING, SHORING, LIGHTS, AND SIGNS AS NECESSARY TO PROTECT THE PUBLIC AND ADJACENT PROPERTIES.
9. CONTRACTOR SHALL EXERCISE CARE TO PREVENT DUST, VIBRATION, SETTLEMENT, OR OTHER IMPACT TO ADJACENT PROPERTY.
10. THE REMOVAL OF [ASBESTOS, LEAD ETC] CONTAINING MATERIALS SHALL BE IN ACCORDANCE WITH REGULATORY REQUIREMENTS, RECOMMENDATIONS IN THE ENVIRONMENTAL SURVEY AND OWNER CONTRACT DOCUMENTS.
11. ALL WORK PERFORMED OUTSIDE SPEEDWAY PROPERTY LINES SHALL BE COORDINATED WITH RESPECTIVE OWNER.

UTILITY OWNER INFORMATION:

SANITARY – GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES (GHCT PS)
(616) 842–5988

WATER – GHCT PS
(616) 842–5988

STORM – OTTAWA COUNTY
CONTACT: DENNIS R. COLE
(616) 994–4523

ELECTRICAL – DTE ENERGY
CONTACT: ANDRE DIAZ
(616) 632–2631

GAS – MICHIGAN GAS UTILITIES
CONTACT: PAUL LIVERNOIS
(734) 457–6123

TELEPHONE – AT&T, GRAND HAVEN
(616) 293–9212

A. KEY NOTES

1. EXISTING FENCE AND FOUNDATION TO BE REMOVED.
2. EXISTING TREES TO BE REMOVED. PROVIDE TREE PROTECTION FENCE FOR THE EXISTING TREES TO REMAIN ONCE TREES ARE REMOVED UNTIL THE END OF CONSTRUCTION.
3. REMOVE EXISITING GRASS AND TOP SOIL.
4. EXISTING CONCRETE CURB AND GUTTER TO BE REMOVED TO FULL DEPTH TO THE NEAREST JOINT WITH VERTICAL SAWCUTS AT INSIDE EDGE OF CURB, PARALLEL TO ROAD AND AT REMOVAL LIMITS, PERPENDICULAR TO ROAD.
5. REMOVE GRAVEL SHOULDER.
6. EXISTING OVERHEAD ELECTRIC LINE AND POLE TO BE RELOCATED BY ELECTRICAL COMPANY.
7. EXISTING WATER MAIN TO REMAIN.
8. EXISTING GAS MAIN TO REMAIN.
9. EXISTING CATCH BASIN TO REMAIN.
10. EXISTING ROAD SIGN TO BE RELOCATED.
11. EXISTING FRAME AND GRATE TO BE REPLACED.

LEGEND

- GRASS TO CLEAR AND GRUB
- TREES TO BE REMOVED
- ITEM TO BE REMOVED
- ITEM TO BE PROTECTED
- PROPERTY LINE
- WETLAND LIMIT
- LIMIT OF CONSTRUCTION

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Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
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	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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DEMOLITION PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO.
1830–CD

E. PAVING DETAILS

1. CONSTRUCT NEW HIGH STRENGTH CONCRETE TANK SLAB PER DRAWINGS STD–PQ–4.1 AND STD–CP–1.
2. CONSTRUCT NEW CONCRETE CAR CANOPY ISLAND SLAB PER DRAWINGS STD–SB–2 AND STD–CP–1.
3. CONSTRUCT NEW HIGH STRENGTH CONCRETE TRUCK CANOPY SLAB PER STD–SB–2 AND STD–CP–1.
4. INSTALL NORMAL STRENGTH ASPHALT PAVEMENT WITH AN AGGREGATE BASE PER PAVEMENT SECTION STD–CP–1 AND PER RECOMMENDATIONS OF GEOTECHNICAL CONSULTANT FOR ALL SUBSURFACE CONDITIONS ON THIS SITE. NOTIFY THE OWNER'S REPRESENTATIVE IF THERE ARE ANY CONFLICTS.
5. INSTALL HIGH STRENGTH ASPHALT PAVEMENT WITH AN AGGREGATE BASE PER PAVEMENT SECTION STD–CP–1 AND PER RECOMMENDATIONS OF GEOTECHNICAL CONSULTANT FOR ALL SUBSURFACE CONDITIONS ON THIS SITE. NOTIFY THE OWNER'S REPRESENTATIVE IF THERE ARE ANY CONFLICTS.
6. CONSTRUCT A 9' WIDE NORMAL STRENGTH CONCRETE SLAB ON BUILDING FRONT PARKING AREAS AS SHOWN ON PLOT PLAN.
7. CONSTRUCT DRIVEWAY APPROACHES WITH HIGH STRENGTH ASPHALT PER STATE AND/OR LOCAL SPECIFICATIONS.
8. NOT USED.
9. INSTALL (7) NEW CONCRETE DISPENSER ISLANDS WITH 4' X 5' X 13" ISLAND FORM FOR AUTO DISPENSERS.
10. INSTALL (3) NEW CONCRETE DISPENSER ISLANDS WITH 4' X 7' X 13" ISLAND FORM FOR MASTER OR MASTER/SATELLITE DIESEL DISPENSERS. ENTIRE WIDTH OF THE DEF AND DIESEL CABINETS TO BE CENTERED ON THE ISLAND PER STD–TF DETAILS.
11. INSTALL (1) NEW CONCRETE DISPENSER ISLAND WITH 4' X 5' X 13" ISLAND FORM FOR SATELLITE DIESEL DISPENSER.
12. CONSTRUCT 1–1/2" DEPRESSED CONCRETE CURB AND GUTTER IN RIGHT–OF–WAY PER STATE AND/OR LOCAL SPECIFICATIONS. MACHINE FORMED CURB AND GUTTER MAY BE USED IF ALLOWED BY STATE AND/OR LOCAL SPECIFICATIONS.
13. CONSTRUCT CAST IN PLACE CONCRETE CURB INSIDE PROPERTY LINES PER DRAWING STD–CP–1.
14. CONSTRUCT RAMP WITH 2'–0" WIDE DETECTABLE WARNING SURFACE IN CONCRETE WALK PER APPLICABLE LOCAL, STATE, AND FEDERAL REGULATIONS
15. CONSTRUCT K–1 CONCRETE SLAB PER STANDARD DRAWING STD–QS–1.
16. INSTALL CONCRETE SLAB FOR AIR MACHINE PER DRAWING STD–QS–1. INSTALL (1) 3/4" CONDUIT AND WIRE PER MANUFACTURER'S RECOMMENDATIONS. VERIFY INSTALLATION DETAILS WITH VENDOR.
17. CONSTRUCT NEW DEF REMOTE FILL PAD AND [2] DECORATIVE BOLLARDS PER STD–DEF–5 AND STD–QS–1 .

F. YARD AREA DETAILS

1. CONSTRUCT DUMPSTER ENCLOSURE (256 SF) AND COLLECTION PAD WITH ATTACHED STORAGE SHED (272 SF) AND RELATED WIRING AND CONDUITS PER DRAWING STD–SS–2E2.3. GATE SHALL BE BOARD–ON–BOARD FENCE (6' HEIGHT).
2. SUPPLY AND INSTALL (4) 6" BOLLARDS PER DETAIL ON DRAWING STD–QS–1 AND STD–SS–2E2.3. BOLLARDS SHALL BE PAINTED RED PER OWNER'S SPECIFICATIONS.
3. SUPPLY AND INSTALL (16) 8" BOLLARDS PER DETAIL ON DRAWING STD–QS–1. BOLLARDS SHALL BE PAINTED RED PER OWNER'S SPECIFICATIONS.
4. SUPPLY AND INSTALL DECORATIVE (26) BOLLARDS PER DETAIL ON DRAWINGS STD–QS–1. NEENAH CAT. R–8403–43DC (3' HEIGHT). REFER TO MANUFACTURER'S CUT SHEET FOR MORE INFORMATION.
5. INSTALL PAINTED ACCESSIBLE PARKING STALLS AND SIGNAGE PER APPLICABLE CODES. PAINT ALL PARKING STRIPES YELLOW.
6. INSTALL ORNAMENTAL METAL FENCE, AMERISTAR AEGIS II 3–RAIL FENCE (MAJESTIC), BLACK PER DETAIL ON STD–CP–2. REFER TO MANUFACTURER'S CUT SHEET FOR MORE INFORMATION. PROVIDE 4' TALL FENCE WITH MANGATES AS SHOWN ON PLAN FOR SEASONAL SALES AREA.
7. INSTALL TANK VENT STACKS. INSTALL 3" PVC PIPE TO HOLD TANK STACK PER OWNER'S REPRESENTATIVE.
8. CONSTRUCT LANDSCAPE KEYSTONE TYPE RETAINING WALL (178 FT LONG) PER DETAIL ON DRAWINGS STD–CP–2.
9. CONSTRUCT (QTY) 18" DIAMETER LIGHT POLE BASES 2'–0" HIGH FOR 15' HIGH LIGHTS PER DETAILS ON DRAWING STD–QS–1. INSTALL (1) 3/4" CONDUIT TO EACH BASE FROM ELECTRICAL PANELS PER THE OWNER'S REPRESENTATIVE AND WIRE FIXTURES. CONTRACTOR IS RESPONSIBLE FOR TOUCH–UP PAINTING ON POLES, ANCHORS BOLTS, ETC.
10. CONSTRUCT (QTY) 24" DIAMETER LIGHT POLE BASES 2'–0" HIGH FOR 30' HIGH LIGHTS PER DETAILS ON DRAWING STD–QS–1. INSTALL (1) 3/4" CONDUIT TO EACH BASE FROM ELECTRICAL PANELS PER THE OWNER'S REPRESENTATIVE AND WIRE FIXTURES. CONTRACTOR IS RESPONSIBLE FOR TOUCH–UP PAINTING ON POLES, ANCHORS BOLTS, ETC.
11. PROVIDE AND INSTALL (1) 3/4" CONDUIT (OR LARGER BASED ON NEC CODES) AND WIRING FROM ELECTRICAL PANEL TO DIRECTIONAL SIGN FOR 120V POWER.
12. CONTRACTOR SHALL SUPPLY AND INSTALL CONDUIT (SIZED PER NEC CODES), AND RG59/18–2 SIAMESE CABLE FOR YARD SECURITY CAMERAS TO THESE LOCATIONS. SECURITY CAMERAS SHALL BE INSTALLED BY SPEEDWAY MAINTENANCE DEPT.
13. CONTRACTOR SHALL INSTALL CONDUIT (SIZED PER NEC CODES) AND INSTALL PULL STRING FOR FUTURE YARD SECURITY CAMERAS TO THESE LOCATIONS.
14. STRIPE CROSSWALK WITH 4" WHITE STRIPE.
15. PAINT 12" WIDE WHITE STOP BAR.
16. INSTALL ORNAMENTAL METAL FENCE, AMERISTAR AEGIS II 3–RAIL FENCE (MAJESTIC), BLACK PER DETAIL ON STD–CP–2, REFER TO MANUFACTURER'S CUT SHEET FOR MORE INFORMATION. PROVIDE 3.5' TALL FENCE FOR OUTDOOR SEATING AREA.
17. OUTDOOR SEATING AREA. "SPEEDWAY CAFE" TABLE SETS PROVIDED BY SPEEDWAY.
18. OUTDOOR SEASONAL SALES AREA.
19. ELECTRIC TRANSFORMER CONCRETE PAD.
20. 4" YELLOW PAVEMENT STRIPES FOR LOADING SPACE (960 SF).
21. LIGHT POLES. SEE PHOTOMETRIC PLAN FOR DETAIL.

G. EXTERIOR APPERANCE AND SIGANGE

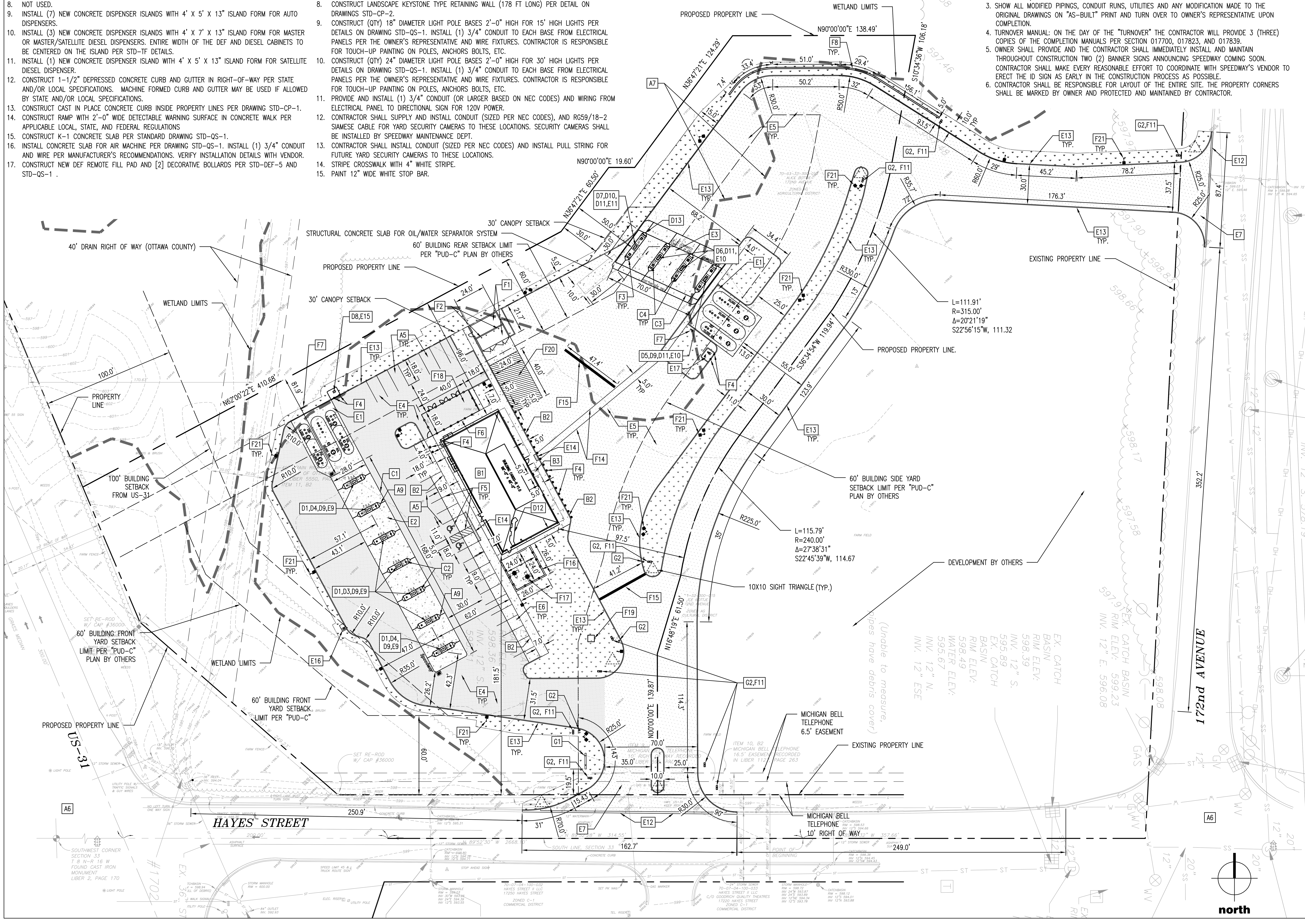
1. (1) GROUND MONUMENT HORIZONTAL PROFILE SIGN. SEE 1830–SS1.
2. DIRECTIONAL TRAFFIC SIGNS. SEE 1830–SS FOR MORE INFORMATION.

HATCH LEGEND

GRASS/ LANDSCAPING
CONCRETE
HIGH STRENGTH ASPHALT
NORMAL STRENGTH ASPHALT
CONCRETE CURB
FENCE
10'x10' CLEAR VISION AREA
LIGHT POLES

PLOT PLAN GENERAL NOTES

1. ALL MATERIAL NOTED ON DRAWINGS WILL BE SUPPLIED BY THE CONTRACTOR UNLESS NOTED OTHERWISE.
2. RESTORE TO ORIGINAL OR BETTER CONDITION ALL AREAS DISTURBED BY CONSTRUCTION. UPON COMPLETION, POWER WASH ALL PAVING TO OWNER'S SATISFACTION.
3. SHOW ALL MODIFIED PIPINGS, CONDUIT RUNS, UTILITIES AND ANY MODIFICATION MADE TO THE ORIGINAL DRAWINGS ON "AS–BUILT" PRINT AND TURN OVER TO OWNER'S REPRESENTATIVE UPON COMPLETION.
4. TURNOVER MANUAL: ON THE DAY OF THE "TURNOVER" THE CONTRACTOR WILL PROVIDE 3 (THREE) COPIES OF THE COMPLETION MANUALS PER SECTION 017700, 017823, AND 017839.
5. OWNER SHALL PROVIDE AND THE CONTRACTOR SHALL IMMEDIATELY INSTALL AND MAINTAIN THROUGHOUT CONSTRUCTION TWO (2) BANNER SIGNS ANNOUNCING SPEEDWAY COMING SOON. CONTRACTOR SHALL MAKE EVERY REASONABLE EFFORT TO COORDINATE WITH SPEEDWAY'S VENDOR TO ERECT THE ID SIGN AS EARLY IN THE CONSTRUCTION PROCESS AS POSSIBLE.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR LAYOUT OF THE ENTIRE SITE. THE PROPERTY CORNERS SHALL BE MARKED BY OWNER AND PROTECTED AND MAINTAINED BY CONTRACTOR.



A. SITE NOTES

1. THE BUILDING IS PARALLEL TO THE N 22° 47' 30" W 216.68' PROPERTY LINE OF US–31.
2. GENERAL SCOPE OF WORK INCLUDES: BUILDING, CANOPY, FUEL TANKS, PIPING AND DISPENSERS AND PARKING.
3. FINAL DESIGN APPROVALS SUBJECT TO LOCAL, STATE AND FEDERAL REGULATIONS.
4. PROPOSED SPEEDWAY SITE: 189,355 SQ. FT. / 4.347 AC. AND 181,994 SQ. FT. / 4.178 AC. (EXCLUDING R.O.W)
5. PROVIDED PARKING: (2) ADA PARKING SPACES AND (26) STANDARD PARKING SPACES. (NOTE; REQUIRED OF PARKING WILL BE DETERMINED BY PUD AGREEMENT).
6. THE ADJACENT INTERSECTION IS NOT SIGNALIZED. IT IS A FOUR WAY STOP.
7. WETLAND IMPACT AREA: 25,698 SQ.FT / 0.59 AC ON THIS PLAN SHOWN. REFER TO DEQ PERMIT NO. 14–70–0075–P FOR ENTIRE IMPACT AREA.
8. USE RECOMMENDATIONS OF GEOTECHNICAL CONSULTANT PER GEOTECHNICAL REPORT FOR ALL SURFACE CONDITIONS. NOTIFY OWNER REPRESENTATIVE OF ANY CONFLICTS.
9. PROVIDE AND INSTALL CODE APPROVED FIRE EXTINGUISHER(S) (1 MINIMUM) WITH PLASTIC BOX HOLDER IN APPROVED LOCATIONS AS REQUIRED BY LOCAL FIRE OFFICIALS. FIRE EXTINGUISHERS SHALL BE LOCATED SUCH THAT AN EXTINGUISHER IS NOT MORE THAN 75 FEET FROM PUMPS, DISPENSERS, OR STORAGE TANK FILL OPENINGS.

B. BUILDING DETAILS

1. CONSTRUCT C–STORE BUILDING #C4600–R V1.0 PER DRAWINGS LISTED. HVAC SYSTEM SHALL BE GAS AND BE ROOF MOUNTED. BUILDING WILL BE 23'–6" HEIGHT TO TOP OF TRUSS.
2. PAINT THE ENTIRE VERTICAL FACE OF THE SIDEWALK HIGHWAY YELLOW (1600014) INCLUDING 4" ONTO THE TOP OF SIDEWALK EXCEPT WHERE CONCRETE FLUSH AT HANDICAP RAMPS OR ADJACENT TO NON–PAVED SURFACES. CONSTRUCT INTERGRAL CURB/SIDEWALK AS SHOWN ON PLOT PLAN AND PER DRAWING STD–CP–1.
3. INSTALL 5'X5' CONCRETE PAD FOR ACCESS LADDER PER DRAWING STD–SF–LAD.

C. CANOPY DETAILS

1. COORDINATE WITH VENDOR DRAWINGS (MCGEE) TO INSTALL NEW 28' X 168' AUTO CANOPY. CONTRACTOR SHALL BE RESPONSIBLE FOR CONCRETE FOOTINGS AND ANCHOR BOLTS.
2. USE AUTO CANOPY COLUMN FOUNDATIONS (12) SIZE 4' X 4' X 5' FOR BIDDING PURPOSES IF AUTO CANOPY DRAWINGS ARE NOT AVAILABLE IN TIME FOR BIDDING. AUTO CANOPY DRAWINGS WILL BE AVAILABLE FOR CONSTRUCTION.
3. COORDINATE WITH VENDOR DRAWINGS (MCGEE) TO INSTALL NEW 30' X 70' COMMERCIAL FUELING LANE CANOPY. CONTRACTOR SHALL BE RESPONSIBLE FOR CONCRETE FOOTINGS AND ANCHOR BOLTS.
4. USE COMMERCIAL FUELING LAND CANOPY COLUMN FOUNDATIONS (8) SIZE 4' X 4' X 7' FOR BIDDING PURPOSES IF COMMERCIAL FUELING LANE CANOPY DRAWINGS ARE NOT AVAILABLE IN TIME FOR BIDDING. COMMERCIAL FUELING LANE CANOPY DRAWINGS WILL BE AVAILABLE FOR CONSTRUCTION.

D. DISPENSER DETAILS

1. THE CONTRACTOR IS RESPONSIBLE FOR PURGING OF THE FUELING SYSTEM AS NECESSARY AT START–UP AND DISPENSER CALIBRATION. THE OWNER SHALL PAY FOR (1) THIRD–PARTY LINE TEST FOR EACH PRODUCT LINE AFTER PURGING IS COMPLETE. COST OF ANY ADDITIONAL DISPENSER CALIBRATIONS AND/OR LINE TESTS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. CONTRACTOR SHALL PURGE SYSTEM PER DISPENSER MANUFACTURER'S INSTRUCTIONS AND OWNER'S SPECIFICATIONS. ALL TESTING TO BE COORDINATED WITH SPEEDWAY COMPLIANCE DEPARTMENT. AFTER PURGING IS COMPLETE, CONTRACTOR SHALL REMOVE AND DISCARD SCREENS AND FACTORY FILTERS AND INSTALL NEW FILTERS (MODEL NOTED BELOW), FURNISHED BY OWNER. INSTALLATION DATES SHALL BE CLEARLY MARKED ON FILTER BY CONTRACTOR. FILTER MODELS ARE (A) AUTO: PETROCLEAR 40510A (B) AUTO–DSL AND K–1: PETROCLEAR 40510W (C) E85: CIMTEK 70991 (D) HIGHFLOW DSL: PETROCLEAR 51110W. SPEEDWAY'S MAINTENANCE DEPARTMENT SHALL INSTALL DISPENSER FACE LABELS.
2. THE CONTRACTOR SHALL COMPLETE THE GILBARCO PROVIDED FORM "A" PRIOR TO START–UP. THE 0.1 TEST MUST BE COMPLETED VIA THE ATG PRIOR TO OPENING FUEL SALES. FORMS "B" AND "C" SHALL BE COMPLETED BY GILBARCO'S AUTHORIZED SERVICE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH SPEEDWAY'S PREFERRED AUTHORIZED SERVICE CONTRACTOR (ASC) FOR TRIPS AS FOLLOWS:

TRIP	GILBARCO ASC RESPONSIBILITIES	FINANCIAL RESPONSIBILITY
1	PREP DISPENSERS FOR CONTRACTOR TO PURGE	GILBARCO
2	REVIEW CONTRACTOR'S PURGE WORK	GILBARCO
	REVIEW CONTRACTOR'S COMPLETED GILBARCO FORM "A"	
	COMPLETE FORM "B" AND FORM "C" (PRE POS INTEGRATION)	
3	COMPLETE FORM "B" AND FORM "C" (POST POS INTEGRATION)	GILBARCO
4	OPENING DAY SUPPORT (SPEEDWAY REQUIREMENT)	CONTRACTOR

3. INSTALL (4) NEW GILBARCO 3 PRODUCT (3+0) HIGH HOSE DISPENSER WITH CARD READER [AND VAC. ASSIST]. INSTALL (8) HOSES, NOZZLES, SWIVELS AND BREAKAWAY FOR GASOLINE DISPENSERS. PRODUCT PIPING LINE–UP AND FRONT SIDE "A" (F.S."A") OF DISPENSERS SHALL BE AS SHOWN.
4. INSTALL (3) NEW GILBARCO 4 PRODUCT (3+1) HIGH HOSE DISPENSER WITH CARD READER [AND VAC. ASSIST]. INSTALL (6) HOSES, NOZZLES, SWIVELS AND BREAKAWAY FOR GASOLINE DISPENSERS, (4) HOSES, NOZZLES, SWIVELS AND BREAKAWAY FOR DIESEL DISPENSERS AND (2) HOSES, NOZZLES, SWIVELS AND BREAKAWAY FOR E–85 DISPENSER(S). PRODUCT PIPING LINE–UP AND FRONT SIDE "A" (F.S."A") OF DISPENSERS SHALL BE AS SHOWN.
5. INSTALL (1) NEW GILBARCO SINGLE PRODUCT "MASTER" DIESEL DISPENSER WITH CARD READER. INSTALL (1) HOSE, NOZZLE, SWIVEL AND BREAKAWAY FOR DIESEL PRODUCT. FRONT SIDE "A" (F.S."A") OF DISPENSER SHALL BE PER STANDARD DRAWING #STD–TF–3.
6. INSTALL (2) NEW GILBARCO SINGLE PRODUCT "MASTER/SATELLITE" DIESEL DISPENSERS WITH CARD READER. INSTALL (4) HOSE, NOZZLE, SWIVEL AND BREAKAWAY FOR DIESEL PRODUCT. FRONT SIDE "A" (F.S."A") OF DISPENSER SHALL BE PER STANDARD DRAWING #STD–TF–3.
7. INSTALL (1) NEW GILBARCO SINGLE PRODUCT "SATELLITE" DIESEL DISPENSER. INSTALL (1) HOSE, NOZZLE, SWIVEL AND BREAKAWAY FOR DIESEL PRODUCT. FRONT SIDE "A" (F.S."A") OF DISPENSER SHALL BE PER STANDARD DRAWING #STD–TF–3.
8. INSTALL (1) NEW REMOTE K–1 DISPENSER.
9. INSTALL NEW (1) 1" AND (2) 3/4" CONDUITS FROM WIRE WAY IN BUILDING TO EACH DISPENSER. (1) 1" CONDUIT TO BE USED FOR POWER/DATA. (1) 3/4" CONDUIT TO BE USED FOR DISPENSER SUMP SENSOR. OTHER 3/4" CONDUIT TO BE USED FOR INTERCOM AND APPLAUSE MEDIA SYSTEM. PULL NEW WIRE AND WIRE DISPENSER PER MANUFACTURER'S SPECIFICATIONS.
10. INSTALL (1) 3/4" CONDUIT FROM WIRE WAY IN BUILDING TO SATELLITE DISPENSER FOR DISPENSER SUMP SENSOR. PULL NEW WIRE AND WIRE PER MANUFACTURER'S SPECIFICATIONS.
11. INSTALL (1) 3/4" JUMPER CONDUIT FROM EACH MASTER DISPENSER TO THE LIKE NUMBERED SATELLITE DISPENSER. INSTALL CONSOLE AND INTERFACE EQUIPMENT. PULL NEW WIRE AND WIRE DISPENSER PER MANUFACTURER'S SPECIFICATIONS.
12. INSTALL 3–M INTERCOM SYSTEM PER DIRECTION OF OWNER'S REPRESENTATIVE AND STANDARD DRAWING #STD–ET–S1.
13. INSTALL END OF LINE HEAT TRACE BEACON LIGHT AT LAST DEF DISPENSER IN PIPE RUN. WIRE PER MANUFACTURER'S SPECIFICATIONS AND STANDARD DEF DETAILS.

GRAPHIC SCALE
0 40' 80' 120'
(IN FEET)
1 inch = 40 ft.

north

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NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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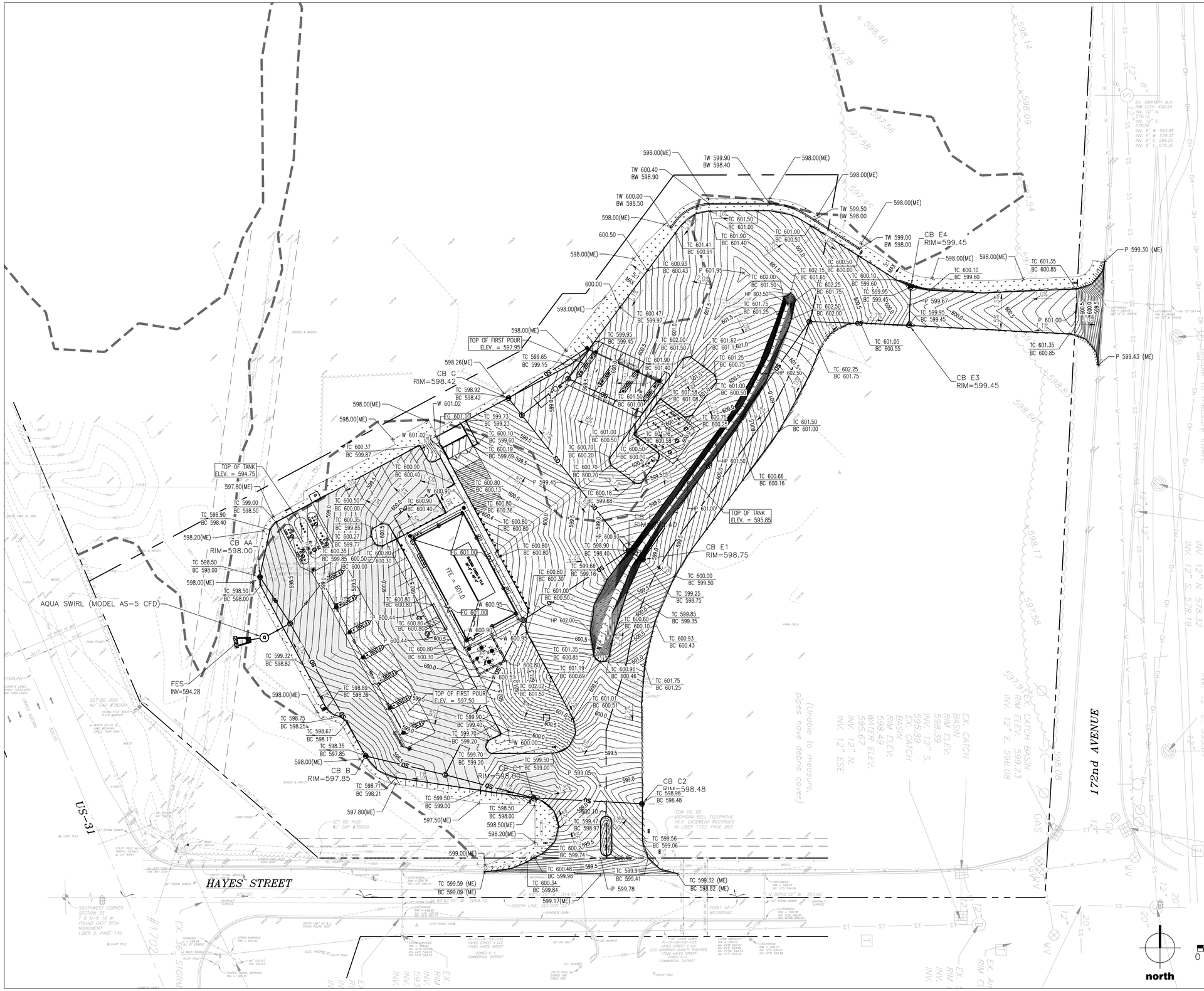
PLOT PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO. 1830
VERSION OR AFE NO. 72526
SCALE SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830–CS



HATCH LEGEND

GRASS/ LANDSCAPING

CONCRETE

HIGH STRENGTH ASPHALT

REGULAR STRENGTH ASPHALT

CONCRETE CURB

LEGEND

RUNOFF FLOW DIRECTION WITH SLOPE — 2.0%

SPOT ELEVATION — 933.40

PROPOSED CONTOUR WITH ELEVATION — 932

STORM LINE — SD

ROOF DRAIN — RD

CATCH BASIN — CB

WATER QUALITY STRUCTURE — Q

MANHOLE — D

CLEANOUT — CO

ABBREVIATIONS

BC	BOTTOM OF CURB
BOT	BOTTOM
BW	BOTTOM OF WALL
EX.	EXISTING
FFE	FINISHED FLOOR ELEVATION
FG	FINISHED GRADE
HWL	HIGH WATER LEVEL
ME	MATCH EXISTING
TC	TOP OF CURB
TW	TOP OF WALL
P	PAVEMENT
W	SIDEWALK
TYP.	TYPICAL

GRADING PLAN NOTES

1. CONTRACTOR TO USE EXTREME CAUTION WHEN GRADING IN AND AROUND EXISTING UTILITIES. CONTRACTOR SHALL FIELD VERIFY LOCATION AND DEPTH PRIOR TO START OF CONSTRUCTION.
2. EXCAVATE SOIL AS NECESSARY TO COMPLETE PROPOSED CONSTRUCTION. UNLESS OTHERWISE DIRECTED (REFER TO GEOTECHNICAL REPORT), USE ALL EXCAVATED SOILS AS FILL ON SITE. ANY SOILS THAT CANNOT BE UTILIZED ON SITE SHALL BE LOADED DIRECTLY ONTO TRANSPORT TRUCKS AND HAULED TO OWNER'S APPROVED LOCATION. ANY IMPACTED SOILS ENCOUNTERED SHALL BE LOADED SEPARATELY AND SHALL NOT BE COMMINGLED WITH CLEAN SOILS. ANY EXCAVATED SOIL OR MATERIALS THAT LEAVE THE SITE MUST GO TO AN APPROVED LANDFILL LOCATION OR BE ACCOMPANIED BY AN APPROVED BILL OR SALE.
3. BID AS ALTERNATE A: IMPACTED SOILS SHALL BE PLACED ON MINIMUM 6 MIL. VISQUEEN AND COVERED WITH 40' X 100' SHEETS OF 4 MIL. VISQUEEN. A SAND BERM SHALL BE CONSTRUCTED AROUND ENTIRE PILE OF SOIL TO HOLD THE VISQUEEN DOWN. ALL SEAMS OR OVERLAP (6" MINIMUM) IN THE VISQUEEN COVERING SHALL BE SECURED WITH WEIGHTED MATERIAL.
4. BID AS ALTERNATE B: PROVIDE DEWATERING NECESSARY FOR ANY EXCAVATIONS AND TO PREVENT TANKS FROM FLOATING WHILE THE TANKS ARE NOT COVERED BY PROPER OVERBURDEN. DEWATERING SHALL CONSIST OF SUPPLYING EQUIPMENT AND LABOR TO MAINTAIN PUMPING ACTIVITIES AS NECESSARY. COORDINATE WITH OWNER'S REPRESENTATIVE TO DETERMINE WHERE WATER CAN BE PUMPED. IDENTIFY THIS COST AS A SPECIFIC LINE ITEM IN THE BID. DISPOSAL OF CONTAMINATED WATER SHALL BE THE OWNER'S RESPONSIBILITY.
5. THE ENVIRONMENTAL CONSULTANT AND THE CONTRACTOR SHALL USE THE "SOILS WORKSHEET" TO ACCOUNT FOR ALL EXCAVATED SOILS.
6. A REPORT OF THE SUBSURFACE INVESTIGATION IS MADE AVAILABLE TO THE CONTRACTOR AT TIME OF BIDDING. THE BASE BID SHALL INCLUDE LAND BALANCING ACTIVITIES BASED ON THE ASSUMPTION THAT EXCAVATED SOIL CAN BE REUSED AS NECESSARY FOR CONSTRUCTION. UPON REVIEWING THE SUBSURFACE INVESTIGATION, CONTRACTOR SHALL INCLUDE THE FOLLOWING AS ALTERNATE:
   A. OVER-EXCAVATE AREAS OF UNSUITABLE SOILS AND STABILIZE AREAS PER THE SUBSURFACE INVESTIGATION. ESTIMATE QUANTITY OF OVER-EXCAVATED AREAS AND REPLACEMENT BACKFILL IN EACH AREA, ALONG WITH THE TYPE OF BACKFILL. ACTUAL QUANTITIES WILL BE VERIFIED DURING CONSTRUCTION PER THE DIRECTION OF THE GEOTECH CONSULTANT AND OWNER'S REPRESENTATIVE, WITH DETAILED CHANGE ORDERS SUBMITTED TO OWNER.
7. ANY DISCREPANCIES BETWEEN ELEVATIONS SHOULD BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE AND THE DESIGN ENGINEER.
8. RETAINING WALL AT THE NORTH END OF SITE SHOWN DUE TO THE MDEQ REQUIREMENT FOR RETAINING WALL AT LOCATIONS WHERE THE NEW SITE IS 2' OR HIGHER THAN EXISTING ADJACENT WETLAND AREAS.
9. STORM SEWER FOR ACCESS AND SPINE ROAD DRAINAGE TO BE COORDINATED WITH OVERALL DEVELOPMENT PLAN. CATCHMENT STRUCTURES ARE SHOWN IN ACCORDANCE WITH THE GRADING CONCEPT FOR REFERENCE.
10. OUTFALL FLARED END SECTION TO BE COORDINATED WITH DRAIN COMMISSION. PER DEVELOPER'S CIVIL CONSULTANT, AN ELEVATION OF 594.28 IS FEASIBLE.
11. CONSTRUCT BERM AT LANDSCAPED ISLAND PER LANDSCAPE PLAN. DO NOT EXCEED 3:1 SLOPE TO TOP OF BERM.

GRAPHIC SCALE

0 40' 80' 120'

(IN FEET)
1 inch = 40 ft.

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NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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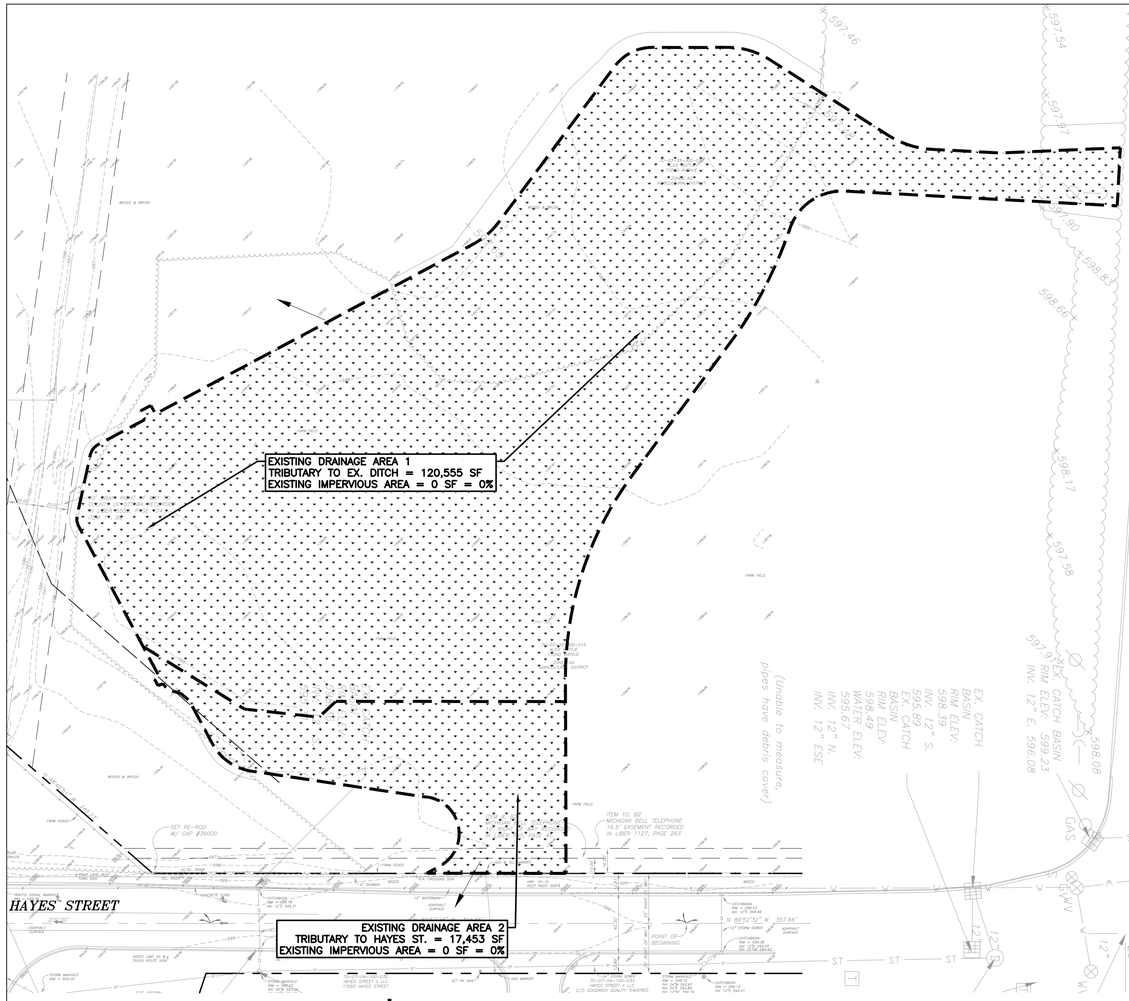
GRADING PLAN
NEW BUILD

US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830-CG

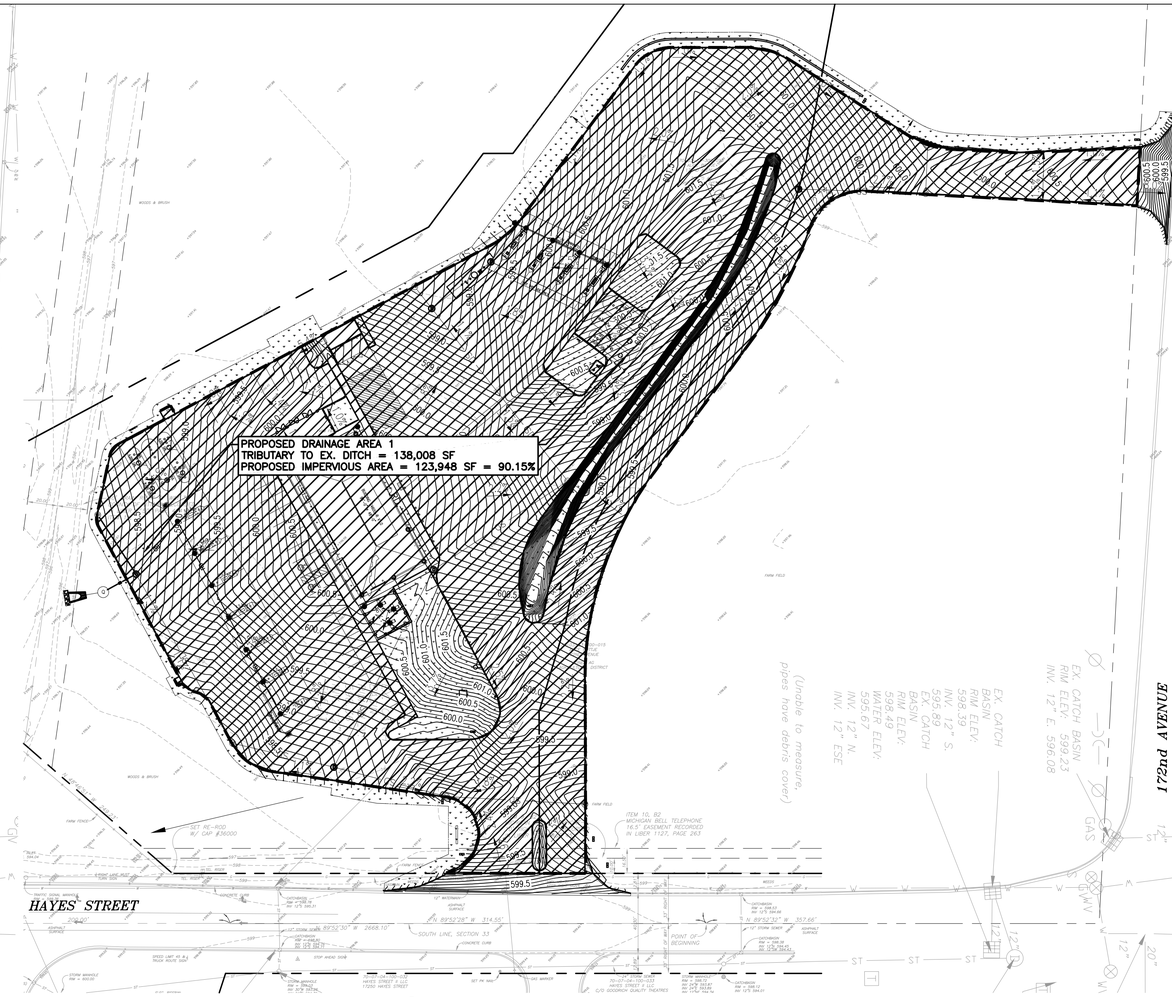


PRE-DEVELOPED CONDITIONS

TOTAL DRAINAGE AREA = 138,008 S.F. = 3.16 ACRES
IMPERVIOUS AREA = 0 S.F. = 0 ACRES = 0% IMPERVIOUS
PERVIOUS AREA = 138,008 S.F. = 3.16 ACRES = 100% PERVIOUS

PERVIOUS AREA

north
1 :50 SCALE



POST-DEVELOPED CONDITIONS

TOTAL DRAINAGE AREA = 138,008 S.F. = 3.16 ACRES
IMPERVIOUS AREA = 123,948 S.F. = 2.85 ACRES = 89.87% IMPERVIOUS
PERVIOUS AREA = 14,060 S.F. = 0.32 ACRES = 10.13% PERVIOUS

IMPERVIOUS AREA

PERVIOUS AREA

north
1 :50 SCALE

STORMWATER MANAGEMENT NOTES:
STORM STORAGE WILL BE COMMUNAL FOR THE SITE, THE DESIGN FOR THE SYSTEM IN ACCORDANCE WITH THE PROPOSED IMPROVED VINCENT DRAIN PER THE OTTAWA COUNTY WATER RESOURCE COMMISSION.

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NO.	REVISIONS	DESIGNER DATE	PROJ. ENGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER NIEFD REVIEW	11/19/14	11/19/14	11/19/14
	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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PRE/POST DRAINAGE PLAN

NEW BUILD

US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

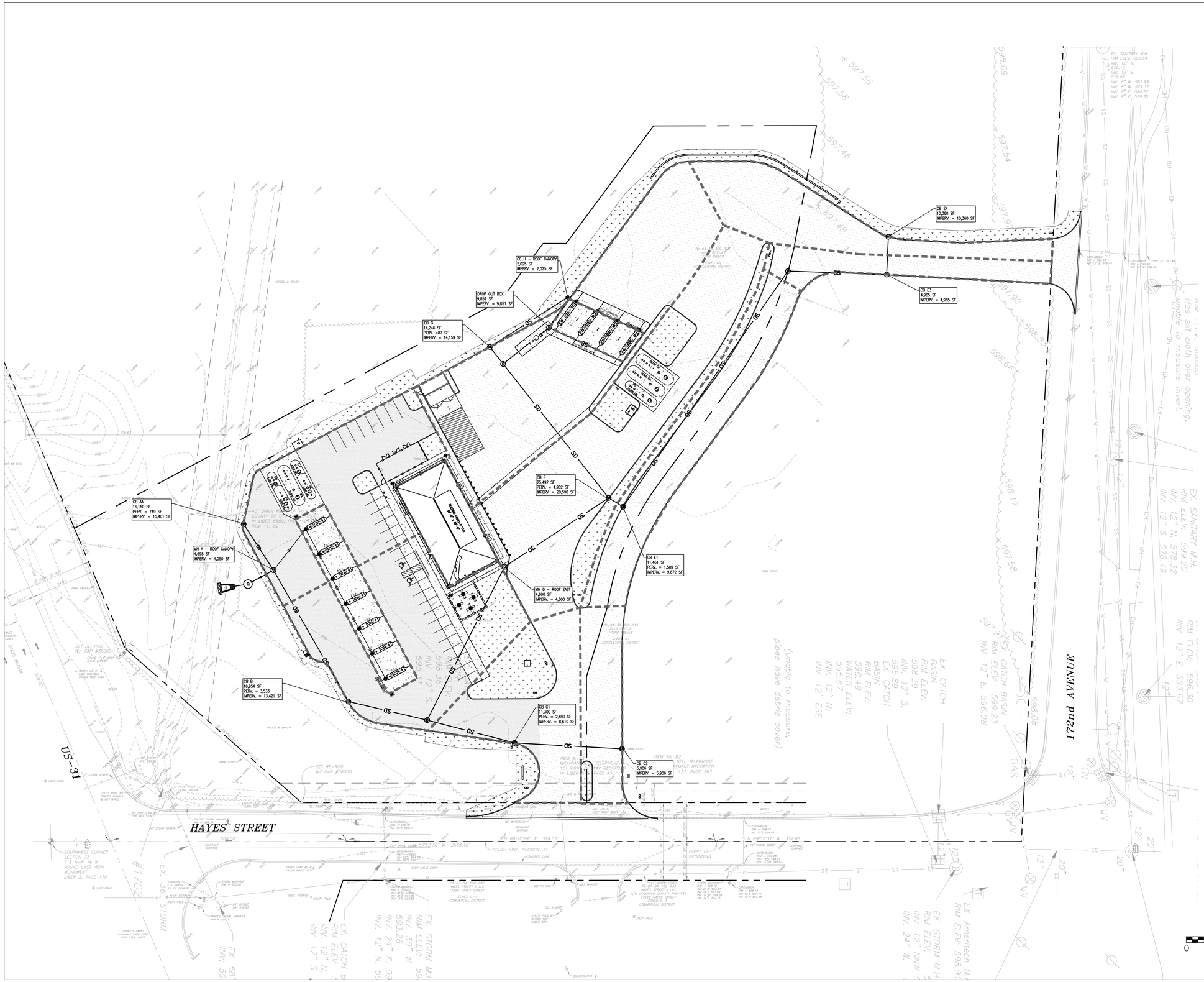
STORE OR BLDG NO. 1830

VERSION OR AFE NO. 72526

SCALE SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830-CG4



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NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
1	SITE PLAN APPROVAL ISSUE	9/29/14	9/29/14	9/29/14
2	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
3	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
4	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
5	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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STORM DRAINAGE PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830–CG5

NOTES

1. EARTHWORK QUANTITIES REPRESENT DIFFERENCE BETWEEN EXISTING AND PROPOSED FINISHED GRADE SURFACES.
2. EARTHWORK ASSOCIATED WITH CONSTRUCTION OF PROPOSED OBJECTS DETERMINED PER SPEEDWAY STANDARDS.
3. NO SWELL OR SHRINKAGE ADJUSTMENT FACTORS INCLUDED.

CUT AND FILL SUMMARY

Description		Total Cut V (CY.)	Total Cut M (tons)
EXISTING		0.00	0.00
BUILDING & TRASH ENCLOSURE		297.26	445.89
TANKS		1443.16	2164.73
MISC. SITE		327.54	491.31
UTILITIES		411.70	617.56
STORM PIPING & STRUCTURES		518.57	777.86
PRODUCT PIPING & DISPENSERS		207.41	311.11
SURFACE TO SURFACE CUT		91.30	136.95
Overall Cut		3296.94	4945.41
Overall Fill		9154.95	13732.43
Total Cut - Fill		-5858.01	-8787.02

north

GRAPHIC SCALE

0 40' 80' 120'

(IN FEET)
1 inch = 40 ft.

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NO.	REVISIONS	DESIGNER DATE	PRJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
	DRAW / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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CUT/FILL PLAN
NEW BUILD

US 31 & HAYES ST
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GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO.
1830-CF

CONSTRUCTION SEQUENCE (SEE KEYNOTES ON PLAN)

A. INITIAL PHASE SOIL EROSION AND SEDIMENT CONTROL CONSTRUCTION SEQUENCE

1. INSTALL PERIMETER SILT FENCE (DETAIL 1 THIS SHEET).
2. INSTALL INLET PROTECTION ON ALL EXISTING OPEN GRATE STORM STRUCTURE (DETAIL 2 THIS SHEET).

B. INTERMEDIATE PHASE SOIL EROSION AND SEDIMENT CONTROL CONSTRUCTION SEQUENCE

1. ADD STABILIZED CONSTRUCTION ENTRANCE (DETAIL 3 THIS SHEET).
2. ROUGH GRADING OF SITE AND INSTALLATION OF NEW STORM SEWER SYSTEM.
3. ADD INLET PROTECTION ON ALL NEW OPEN GRATE STORM STRUCTURES AS THEY ARE INSTALLED (DETAIL 2 THIS SHEET).
4. INSTALL REMAINING UTILITIES.
5. INSTALL BUILDING, DISPENSERS, CANOPY, CURB, PAVEMENT AND COMPLETE FINAL GRADING. CONTRACTOR TO MAINTAIN A DRY SUBBASE SURFACE PRIOR TO BUILDING SLAB OR PAVEMENT CONSTRUCTION.
6. CONTRACTOR SHALL INSPECT EROSION CONTROL MEASURES WEEKLY AND AFTER ANY STORM EVENT EXCEEDING 1/2" OF RAIN.
7. SHOULD THE VOLUME, VELOCITY, SEDIMENT LOAD, OR PEAK FLOW RATES OF STORMWATER RUNOFF TEMPORARILY INCREASE DURING CONSTRUCTION, THEN ADDITIONAL MEASURES TO PROTECT ADJACENT PROPOERTIES SHALL BE UNDERTAKEN.

C. FINAL PHASE SOIL EROSION AND SEDIMENT CONTROL CONSTRUCTION SEQUENCE

1. PERMANENTLY STABILIZE VEGETATED AREAS AND INSTALL LANDSCAPING PER LANDSCAPE PLANS WITHIN 5 DAYS OF FINAL GRADING.
2. REMOVE SEDIMENT CONTROL DEVICES AFTER SITE IS PERMANENTLY STABILIZED AND VEGETATION HAS BEEN ESTABLISHED.
3. EVALUATE IF SEDIMENT ENTERED THE SYSTEM DURING THE WORK AND INITIATE ACTIONS TO HAVE THE STORM SYSTEM CLEANED AS APPROPRIATE.
4. CLEAN ANY SEDIMENT WHICH HAS BEEN CONVEYED TO THE ST. VINCENT DITCH.

LEGEND

CONSTRUCTION ENTRANCE
SILT FENCE — SF —
CONSTRUCTION LIMITS
INLET PROTECTION

SOIL EROSION AND SEDIMENT CONTROL PLAN NOTES

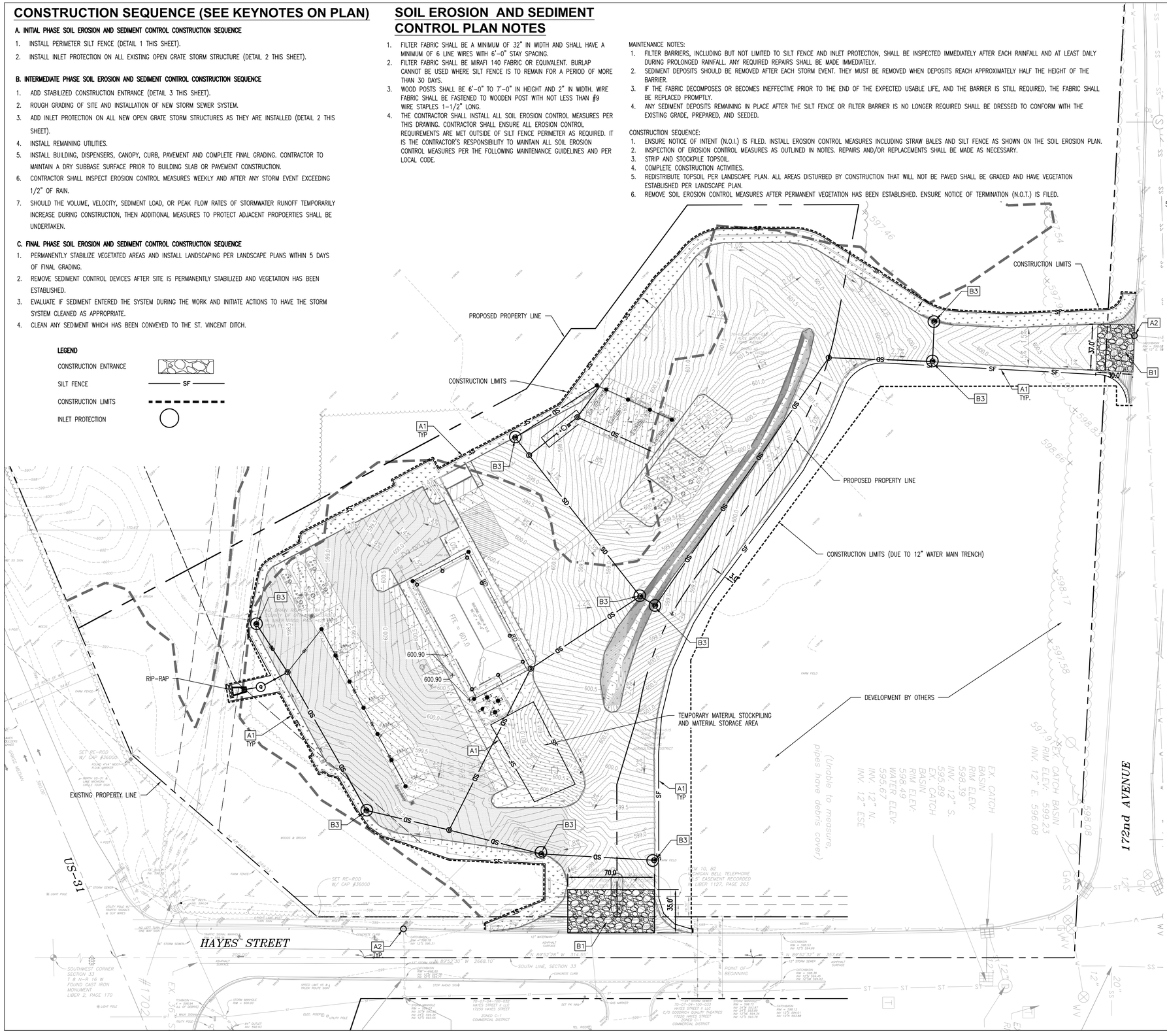
1. FILTER FABRIC SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 6'–0" STAY SPACING.
2. FILTER FABRIC SHALL BE MIRAFI 140 FABRIC OR EQUIVALENT. BURLAP CANNOT BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS.
3. WOOD POSTS SHALL BE 6'–0" TO 7'–0" IN HEIGHT AND 2" IN WIDTH. WIRE FABRIC SHALL BE FASTENED TO WOODEN POST WITH NOT LESS THAN #9 WIRE STAPLES 1–1/2" LONG.
4. THE CONTRACTOR SHALL INSTALL ALL SOIL EROSION CONTROL MEASURES PER THIS DRAWING. CONTRACTOR SHALL ENSURE ALL EROSION CONTROL REQUIREMENTS ARE MET OUTSIDE OF SILT FENCE PERIMETER AS REQUIRED. IT IS THE CONTRACTOR'S RESPONSIBILITY TO MAINTAIN ALL SOIL EROSION CONTROL MEASURES PER THE FOLLOWING MAINTENANCE GUIDELINES AND PER LOCAL CODE.

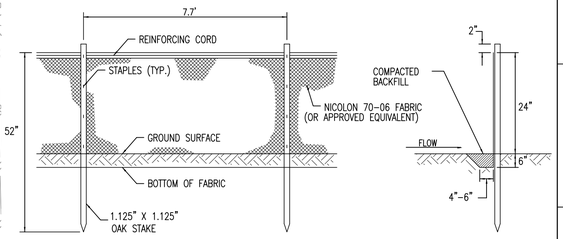
MAINTENANCE NOTES:

1. FILTER BARRIERS, INCLUDING BUT NOT LIMITED TO SILT FENCE AND INLET PROTECTION, SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.
2. SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY HALF THE HEIGHT OF THE BARRIER.
3. IF THE FABRIC DECOMPOSES OR BECOMES INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE, AND THE BARRIER IS STILL REQUIRED, THE FABRIC SHALL BE REPLACED PROMPTLY.
4. ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED, AND SEEDED.

CONSTRUCTION SEQUENCE:

1. ENSURE NOTICE OF INTENT (N.O.I.) IS FILED. INSTALL EROSION CONTROL MEASURES INCLUDING STRAW BALES AND SILT FENCE AS SHOWN ON THE SOIL EROSION PLAN.
2. INSPECTION OF EROSION CONTROL MEASURES AS OUTLINED IN NOTES. REPAIRS AND/OR REPLACEMENTS SHALL BE MADE AS NECESSARY.
3. STRIP AND STOCKPILE TOPSOIL.
4. COMPLETE CONSTRUCTION ACTIVITIES.
5. REDISTRIBUTE TOPSOIL PER LANDSCAPE PLAN. ALL AREAS DISTURBED BY CONSTRUCTION THAT WILL NOT BE PAVED SHALL BE GRADED AND HAVE VEGETATION ESTABLISHED PER LANDSCAPE PLAN.
6. REMOVE SOIL EROSION CONTROL MEASURES AFTER PERMANENT VEGETATION HAS BEEN ESTABLISHED. ENSURE NOTICE OF TERMINATION (N.O.T.) IS FILED.

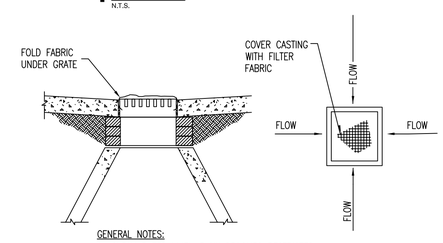




GENERAL NOTES:

1. SILT FENCE SHALL BE MAINTAINED UNTIL THE AREA TRIBUTARY TO THE STRUCTURE HAS STABILIZED GROUND COVER, AS DETERMINED BY THE OWNER'S CONSTRUCTION MANAGER.

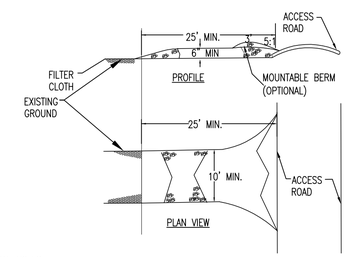
1 SILT FENCE
N.T.S.



GENERAL NOTES:

1. CLEAN FILTER WHEN FLOW BECOMES RESTRICTED.
2. FILTER FABRIC SHALL BE OF THE FOLLOWING OR APPROVED EQUIVALENT:
   A. MIRAFI (NON–WOVEN) – CELANESE FIBERS MARKETING CO.
   B. POLYFILTER X (WOVEN) – CARTHAGE MILLS
   C. TYPAR (NON–WOVEN) – DUPONT COMPANY
3. ALL MANHOLE, CATCH BASINS, AND CURB INLETS TO BE PROTECTED WITH THE FILTER FABRIC INLET FILTER SHOWN ABOVE.

2 INLET PROTECTION
N.T.S.



GENERAL NOTES:

1. STONE SIZE – USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – AS SHOWN ON PLAN, BUT NOT LESS THAN 25 FEET
3. THICKNESS – NOT LESS THAN 6"
4. WIDTH – 10' MIN. NOT LESS THAN THE FULL WIDTH AT POINT WHERE INGRESS OR ENGRESS OCCURS
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5H:1V SLOPE WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. SPILLED, DROPPED, WASHED OR TRACKED SEDIMENTS ONTO PUBLIC RIGHT–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT–OF WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

3 CONSTRUCTION ENTRANCE
N.T.S.

north

GRAPHIC SCALE
0 40' 80' 120'
(IN FEET)
1 inch = 40 ft.

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Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
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	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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SOIL EROSION AND SEDIMENT CONTROL PLAN

NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830–CE

HATCH LEGEND

- GRASS/ LANDSCAPING
- CONCRETE
- HIGH STRENGTH ASPHALT
- REGULAR STRENGTH ASPHALT
- CONCRETE CURB
- SANITARY SEWER — SS —
- WATER SERVICE — W —
- ELECTRIC SERVICE — E —
- UNDERGROUND NATURAL GAS — G —
- STORM SEWER — SD —
- ROOF DRAIN — RD —
- UNDERGROUND TELEPHONE — T —

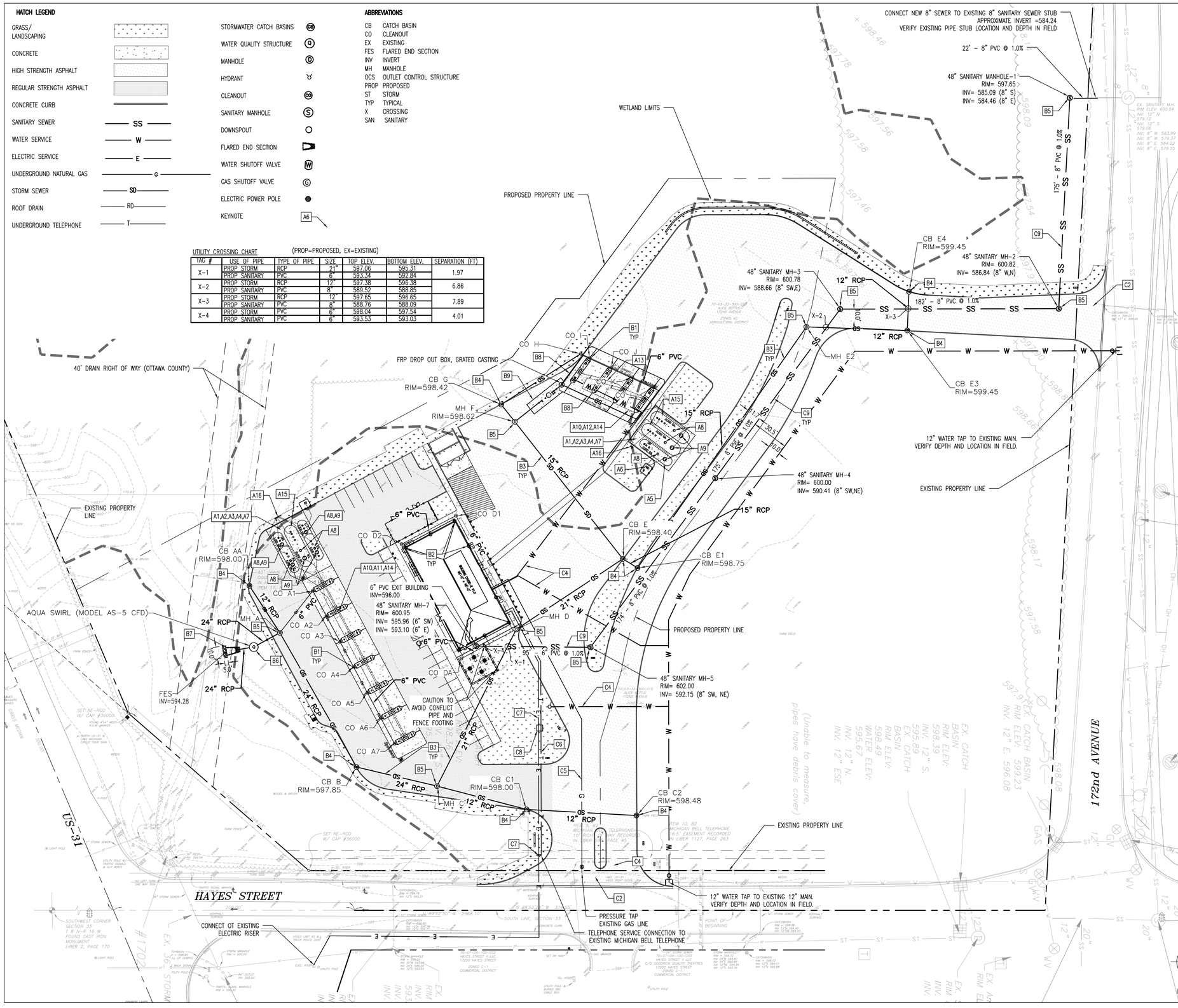
- STORMWATER CATCH BASINS
- WATER QUALITY STRUCTURE
- MANHOLE
- HYDRANT
- CLEANOUT
- SANITARY MANHOLE
- DOWNSPOUT
- FLARED END SECTION
- WATER SHUTOFF VALVE
- GAS SHUTOFF VALVE
- ELECTRIC POWER POLE
- KEYNOTE — A6

ABBREVIATIONS

CB	CATCH BASIN
CO	CLEANOUT
EX	EXISTING
FES	FLARED END SECTION
INV	INVERT
MH	MANHOLE
OCS	OUTLET CONTROL STRUCTURE
PROP	PROPOSED
ST	STORM
TYP	TYPICAL
X	CROSSING
SAN	SANITARY

UTILITY CROSSING CHART (PROP=PROPOSED, EX=EXISTING)

TAG #	USE OF PIPE	TYPE OF PIPE	SIZE	TOP ELEV.	BOTTOM ELEV.	SEPARATION (FT)
X-1	PROP STORM	RCP	21"	597.06	595.31	1.97
	PROP SANITARY	PVC	6"	593.34	592.84	
X-2	PROP STORM	RCP	12"	597.38	596.38	6.86
	PROP SANITARY	PVC	8"	589.52	588.85	
X-3	PROP STORM	RCP	12"	597.65	596.65	7.89
	PROP SANITARY	PVC	8"	588.76	588.09	
X-4	PROP STORM	PVC	6"	598.04	597.54	4.01
	PROP SANITARY	PVC	6"	593.53	593.03	



UTILITY PLAN NOTES

A. TANKS AND PRODUCT PIPING DETAILS

1. CONTRACTOR SHALL FURNISH AND INSTALL ALL MATERIAL AS INDICATED ON STD-PQ, STD-TF AND STD-DEF DRAWINGS.
2. ALL NEW INSTALLATIONS AND MODIFICATIONS TO THE UNDERGROUND STORAGE TANK SYSTEM SHALL COMPLY WITH PEI RP100-05, PEI RP300-09, API RP1615 AND ALL FEDERAL, STATE AND LOCAL CODES AND ORDINANCES.
3. TANKS SHALL BE ANCHORED PER STANDARD DRAWING STD-PQ-5.
4. BALLAST TANKS TO 90% FULL WITH CLEAN WATER. DO NOT BALLAST DEF TANKS WITH WATER. AFTER THE TANKS HAVE BEEN PROPERLY COVERED BY OVERBURDEN AND BEFORE PRODUCT IS DELIVERED, THE CONTRACTOR SHALL REMOVE ALL WATER. COORDINATE WITH OWNER'S REPRESENTATIVE FOR DELIVERY OF PRODUCT. ANY WATER REMAINING IN TANKS AFTER PRODUCT DELIVERY SHALL BE REMOVED AND DISPOSED OF AT THE CONTRACTOR'S EXPENSE AND PER LOCAL AHJ.
5. BALLAST DIESEL EXHAUST FLUID (DEF) TANK 90% FULL WITH THE DEF PRODUCT. COORDINATE WITH OWNER'S REPRESENTATIVE FOR DELIVERY OF PRODUCT.
6. INSTALL REMOTE FILL, AUTOMATIC TANK GAUGE, AND REMOTE VAPOR RECOVERY MANHOLES AND RELATED EQUIPMENT PER PIPING PLAN AND STD-PQ SERIES DRAWINGS.
7. INSTALL TANK CONDUIT FROM TANK TO DISPENSER ELECTRICAL EQUIPMENT INSIDE BUILDING PER STD-PQ SERIES DRAWINGS AND MANUFACTURER'S INSTRUCTIONS.
8. INSTALL VEEDER ROOT LINE LEAK DETECTION AND ATG SYSTEM, RELATED MANHOLES, CONDUITS, AND JUNCTION BOXES PER DRAWING STD-EI-7 AND MANUFACTURER'S INSTRUCTIONS. INSTALL TANK INTERSTITIAL SENSORS FURNISHED BY OWNER.
9. INSTALL TANK SUMP SENSORS FURNISHED BY OWNER.
10. PRODUCT PIPING LINE-UP AND FRONT SIDE "A" (F.S. "A") OF DISPENSERS SHALL BE AS SHOWN. PIPING AND CONDUIT LOCATION AND SPACING UNDER DISPENSERS SHALL BE PER STD-PQ SERIES DRAWINGS.
11. FOR CONVENTIONAL, INSTALL 2" DIRECT-BURY SOLID WALL PRODUCT PIPING (UPP DOUBLE WALL) PER MANUFACTURER'S RECOMMENDATIONS AND SERIES STD-PQ DRAWINGS. THE PIPE, APPURTENANCES (INCLUDING BULKHEAD ENTRY FITTINGS), AND MISC. MATERIALS NECESSARY TO ASSEMBLE SYSTEM SHALL BE OWNER SUPPLIED.
12. INSTALL 3" DIRECT-BURY SOLID WALL PRODUCT PIPING (UPP DOUBLE WALL) WITH 2" LATERALS TO EACH MASTER OR MASTER/SATELLITE DISPENSER FOR TRUCK LANES PER MANUFACTURER'S RECOMMENDATION AND SERIES STD-TF DRAWINGS. THE PIPE, APPURTENANCES (INCLUDING BULKHEAD ENTRY FITTINGS), AND MISC. MATERIALS NECESSARY TO ASSEMBLE SYSTEM SHALL BE OWNER SUPPLIED.
13. INSTALL 1" STAINLESS STEEL FLEXIBLE PRODUCT PIPING WITH HEAT TRACE WITHIN 4" ACCESS/CONTAINMENT PIPE FOR DEF PIPING PER MANUFACTURER'S RECOMMENDATION AND STANDARD SERIES STD-DEF DRAWINGS. THE PIPE, APPURTENANCES (INCLUDING BULKHEAD ENTRY FITTINGS), AND MISC. MATERIALS NECESSARY TO ASSEMBLE SYSTEM SHALL BE OWNER SUPPLIED.
14. INSTALL SIPHON LINES PER DETAILS ON THE STD-PQ SERIES DRAWINGS.
15. INSTALL A SECOND FILL PIPE ON 20,000 GALLON TANKS PER DETAILS ON THE STD-PQ SERIES DRAWINGS
16. SUPPLY AND INSTALL 2" SINGLEWALL FIBERGLASS VENT LINES AND RELATED EQUIPMENT. CONTRACTOR TO LOCATE VENT STACKS A MINIMUM OF 10' AWAY FROM ELECTRICAL EQUIPMENT AND EXISTING BUILDING STRUCTURES.

B. STORM PIPING

1. A CLEANOUT SHALL BE INCLUDED AT EVERY CANOPY COLUMN WITH A 4" DOWNSPOUT THAT IS CONNECTED TO THE STORM DRAINAGE SYSTEM AS INDICATED PER DRAWING STD-SB-1.
2. 4" PVC BUILDING DOWNSPOUTS SHALL BE CONNECTED TO STORM DRAINAGE SYSTEM AS INDICATED. SEE BUILDING DRAWINGS FOR ACTUAL LOCATION OF DOWNSPOUTS.
3. SUPPLY AND INSTALL STORM DRAINAGE PIPING AS SHOWN PER STANDARD DRAWING SERIES 1830-PS-1.
4. SUPPLY AND INSTALL STANDARD DUTY CATCH BASINS, WITH SPIDER DRAINS, INCLUDING CONCRETE COLLAR IF IN ASPHALT PAVEMENT PER DRAWING 1830-PS-1. SUPPLY AND INSTALL HEAVY DUTY NEAR CFL AREA.
5. SUPPLY AND INSTALL STANDARD DUTY MANHOLES, INCLUDING CONCRETE COLLAR IF IN ASPHALT PAVEMENT PER DRAWING 1830-PS-1. SUPPLY AND INSTALL HEAVY DUTY NEAR CFL AREA.
6. SUPPLY AND INSTALL WATER QUALITY TREATMENT STRUCTURE (AQUASWIRL™ BY AQUASHIELD) PER MANUFACTURER'S SPECIFICATIONS. SEE DETAIL ON SHEET 1830-PS-2.
7. REGIONAL PUD DETENTION AGREEMENT TO BE HANDLED DEVELOPER. SEE PLANS BY NEDERVELD ENGINEERING FOR FURTHER DETAIL. OUTFALL FLARED END SECTION TO BE COORDINATED WITH DRAIN COMMISSION PER DEVELOPER'S CIVIL CONSULTANT, AN ELEVATION OF 594.28 IS FEASIBLE. SEE FLARED END SECTION & RIP-RAP DETAIL ON SHEET 1830-PS-1.
8. SUPPLY AND INSTALL SLOTTED DRAIN ALONG WEST AND SOUTH OF CFL CANOPY PER 1830-PS-1.
9. SUPPLY AND INSTALL OIL/WATER SEPARATOR (MODEL CSI-10 MANUFACTURER BY CONTAINMENT SOLUTIONS) PER MANUFACTURER'S SPECIFICATION.

C. UTILITIES

1. VERIFY ALL SERVICE UTILITY ROUTINGS WITH OWNER'S REPRESENTATIVE PRIOR TO INSTALLATION. VERIFY ALL UTILITY CLEARANCES ARE MAINTAINED PER LOCAL CODE.
2. ALL WORK WITHIN RIGHT-OF-WAY SHALL CONFORM TO GOVERNING STATE AND/OR LOCAL SPECIFICATIONS.
3. SITE CONTRACTOR TO BRING UTILITIES WITHIN 5' OF BUILDING AT LOCATIONS SHOWN. COORDINATE ALL BUILDING UTILITY CONNECTIONS WITH BUILDING DRAWINGS.
4. CONTRACTOR SHALL FURNISH AND INSTALL NEW 2" COPPER WATER SERVICE LINE FROM METER TO NEW 1.5" TAP. CONTRACTOR SHALL INSTALL THE WATER LINE FROM THE METER TO THE BUILDING SERVICE PER THE BUILDING DRAWINGS. CONTRACTOR SHALL COORDINATE INSTALLATION WITH WATER COMPANY.
5. LOCAL GAS COMPANY SHALL FURNISH AND INSTALL 1.25" GAS LINE FROM METER TO NEW TAP. THE CONTRACTOR SHALL INSTALL THE GAS LINE FROM THE METER TO THE BUILDING SERVICE PER THE BUILDING DRAWINGS. CONTRACTOR SHALL COORDINATE INSTALLATION WITH GAS COMPANY.
6. CONTRACTOR SHALL FURNISH AND INSTALL (1) 2" PVC CONDUIT WITH PULL STRING FROM TELEPHONE SERVICE CONNECTION TO BUILDING.
7. NEW UNDERGROUND 120/208V THREE PHASE ELECTRIC SERVICE SHALL BE INSTALLED PER BUILDING DRAWINGS. CONTRACTOR SHALL INSTALL CONDUITS AND CONDUCTORS FROM PAD MOUNTED TRANSFORMER TO BUILDING. CONTRACTOR SHALL SUPPLY AND INSTALL CONDUITS FOR PRIMARY POWER AS SPECIFIED BY LOCAL POWER COMPANY TO TRANSFORMER. PRIMARY POWER CONDUCTORS SUPPLIED AND INSTALLED BY LOCAL POWER COMPANY. SERVICE POWER ROUTING TO BE COORDINATED WITH ELECTRIC COMPANY.
8. INSTALL CONCRETE TRANSFORMER PAD AT LOCATION INDICATED PER REQUIREMENTS OF LOCAL POWER COMPANY, INCLUDING ANY REQUIRED BOLLARDS.
9. INSTALL 6" & 8" SCHEDULE 40 PVC SANITARY SEWER LINE FROM BUILDING TO APPROPRIATE SERVICE LATERAL PER FIELD CONDITIONS. MINIMUM SLOPE SHALL BE 1.0%. INSTALL CLEANOUTS EVERY 100' (MAX.) ALONG SEWER LINE.
10. SEE SHEET CU1 FOR STORM SEWER PIPE PROFILES WITH ELEVATION INFORMATION.

Know what's below. Call before you dig.

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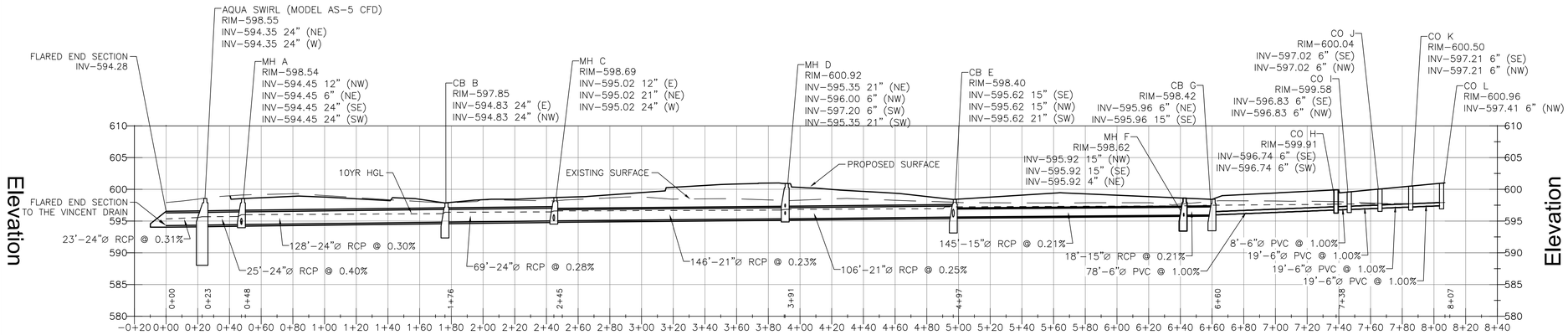
PIPING AND UTILITIES PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO. 1830
VERSION OR AFE NO. 72526
SCALE SHOWN IN PLAN

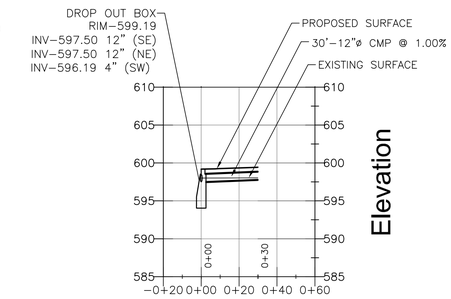
DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830-CU

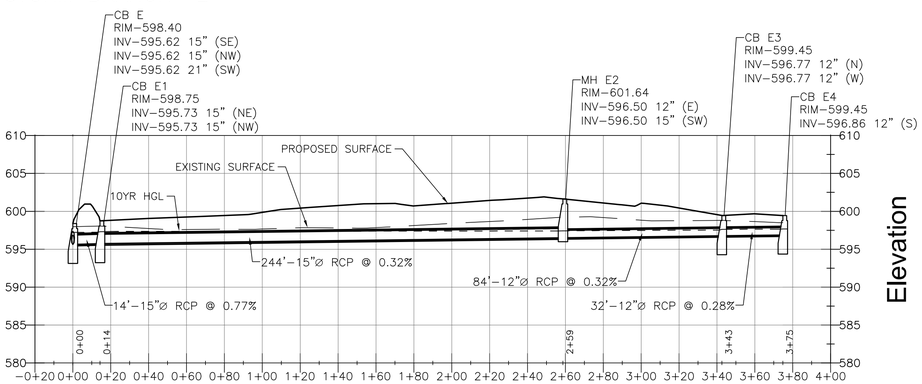
MAIN STORM RUN ("FES-AQUA SWIRL-ABCDEFGHIJ")



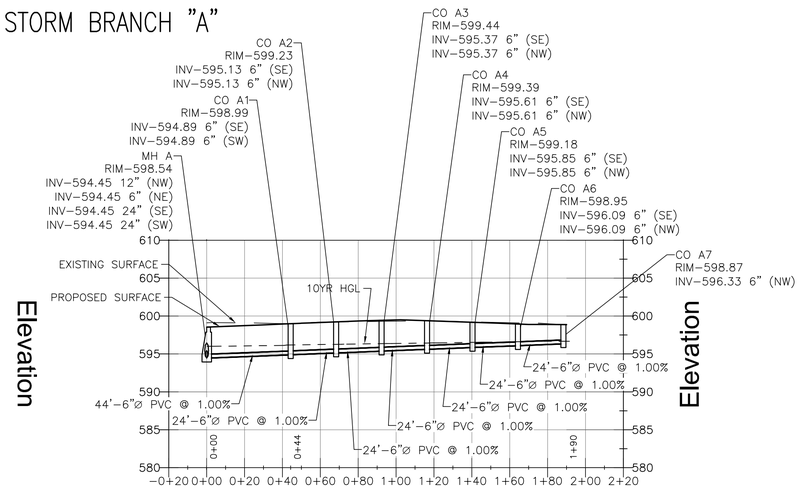
STORM BRANCH "DROP OUT BOX – NE SLOT DRAIN"



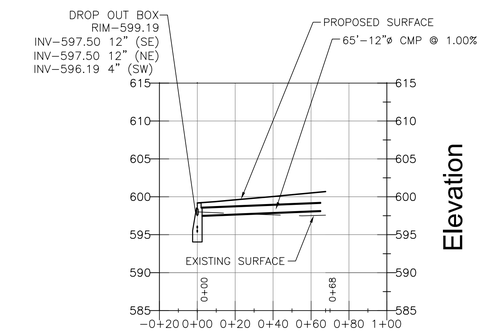
STORM BRANCH "E"



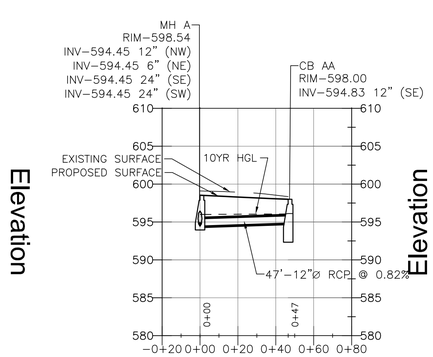
STORM BRANCH "A"



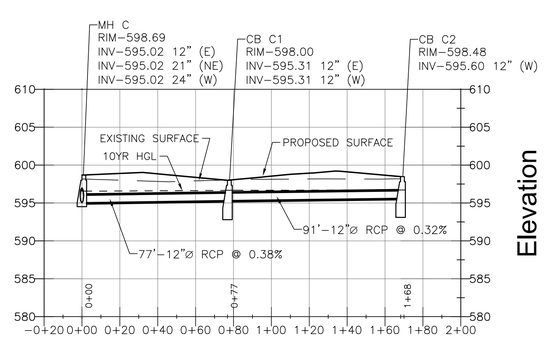
STORM BRANCH "DROP OUT BOX – SE SLOT DRAIN"



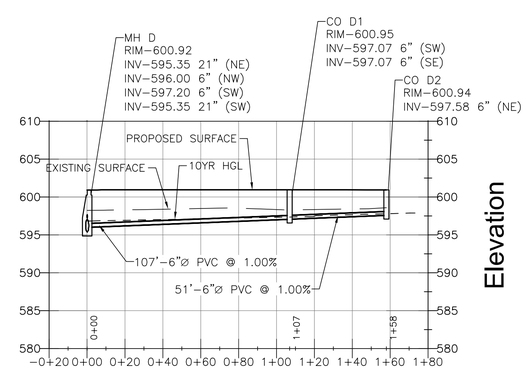
STORM BRANCH "A-AA"



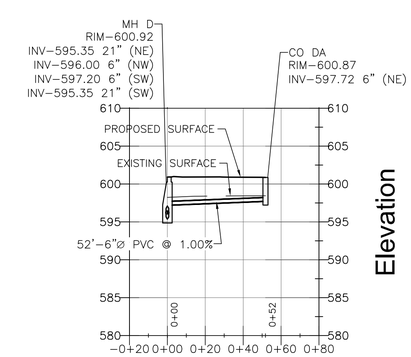
STORM BRANCH "C"



STORM BRANCH "D"



STORM BRANCH "D-DA"



*HORIZONTAL SCALE 1:40 & VERTICAL SCALE 1:10

*NOTE: A MINIMUM 1' OF COVER WAS MAINTAINED ON STORM SEWER PIPE.

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STORM SEWER PROFILES
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

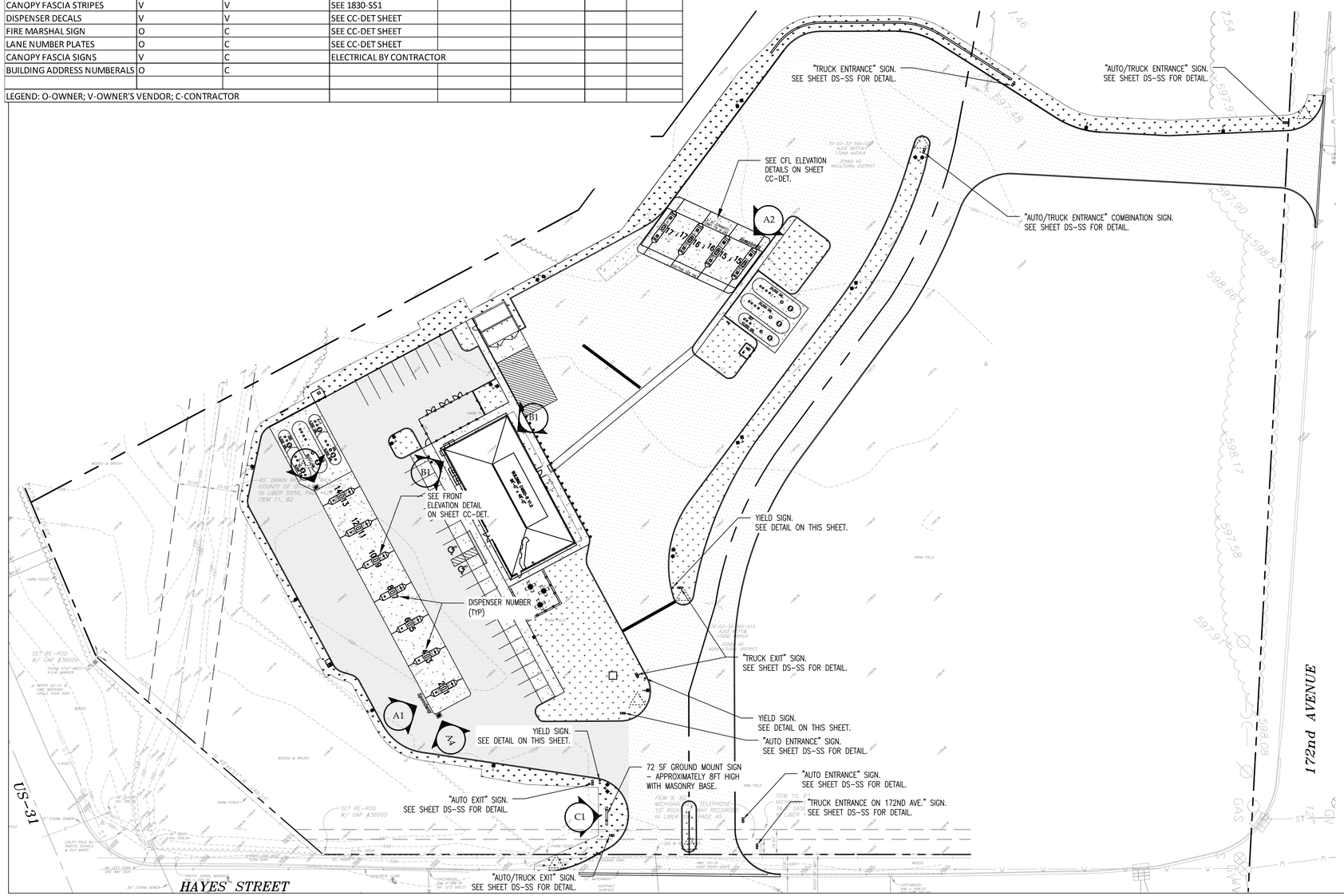
STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

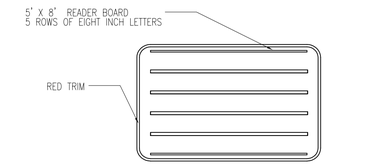
DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830-CU2

SIGNAGE

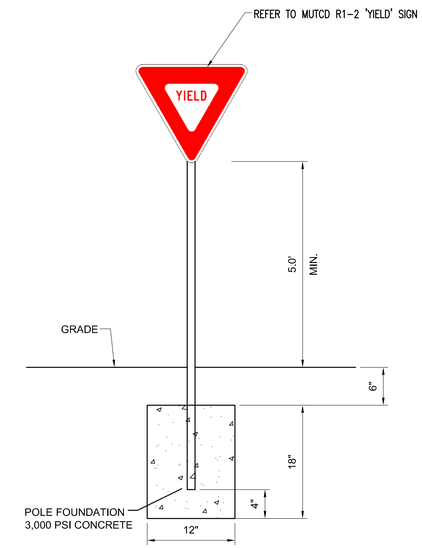
REFERENCE LETTER		LOCATION	MESSAGE	ILLUMINATION (Y/N?)	DIMENSION	AREA	STANDARD DETAILS
	CANOPY						
A1	1 EA	AUTO CANOPY	SPEEDWAY	YES	3.0' H X 15' 9" W	47.25 SF	SEE 1830-SS1
A2	1 EA	TRUCK CANOPY	SPEEDWAY	YES	3.0' H X 15' 9" W	47.25 SF	SEE 1830-SS1
A3	1 EA	AUTO CANOPY	MOVING 'S' LOGO	YES	3.0' H X 3' 8" W	11.0 SF	SEE 1830-SS1
A4	1 EA	AUTO CANOPY	MOVING 'S' LOGO	YES	3.0' H X 3' 8" W	11.0 SF	SEE 1830-SS1
					CANOPY TOTAL	116.5 SF	
	BUILDING						
B1	2 EA	BUILDING WALL	READER BOARD	YES	5' X 8'	80 SF	DETAIL B1 THIS SHEET
					BUILDING TOTAL	80 SF	
	YARD						
C1	1 EA	SOUTHERN ENTRACE AT HAYES	TRADE MARK / PRICE	YES	SEE STANDARD DETAIL	72 SF	SEE 1830-SS1
					YARD TOTAL	72 SF	
GRAPHICS-INSTALLATION							
ITEM	FURNISHED BY:	INSTALLED BY	REMARKS				
CANOPY FASCIA STRIPES	V	V	SEE 1830-SS1				
DISPENSER DECALS	V	V	SEE CC-DET SHEET				
FIRE MARSHAL SIGN	O	C	SEE CC-DET SHEET				
LANE NUMBER PLATES	O	C	SEE CC-DET SHEET				
CANOPY FASCIA SIGNS	V	C	ELECTRICAL BY CONTRACTOR				
BUILDING ADDRESS NUMBERALS	O	C					
LEGEND: O-OWNER; V-OWNER'S VENDOR; C-CONTRACTOR							



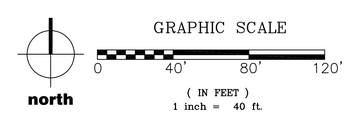


NOTES:
1. SIGN TO BE SINGLE FACED AND INTERNALLY ILLUMINATED
2. SIGN FURNISHED BY OWNER, AND INSTALLED BY CONTRACTOR.
3. ALIGN UPPER EDGE WITH TOP OF WINDOW.
4. LOCATED ON "COOLER" END OF BUILDING.

B1 READER BOARD ELEVATION
N.T.S.



YIELD SIGN
N.T.S.



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SIGNAGE PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

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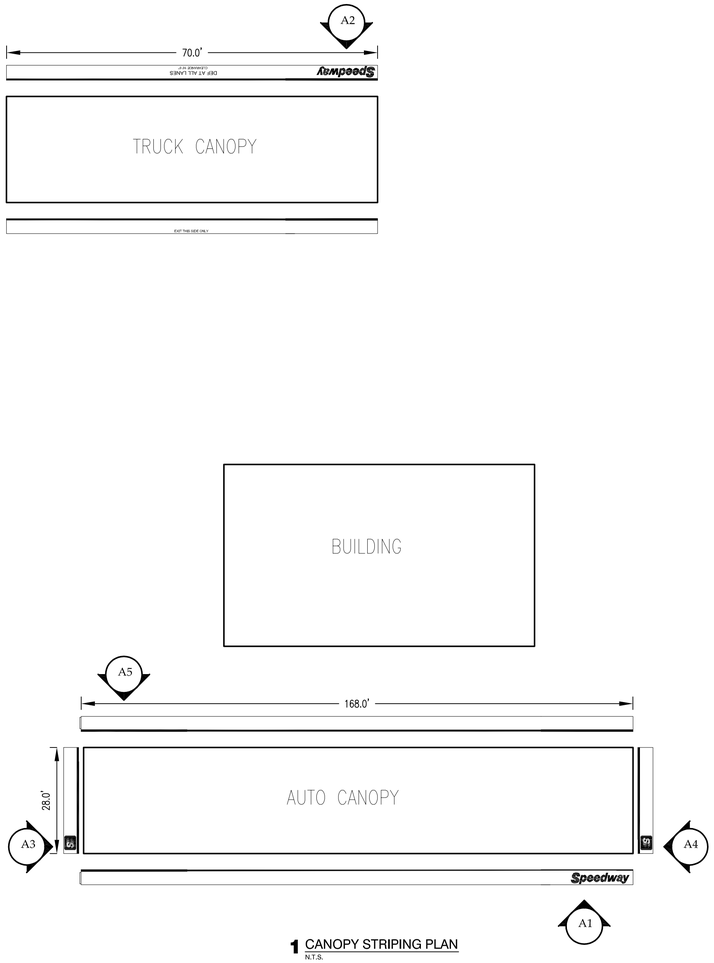
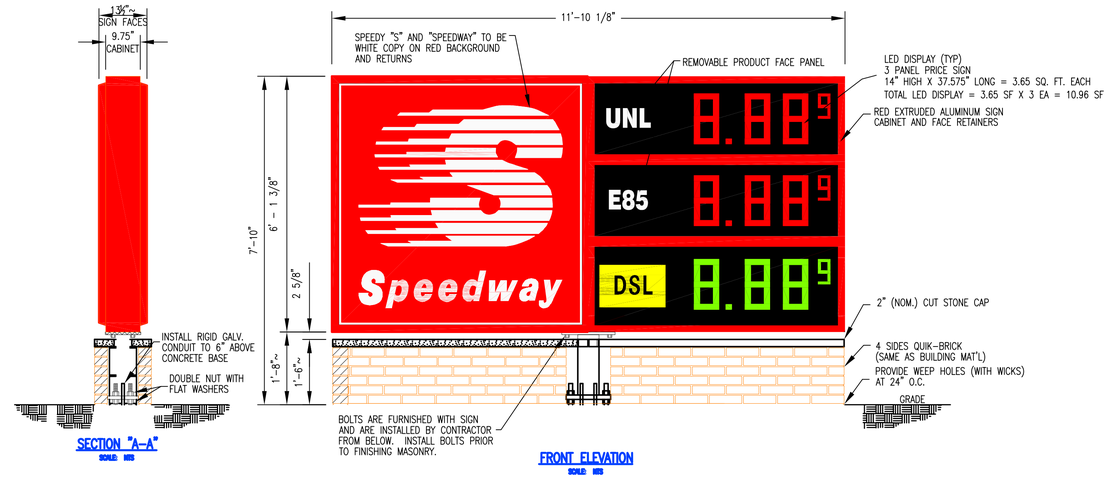
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO.
1830-SS

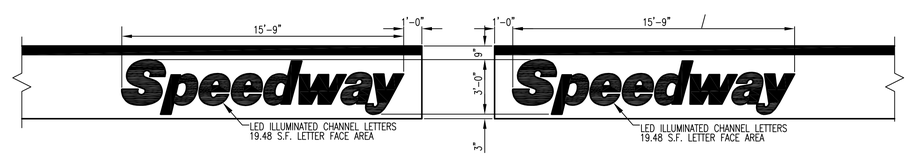


1 CANOPY STRIPING PLAN
N.T.S.



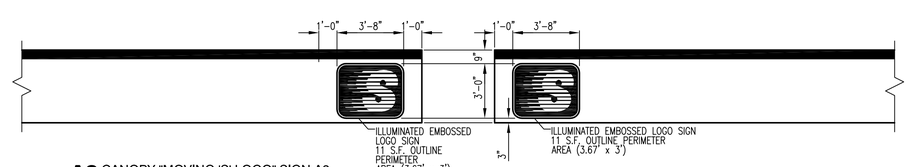
NOTE: NOT TO EXCEED THE MANUFACTURERS SPECIFICATION FOR LIGHTING LEVELS

C1 72 S.F. "SPEEDWAY" MONUMENT SIGN DETAIL
N.T.S.



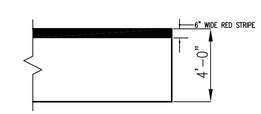
A1 CANOPY "SPEEDWAY" SIGN A1
N.T.S.

A2 CANOPY "SPEEDWAY" SIGN A2
N.T.S.



A3 CANOPY "MOVING 'S' LOGO" SIGN A3
N.T.S.

A4 CANOPY "MOVING 'S' LOGO" SIGN A4
N.T.S.



A5 CANOPY "SPEEDWAY" SIGN A5
N.T.S.

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Speedway®
Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PM/DP DATE	DESIGNER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
	DGNR / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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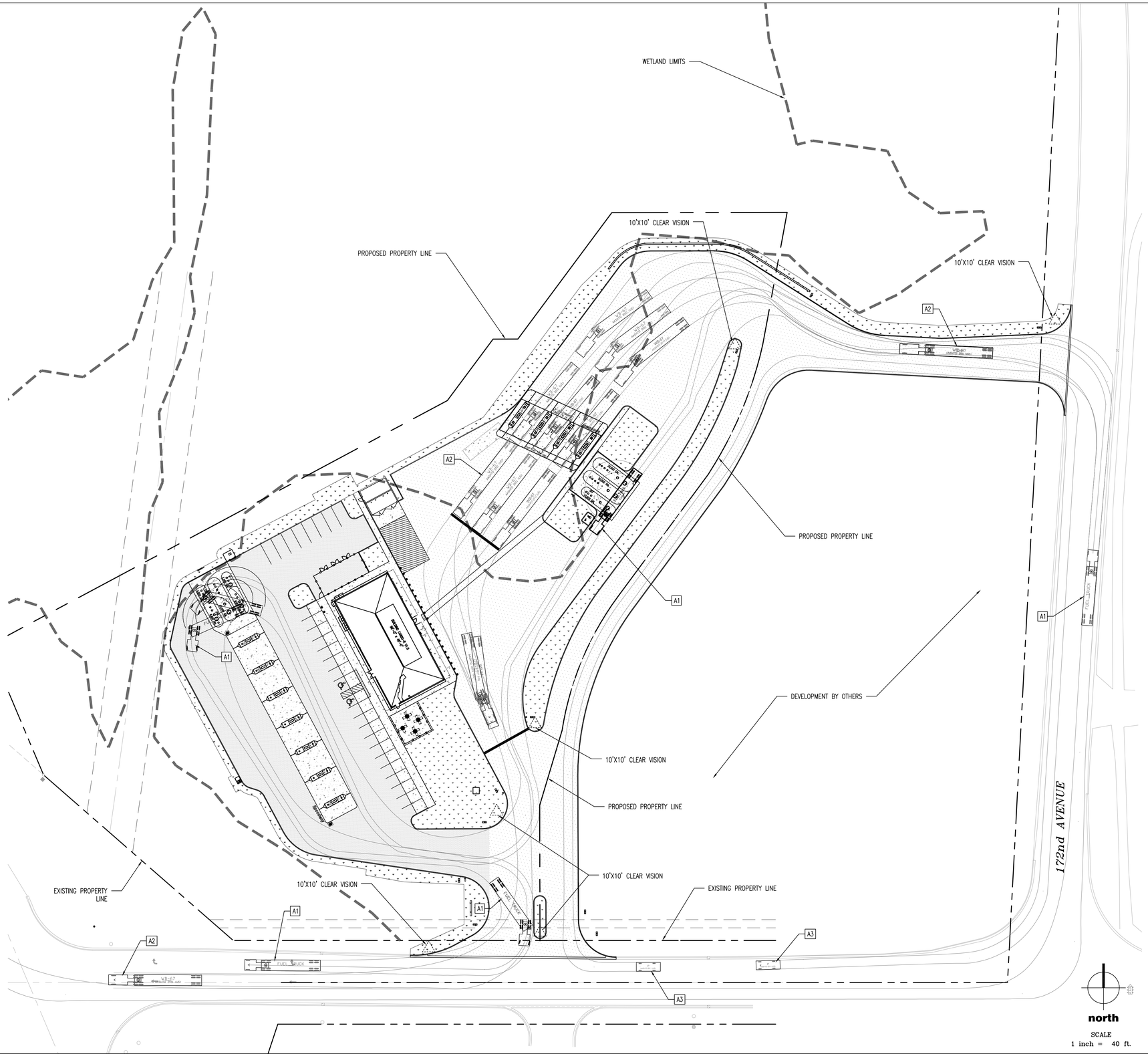
CANOPY STRIPING PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

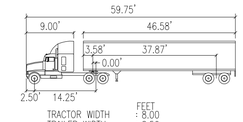
DESIGN TEAM		DATE
DGNR.	PARK	01/20/2015
PM./DP.	WLODYKA	01/20/2015
RVR./DP.	COUGHLIN	01/20/2015

DRWG. NO.
1830-SS1



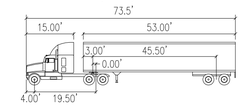
A. VEHICLE LEGEND

1. FUEL TRUCK



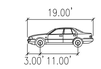
	FEET
TRACTOR WIDTH	: 8.00
TRAILER WIDTH	: 8.50
TRACTOR TRACK	: 8.00
TRAILER TRACK	: 8.50
LOCK TO LOCK TIME	: 6.0
STEERING ANGLE	: 26.0
ARTICULATING ANGLE	: 70.0

2. LARGE TRUCK (WB-67)



	FEET
TRACTOR WIDTH	: 8.00
TRAILER WIDTH	: 8.50
TRACTOR TRACK	: 8.00
TRAILER TRACK	: 8.50
LOCK TO LOCK TIME	: 6.0
STEERING ANGLE	: 28.4
ARTICULATING ANGLE	: 75.0

3. LARGE PASSENGER CAR



	FEET
WIDTH	: 7.00
TRACK	: 6.00
LOCK TO LOCK TIME	: 6.0
STEERING ANGLE	: 31.6

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Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PM/DP DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDOT REVIEW	11/19/14	11/19/14	11/19/14
	DGNR. / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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CIRCULATION PLAN
NEW BUILD

US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. 1830-CR

811 Know what's **below.** **Call** before you dig.

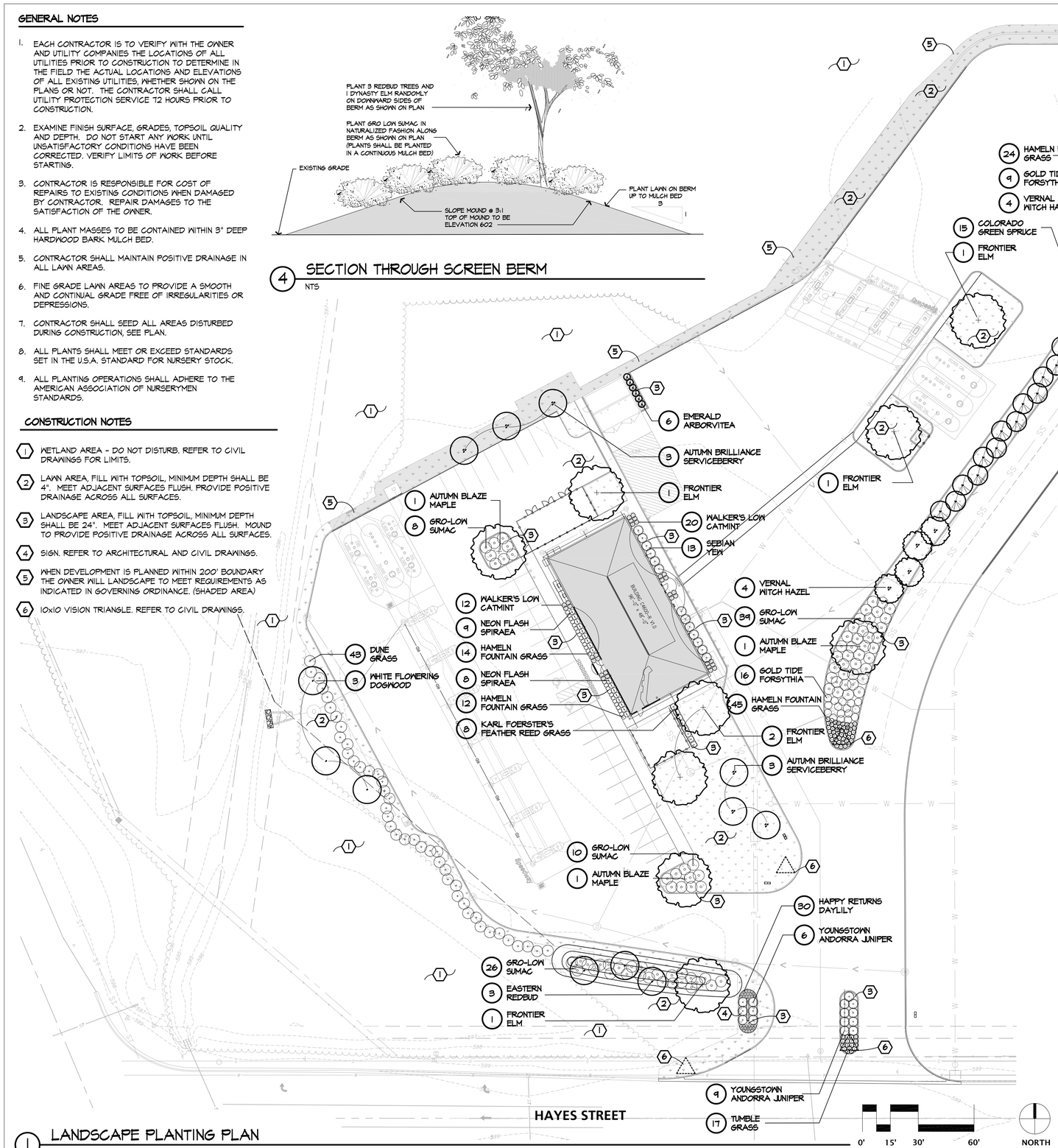
GENERAL NOTES

1. EACH CONTRACTOR IS TO VERIFY WITH THE OWNER AND UTILITY COMPANIES THE LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION TO DETERMINE IN THE FIELD THE ACTUAL LOCATIONS AND ELEVATIONS OF ALL EXISTING UTILITIES, WHETHER SHOWN ON THE PLANS OR NOT. THE CONTRACTOR SHALL CALL UTILITY PROTECTION SERVICE 72 HOURS PRIOR TO CONSTRUCTION.
2. EXAMINE FINISH SURFACE, GRADES, TOPSOIL QUALITY AND DEPTH. DO NOT START ANY WORK UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED. VERIFY LIMITS OF WORK BEFORE STARTING.
3. CONTRACTOR IS RESPONSIBLE FOR COST OF REPAIRS TO EXISTING CONDITIONS WHEN DAMAGED BY CONTRACTOR. REPAIR DAMAGES TO THE SATISFACTION OF THE OWNER.
4. ALL PLANT MASSES TO BE CONTAINED WITHIN 3" DEEP HARDWOOD BARK MULCH BED.
5. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE IN ALL LAWN AREAS.
6. FINE GRADE LAWN AREAS TO PROVIDE A SMOOTH AND CONTINUAL GRADE FREE OF IRREGULARITIES OR DEPRESSIONS.
7. CONTRACTOR SHALL SEED ALL AREAS DISTURBED DURING CONSTRUCTION, SEE PLAN.
8. ALL PLANTS SHALL MEET OR EXCEED STANDARDS SET IN THE U.S.A. STANDARD FOR NURSERY STOCK.
9. ALL PLANTING OPERATIONS SHALL ADHERE TO THE AMERICAN ASSOCIATION OF NURSERYMEN STANDARDS.

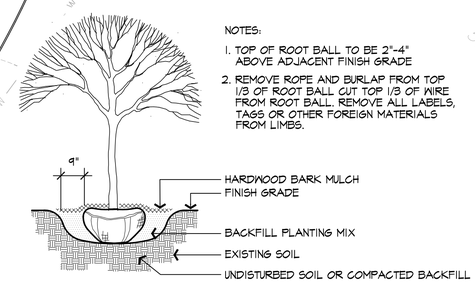
CONSTRUCTION NOTES

1. WETLAND AREA - DO NOT DISTURB. REFER TO CIVIL DRAWINGS FOR LIMITS.
2. LAWN AREA, FILL WITH TOPSOIL, MINIMUM DEPTH SHALL BE 4". MEET ADJACENT SURFACES FLUSH. PROVIDE POSITIVE DRAINAGE ACROSS ALL SURFACES.
3. LANDSCAPE AREA, FILL WITH TOPSOIL, MINIMUM DEPTH SHALL BE 24". MEET ADJACENT SURFACES FLUSH. MOUND TO PROVIDE POSITIVE DRAINAGE ACROSS ALL SURFACES.
4. SIGN. REFER TO ARCHITECTURAL AND CIVIL DRAWINGS.
5. WHEN DEVELOPMENT IS PLANNED WITHIN 200' BOUNDARY THE OWNER WILL LANDSCAPE TO MEET REQUIREMENTS AS INDICATED IN GOVERNING ORDINANCE. (SHADED AREA)
6. 10X10 VISION TRIANGLE. REFER TO CIVIL DRAWINGS.

4 SECTION THROUGH SCREEN BERM
NTS

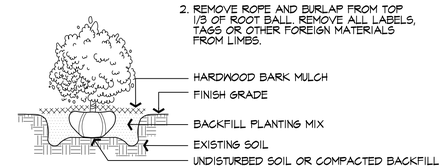


1 LANDSCAPE PLANTING PLAN
SCALE: 1" = 30'-0"



NOTES:
1. TOP OF ROOT BALL TO BE 2"-4" ABOVE ADJACENT FINISH GRADE
2. REMOVE ROPE AND BURLAP FROM TOP 1/3 OF ROOT BALL CUT TOP 1/3 OF WIRE FROM ROOT BALL. REMOVE ALL LABELS, TAGS OR OTHER FOREIGN MATERIALS FROM LIMBS.

2 TREE PLANTING
NTS



NOTES:
1. TOP OF ROOT BALL TO BE 2"-3" ABOVE ADJACENT FINISH GRADE
2. REMOVE ROPE AND BURLAP FROM TOP 1/3 OF ROOT BALL. REMOVE ALL LABELS, TAGS OR OTHER FOREIGN MATERIALS FROM LIMBS.

3 SHRUB PLANTING
NTS

PLANT MATERIALS LIST

COMMON NAME	BOTANICAL NAME	SIZE	ROOT	REMARKS
TREES				
AUTUMN BLAZE MAPLE	Acer x freemanii 'Jeffers Red'	3" Cal.	B&B	
FRONTIER ELM	Ulmus parvifolia 'Frontier'	3" Cal.	B&B	
WHITE FLOWERING DOGWOOD	Cornus florida	2" Cal.	B&B	
AUTUMN BRILLIANCE SERVICEBERRY	Amelanchier 'Autumn Brilliance'	7' Hgt.	B&B	MULTI-STEM
EASTERN REDBUD	Cercis canadensis	2" Cal.	B&B	SINGLE STEM
VERNAL WITCH HAZEL	Hamamelis vernalis	6' Hgt.	B&B	MULTI-STEM/FULL TO GROUND
COLORADO GREEN SPRUCE	Pica Pungens	6' Hgt.	B&B	FULL
SHRUBS				
EMERALD ARBORVITEA	Thuja occidentalis 'Emerald'	6' Hgt.	Cont.	
GRO LOW SUMAC	Rhus aromatica 'Gro Low'	24" Spr.	Cont.	
NEON FLASH SPIRAEA	Spiraea japonia 'Neon Flash'	15" Hgt.	Cont.	
SEBIAN YEW	Taxus media "Sebian'	24" Hgt.	B&B	
YOUNGSTOWN ANDORRA JUNIPER	Juniperus horizontalis 'Plumosa Compacta Youngstown'	18" Spr.	Cont.	
GOLD TIDE FORSYTHIA	Forsythia x intermedia 'Gold Tide'	15" Hgt.	Cont.	
PERENNIALS / GRASSES				
KARL FOERSTER' FEATHER REED GRASS	Calamagrostis x acutifolia 'Karl Ffoester'	2 Gal.	Cont.	
WALKER'S LOW CATMINT	Nepeta x faassenii 'Walker's Low'	1 Gal.	Clump	
HAPPY RETURNS DAYLILY	Hemerocallis 'Happy Returns'	1 Gal.	Cont.	
HAMELN FOUNTAIN GRASS	Pennisetum alopecuroides 'Hameln'	2 Gal.	Cont.	
DUNE GRASS	Ammophila breviligulata	2 Gal.	Cont.	

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LANDSCAPE ARCHITECT
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REGISTERED LANDSCAPE ARCHITECT

Speedway®

Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER INITIALS	DATE
1	ISSUED PLANNING COMMISSION		06/29/15

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LANDSCAPE PLAN
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	SHOWN IN PLAN

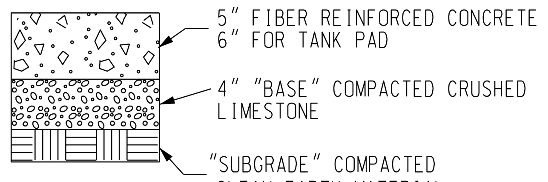
DESIGN TEAM		DATE
DGNR.	EDGE	05/21/2015
PM./DP.	WLODYKA	01/20/2015
RVR./DP.	COUGHLIN	01/20/2015

DRWG. NO. 1830-LA

CONCRETE PAVEMENT INSTALLATION AND MAINTENANCE

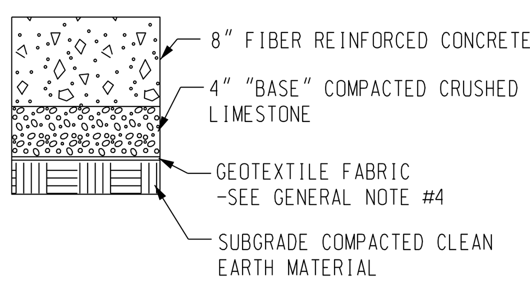
NORMAL STRENGTH PAVEMENT DETAIL

AUTO PARKING AREAS , AND
OTHER LIMITED SERVICE TRAFFIC AREAS



HIGH STRENGTH PAVEMENT DETAIL

HEAVY LOAD TRAFFIC AREAS



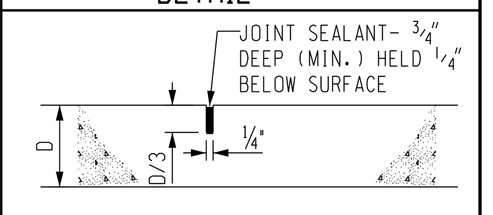
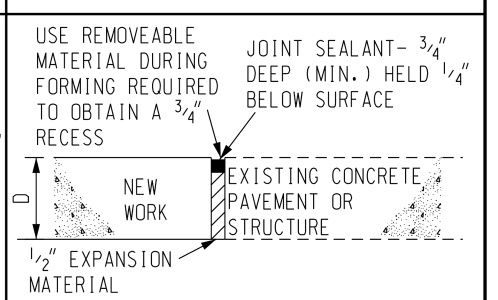
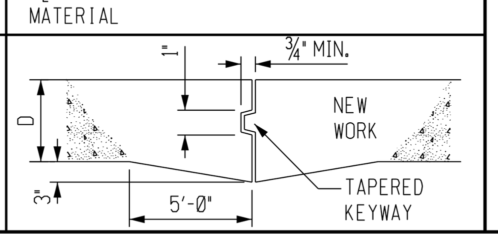
CONCRETE PAVING GENERAL NOTES:

1. ALL WORK SHALL BE IN CONFORMANCE WITH OWNER'S SPECIFICATIONS DIVISION 3 - CONCRETE.
2. SEE TANK AND PIPING DRAWINGS. FOR ADDITIONAL REQUIREMENTS FOR TANK SLABS.
3. SEE DRAWING #STD-PQ-5 FOR ADDITIONAL REQUIREMENTS FOR PUMP ISLAND SLABS.
4. GEOTEXTILE FABRIC (NEEDS TO BE DETERMINED BY OWNER'S REPRESENTATIVE) 8 OZ/SQ.YD., NON WOVEN NEEDLE PUNCHED FABRIC

CONCRETE PAVING MAINTENANCE NOTES:

1. CONTRACTOR SHALL REMOVE CONCRETE FROM FAILED AREA BY SAWCUTTING TO A DEPTH OF 1/4 THE ORIGINAL SLAB DEPTH AND REMOVING THE EXISTING CONCRETE. THE PATCH SHALL BE RECTANGULAR IN SHAPE AND SHALL EXTEND TO THE NEXT JOINT IF WITHIN 3'.
2. ANY JOINTS WHICH ARE REMOVED SHALL BE REPLACED IN THE SAME LOCATION AS THE OLD JOINTS - SEE JOINT DETAILS.
3. CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL DEBRIS PER LOCAL, STATE, AND FEDERAL REGULATIONS.
4. SEE NORMAL STRENGTH PAVEMENT, HIGH STRENGTH PAVEMENT DETAILS FOR FULL DEPTH PATCH REQUIRMENTS.

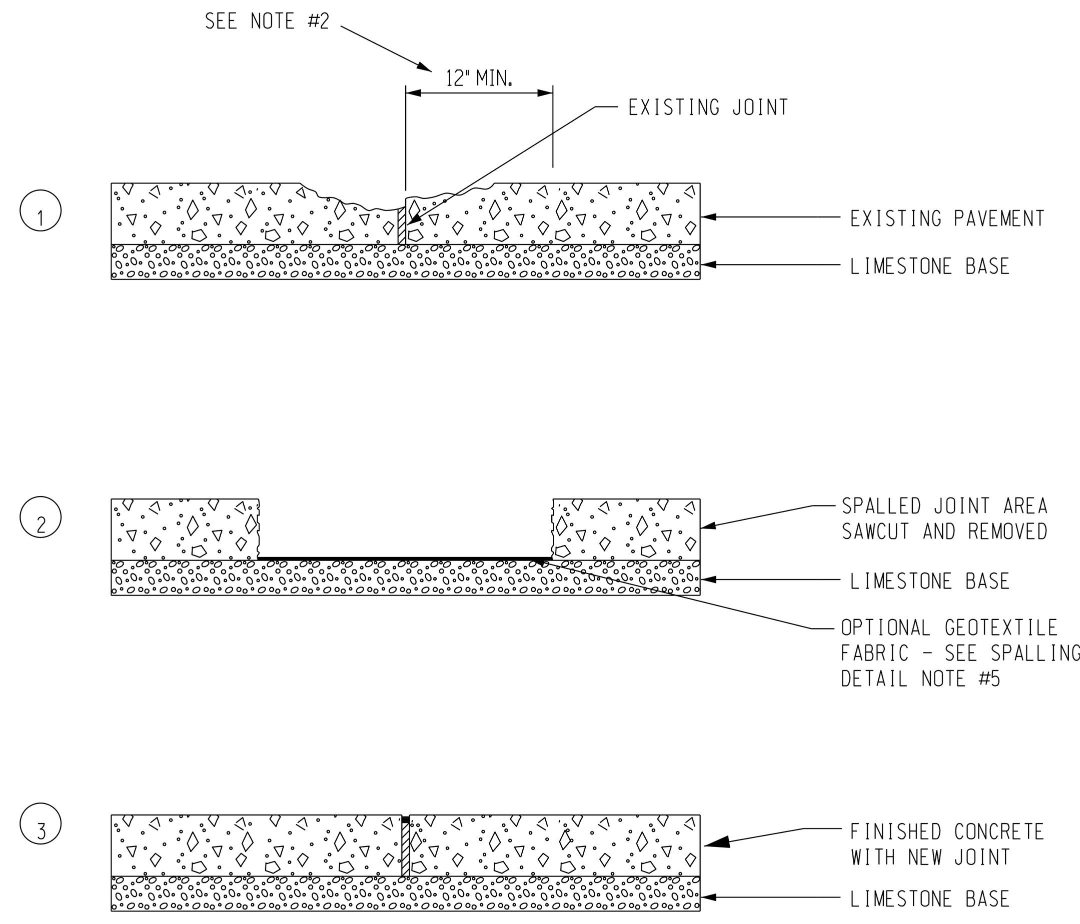
CONCRETE PAVEMENT JOINT DETAILS

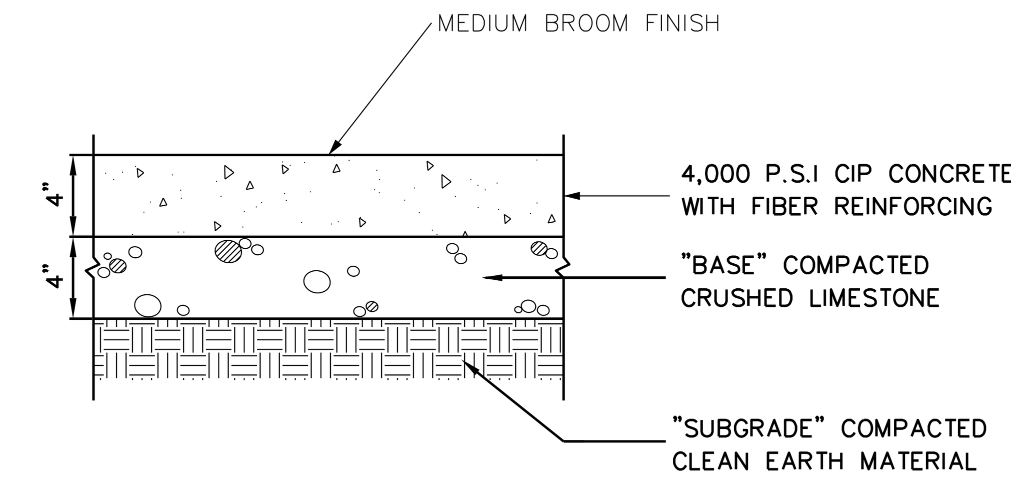
TYPE OF JOINT	USE DESCRIPTION	DETAIL
A. CONTROL JOINT 1. SAWN 2. PREMOLD STRIP 3. HAND FORMED AND SAWN AT CRITICAL JOINTS	PLACE JOINTS SO AS TO UNIFORMLY DIVIDE SLABS INTO NOMINAL 12' X 12' (NORMAL STRENGTH) OR 16' X 16' (HIGH STRENGTH) SECTIONS. (SEAL CONTROL JOINTS ONLY IF SPECIFIED ON DRAWINGS OR BY OWNER'S REPRESENTATIVE.)	
B. EXPANSION JOINT (ISOLATION JOINT)	PLACE AGAINST CONCRETE TANK SLAB, ABUTTING ROADWAY PAVEMENTS AND STRUCTURES (BUILDINGS, CANOPY COLUMNS, CATCH BASINS, ETC.)	
C. CONSTRUCTION JOINT	CONSTRUCTION JOINTS MUST BE APPROVED BY OWNER'S REPRESENTATIVE. PLACE WHEN CONTINUOUS POUR OPERATIONS ARE SUSPENDED FOR MORE THAN 30 MINUTES.	

SPALLING DETAIL

SPALLING DETAIL NOTES:

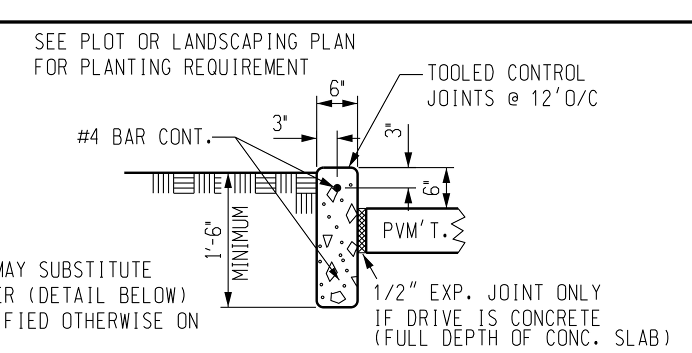
1. SPALLING ALONG JOINTS SHALL BE TREATED WITH REPAIR SIMILAR TO THAT OF A FULL DEPTH PATCH.
2. SPALLED CONCRETE SHALL BE REMOVED IN AN AREA NO LESS THAN ONE FOOT FROM THE JOINT BUT LARGE ENOUGH TO REMOVE ALL UNSOUND CONCRETE AND REMOVED TO A DEPTH GREAT ENOUGH TO REACH SUITABLE SUBGRADE.
3. THE CONCRETE SHALL BE REPLACED PER THE FULL DEPTH PATCH DETAIL AND MARATHON'S TERMINAL SPECIFICATIONS.
4. THE JOINT SHALL BE REPLACED PER THE JOINT DETAIL TO COINCIDE WITH THE LOCATION OF THE OLD JOINT. THE JOINT SHALL EXTEND THE FULL DEPTH OF THE NEW PATCH.
5. GEOTEXTILE FABRIC (NEEDS TO BE DETERMINED BY OWNER'S REPRESENTATIVE) 8 OZ/SQ YD NEEDLE PUNCHED NON WOVEN, NEEDLE PUNCHED FABRIC





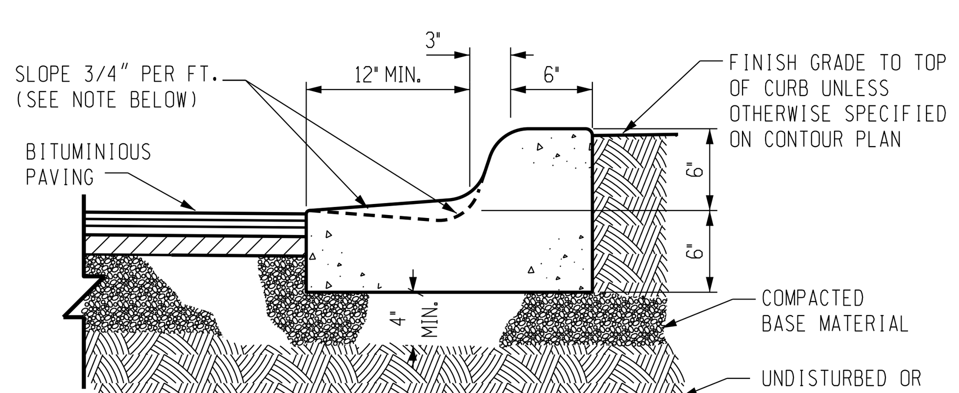
CONCRETE WALK PAVEMENT

CONCRETE CURBS



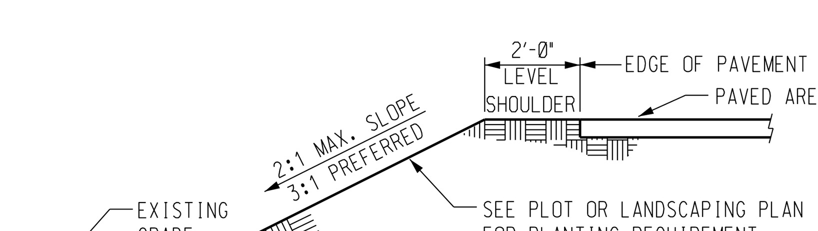
NOTE: CONTRACTOR MAY SUBSTITUTE CURB & GUTTER (DETAIL BELOW) UNLESS SPECIFIED OTHERWISE ON PLOT PLAN.

CAST-IN-PLACE CONCRETE CURB



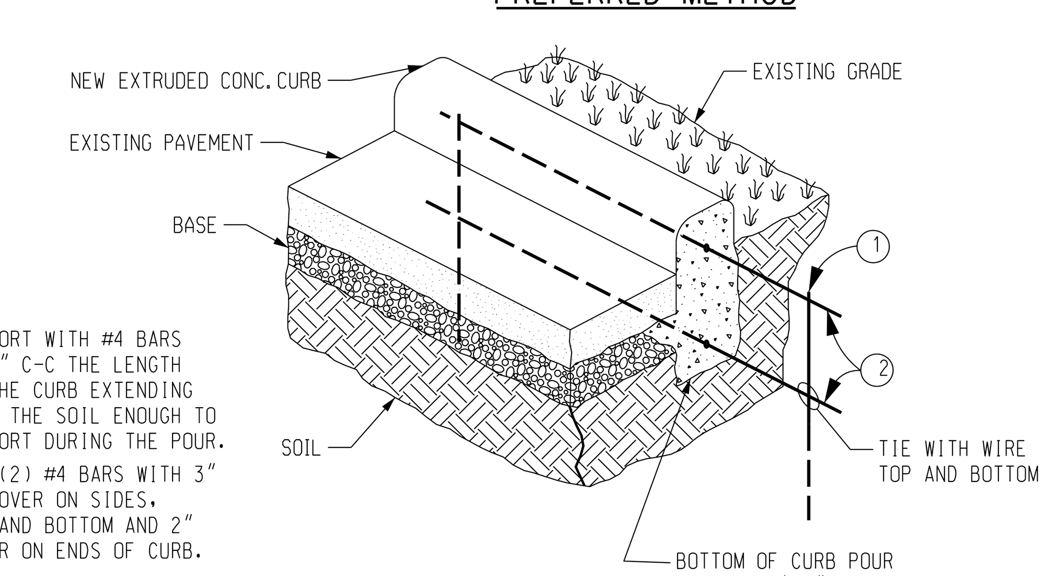
NOTE: GUTTER TO BE SLOPED DOWNGRADIENT TOWARDS CURB WHEN SITE GRADE IS TOWARDS CURB. GUTTER TO BE SLOPED DOWN GRADIENT AWAY FROM CURB WHEN SITE GRADE IS AWAY FROM CURB. MAY BE MACHINE FORMED.

CONCRETE CURB & GUTTER



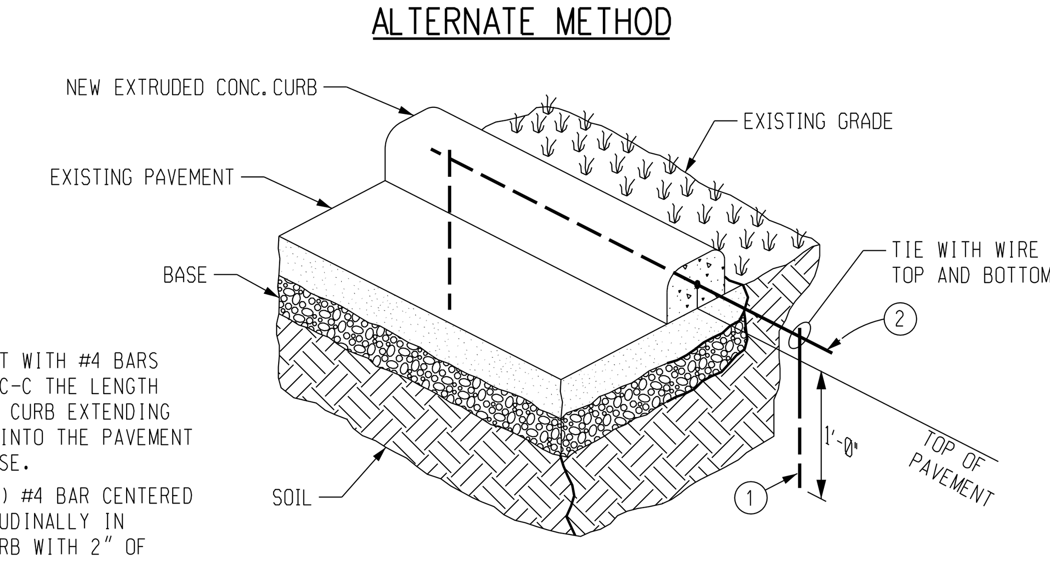
PAVEMENT BERM

PREFERRED METHOD



1 - SUPPORT WITH #4 BARS 4'-0" C-C THE LENGTH OF THE CURB EXTENDING INTO THE SOIL ENOUGH TO SUPPORT DURING THE POUR.
2 - USE (2) #4 BARS WITH 3" OF COVER ON SIDES, TOP AND BOTTOM AND 2" COVER ON ENDS OF CURB.

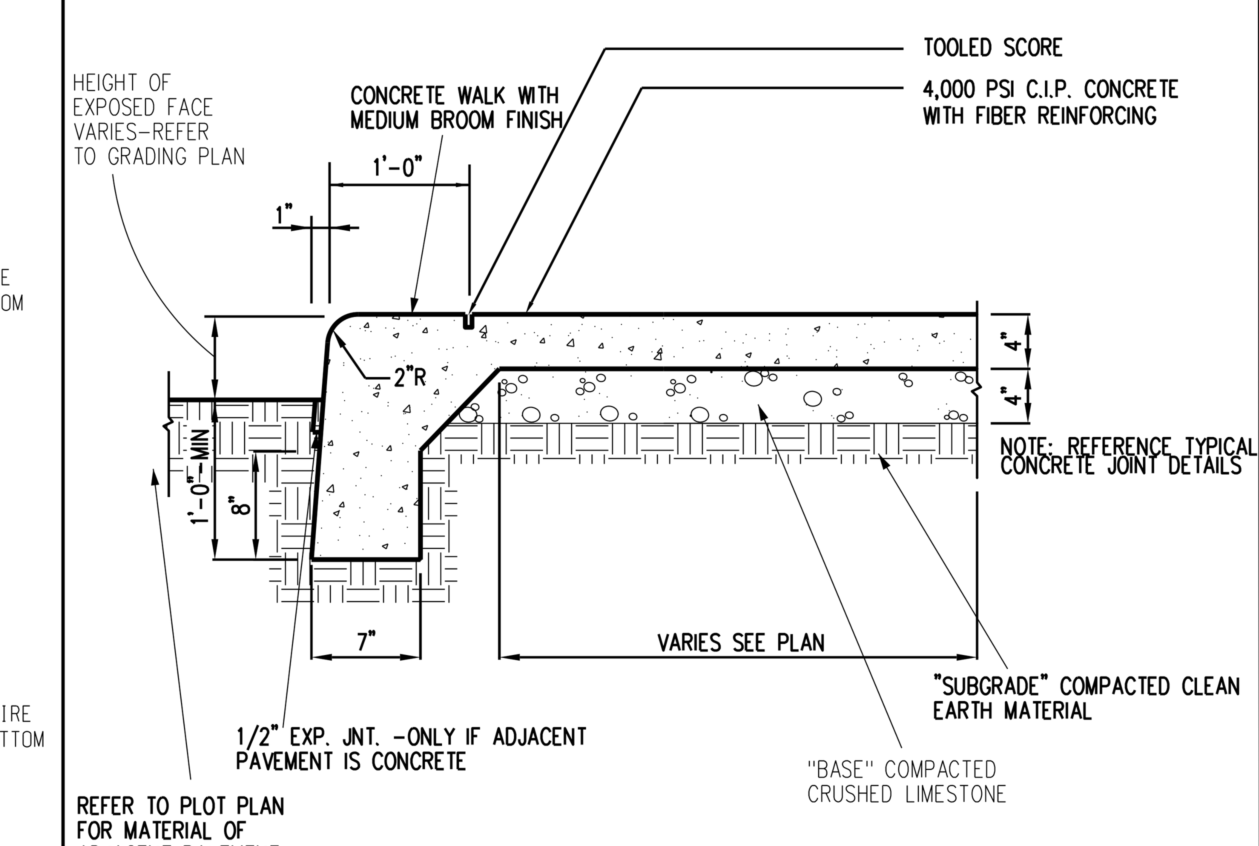
ALTERNATE METHOD



1 - SUPPORT WITH #4 BARS 4'-0" C-C THE LENGTH OF THE CURB EXTENDING 1'-0" INTO THE PAVEMENT AND BASE.
2 - USE (1) #4 BAR CENTERED LONGITUDINALLY IN THE CURB WITH 2" OF COVER ON ENDS OF CURB.

COLD WEATHER CURB INSTALLATION

FOR USE WHEN COLD WEATHER CONDITIONS CAUSE ASPHALT PAVEMENT TO BE PLACED BEFORE THE CONCRETE CURB.



INTEGRAL CURB AND WALK

NOTE: EXPOSED FACE OF CURB AND 4" WIDE STRIPE ATOP OF CURB ARE TO BE PAINTED WARNING YELLOW

ASPHALT PAVEMENT INSTALLATION AND MAINTENANCE

ASPHALT SEALING

1. SURFACE CLEANING:
   THE SURFACE TO BE SEALED SHALL BE FREE FROM DIRT AND OTHER FOREIGN MATTER. ANY ACCUMULATIONS OF OIL OR GREASE SHALL BE CLEANED OFF THE PAVEMENT WITH DETERGENT SOLUTION, THE RESIDUE OF WHICH SHALL BE THOUROUGHLY WASHED AWAY WITH CLEAN WATER BEFORE SEALANT IS APPLIED.
2. SEALING:
   THE SEAL COATING MATERIAL SHALL BE COMPRISED OF A RUBBERIZED COAL-TAR PITCH EMULSION AND SHALL MEET OR EXCEED FEDERAL SPECIFICATION R-P-355e. SUPPLIED IN CONCENTRATED FORM, IT SHALL BE DILUTED A MINIMUM OF 15% AND A MAXIMUM OF 25% WITH FRESH, CLEAN WATER. THE SEALANT MATERIAL SHALL CONTAIN 5-6 LBS. PER GALLON OF FINE, CLEAN, DRY SILICA SAND MEETING THE FOLLOWING GRADATION:

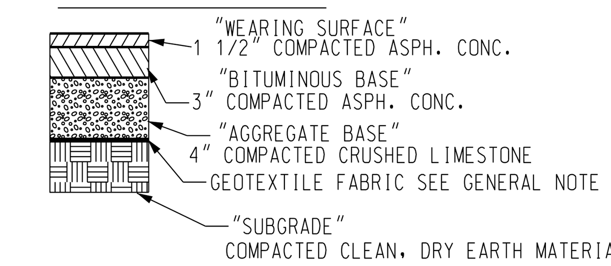
SIEVE SIZE	% PASSING
#16	100
#30	80-100
#50	10-60
#100	0-5

THE SEALANT SHALL BE APPLIED TO THE PAVEMENT IN TWO COATS AT THE RATE OF 0.08 TO 0.12 GALLONS PER SQUARE YARD. A LATEX ADDITIVE MAY ALSO BE ADDED TO THE SEALANT TO ALLOW FOR QUICKER DRYING TIME IN THOSE AREAS SPECIFIED BY OWNER'S REPRESENTATIVE.

NORMAL STRENGTH PAVEMENT

PARKING AREAS , AND OTHER LIMITED SERVICE TRAFFIC AREAS

GRANULAR BASE (PREFERRED)



ASPHALT PAVEMENT GENERAL NOTES:

1. ALL WORK SHALL BE IN CONFORMANCE WITH OWNER'S SPECIFICATIONS FOR ASPHALTIC CONCRETE PAVING.
2. GEOTEXTILE FABRIC (NEEDS TO BE DETERMINED BY OWNER'S REPRESENTATIVE) 8 OZ/SQ.YD., NON WOVEN, NEEDLE PUNCHED FABRIC.

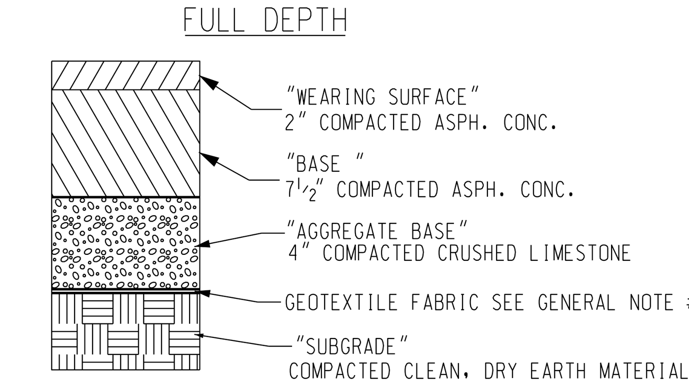
ASPHALT PAVEMENT MAINTENANCE NOTES:

1. CONTRACTOR SHALL REMOVE ASPHALT FROM FAILED AREA BY SAWCUTTING A RECTANGULAR SHAPE AT LEAST 3' BEYOND THE DAMAGED AREA. TWO OF THE EDGES MUST BE AT RIGHT ANGLES TO THE DIRECTION OF TRAFFIC.
2. SUBGRADE MUST BE REMOVED TO SOLID GROUND AND REPLACED IN ACCORDANCE WITH THE FULL DEPTH PATCH DETAIL AND OWNER'S SPECIFICATIONS.
3. CONTRACTOR IS RESPONSIBLE FOR DISPOSAL OF ALL DEBRIS PER LOCAL, STATE, AND FEDERAL REGULATIONS.

HIGH STRENGTH PAVEMENT

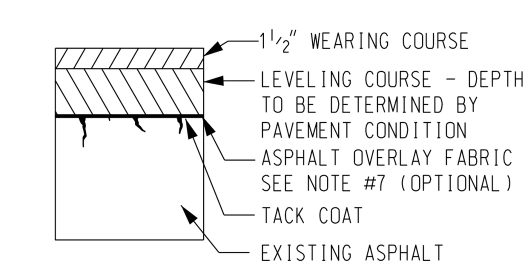
HEAVY LOAD TRAFFIC AREAS

FULL DEPTH

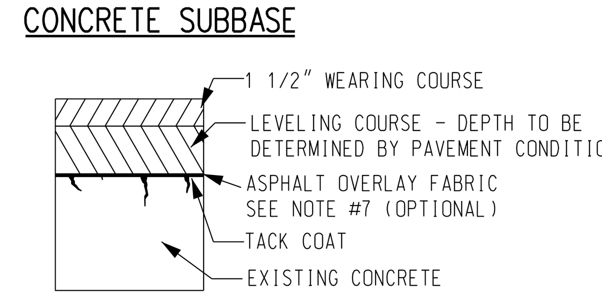


ASPHALT OVERLAY DETAIL

ASPHALT SUBBASE



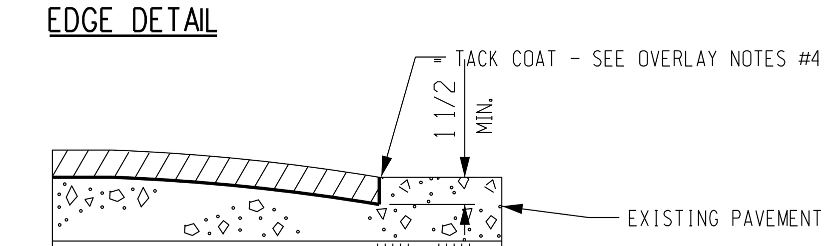
CONCRETE SUBBASE



DETAIL NOTES:

1. THE OVERLAY SHALL BE PLACED IN ACCORDANCE WITH MARATHON'S SPECIFICATIONS.
2. ALL FAILED AREAS SHALL BE REPAIRED WITH PROPER PATCHES BEFORE OVERLAY IS PLACED.
3. IF THE SURFACE IS DISTORTED, THE CONTRACTOR WILL CONSTRUCT LEVELING COURSES TO RESTORE PROPER LINE AND CROSS SECTION.
4. THE PAVEMENT SHALL BE THOUROUGHLY CLEANED AND A TACK COAT OF ASPHALT SHALL BE APPLIED BEFORE THE OVERLAY IS PLACED.
5. ALL VERTICAL SURFACES COMING IN CONTACT WITH THE OVERLAY SHALL BE SPRAYED OR PAINTED WITH A UNIFORM COATING OF EMULSIFIED ASPHALT IMMEDIATELY PRIOR TO PAVEMENT CONSTRUCTION.
6. CONTRACTOR IS RESPONSIBLE FOR ENSURING PROPER SURFACE DRAINAGE. PONDING OR PUDDLING OF WATER ON THE FINAL SURFACE WILL BE UNACCEPTABLE.
7. OPTIONAL ASPHALT OVERLAY FABRIC, DETERMINED BY ENGINEER, SHALL BE AMOPAVE NONWOVEN CONSTRUCTION FABRIC.

EDGE DETAIL



WHERE OVERLAY IS NOT SPECIFIED FOR ENTIRE EXISTING SURFACE, THE INTERFACE BETWEEN THE NEW OVERLAY AND THE OLD PAVEMENT SURFACE SHALL BE PER THE ABOVE DETAIL. FEATHERING OF THE ASPHALT TO MEET THE EXISTING PAVEMENT WILL NOT BE ACCEPTABLE.

Speedway®
Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

REVISIONS

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
1.	ADDED STONE BASE TO NORMAL STRENGTH CONCRETE PAVEMENT DETAIL	SJH 12-13-11		NRH 12-13-11
2.	CHANGES TO STD NOTE PER OWNERS REQUEST	J.R.J. 04-15-13		J.D. 04-15-13
3.	REMOVED ALTERNATE #1 FROM NORMAL STRENGTH PAVEMENT	R.C.T. 05-21-14		J.T.C. 05-21-14

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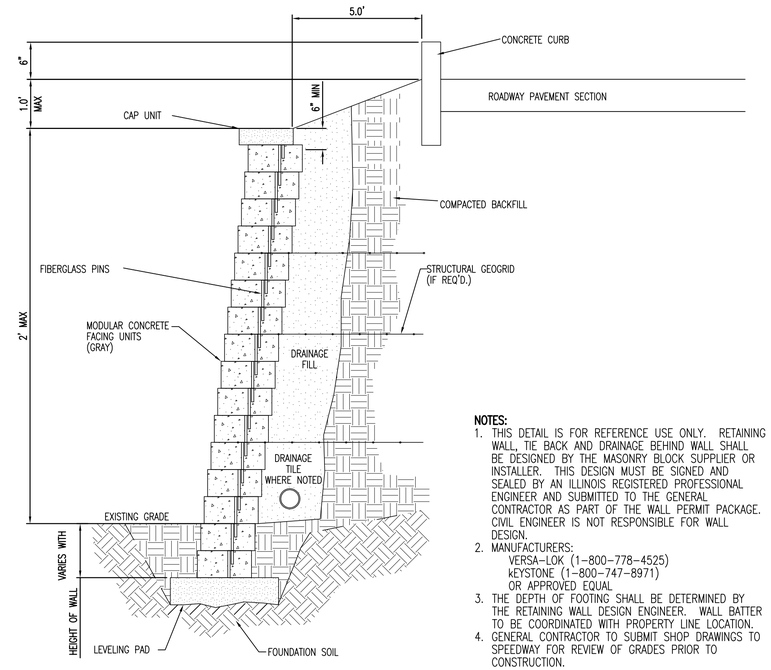
PAVEMENT & CURBING DETAILS

STORE OR BLDG NO.		
VERSION OR PROJECT ID		
SCALE 0	AS SHOWN	
DESIGN TEAM		DATE
DGNR.	K.SPRINGER	11-2-04
P.MGR.	L.D.LOCKE	11-2-04
RVWR.	F.T.PLEASANTS	11-2-04
DRWG. NO.	STD-CP-1	

$SYTIME$..SYSNMEME
$DGN-SPEC$..$DGN-SPEC$..$DGN-SPEC$..$DGN-SPEC$

ORNAMENTAL STEEL FENCE



NOTES:

1. THIS DETAIL IS FOR REFERENCE USE ONLY. RETAINING WALL, TIE BACK AND DRAINAGE BEHIND WALL SHALL BE DESIGNED BY THE MASONRY BLOCK SUPPLIER OR INSTALLER. THIS DESIGN MUST BE SIGNED AND SEALED BY AN ILLINOIS REGISTERED PROFESSIONAL ENGINEER AND SUBMITTED TO THE GENERAL CONTRACTOR AS PART OF THE WALL PERMIT PACKAGE. CIVIL ENGINEER IS NOT RESPONSIBLE FOR WALL DESIGN.
2. MANUFACTURERS:
   VERSA-LOK (1-800-778-4525)
   KEYSTONE (1-800-747-8971)
   OR APPROVED EQUAL
3. THE DEPTH OF FOOTING SHALL BE DETERMINED BY THE RETAINING WALL DESIGN ENGINEER. WALL BATTER TO BE COORDINATED WITH PROPERTY LINE LOCATION.
4. GENERAL CONTRACTOR TO SUBMIT SHOP DRAWINGS TO SPEEDWAY FOR REVIEW OF GRADES PRIOR TO CONSTRUCTION.

CONCRETE MODULAR BLOCK RETAINING WALL

exp U.S. Services Inc.
t: +1.614.764.4300 | f: +1.614.744.4350
150 E. Gay Street
Suite 1510
Columbus, OH 43215
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Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	DESIGNER DATE
1	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
2	REVISED PLAN PER NRCD REVIEW	11/19/14	11/19/14	11/19/14
3	DGNR / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
4	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
5	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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RETAINING WALL AND FENCE DETAILS

NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO. 1830

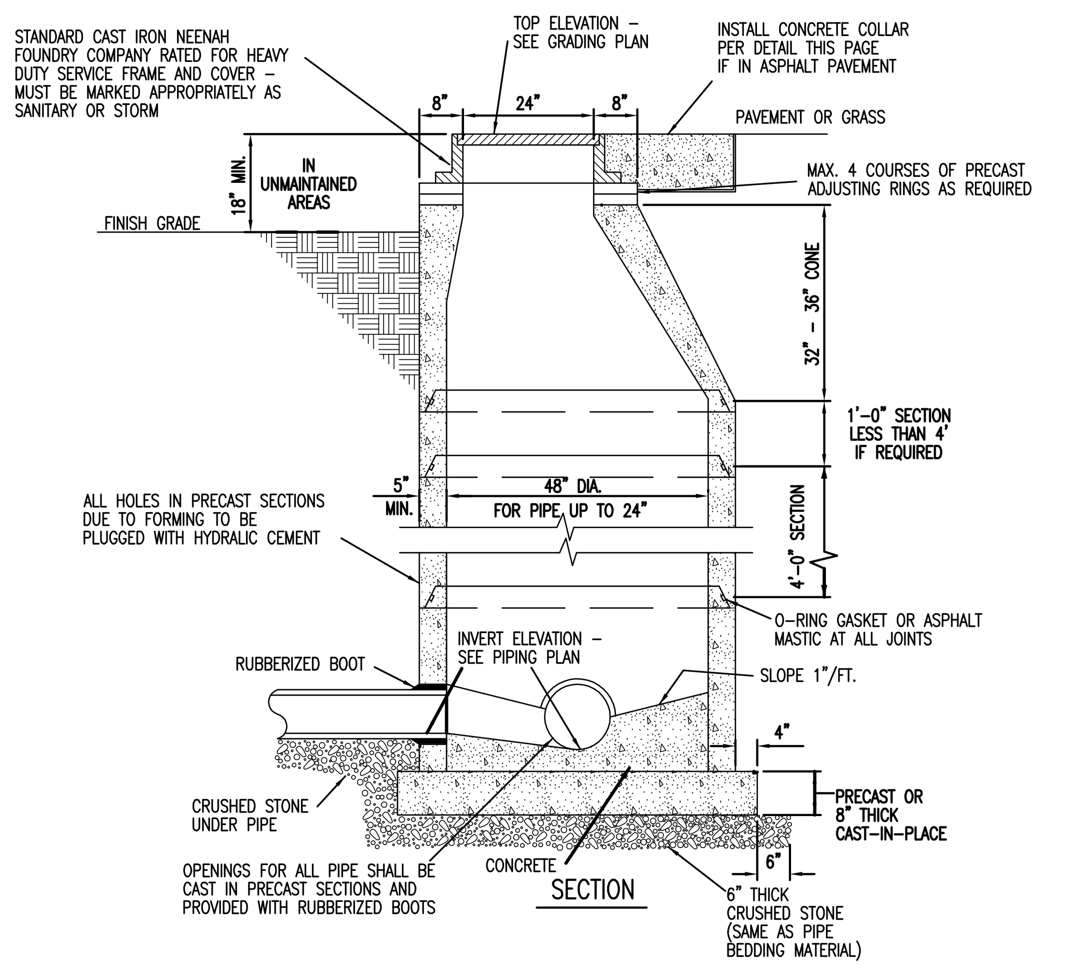
VERSION OR AFE NO. 72526

SCALE AS NOTED

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

DRWG. NO. STD-CP-2

DRAINAGE & UTILITY DETAILS



1. MANHOLES SHOWN ON THE PLOT OR PIPING PLAN SHALL BE PRECAST CONCRETE AND CONSTRUCTED OF MATERIALS AND IN A MANNER MEETING THE SPECIFICATIONS OF ASTM C–478 AND THE PUBLIC AUTHORITY HAVING JURISDICTION.
2. SEE GRADING AND/OR PIPING PLAN FOR TOP AND INVERT ELEVATIONS, SIZE AND ARRANGEMENT OF INLET/OUTLET PIPING.
3. ADDITIONAL MASONRY BRICK OR BLOCK WORK IS NOT PERMITTED TO MEET SURFACE ELEVATION.

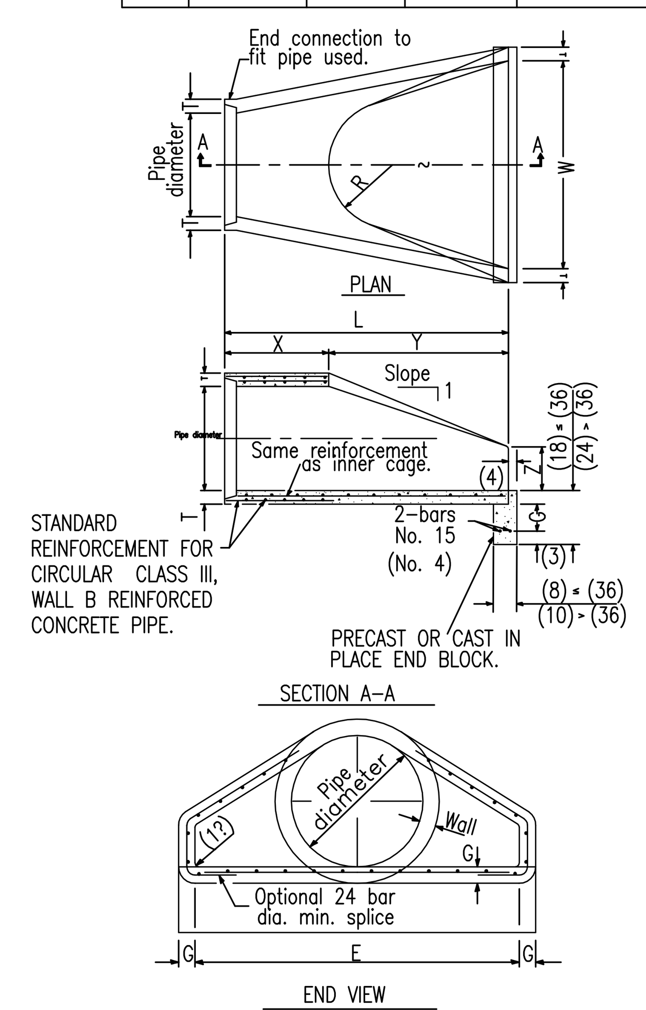
FOR SANITARY SEWERS ONLY

4. THE BOTTOM OF THE MANHOLE SHALL BE CONTOURED WITH CONCRETE TO CHANNEL THE FLOW THROUGH THE MANHOLE.
5. WHEN SPECIFIED ON THE PLANS, AN EXTERIOR "DROP" MANHOLE SHALL BE CONSTRUCTED PER LOCAL SPECIFICATIONS.

STANDARD MANHOLE

SCALE: NOT TO SCALE

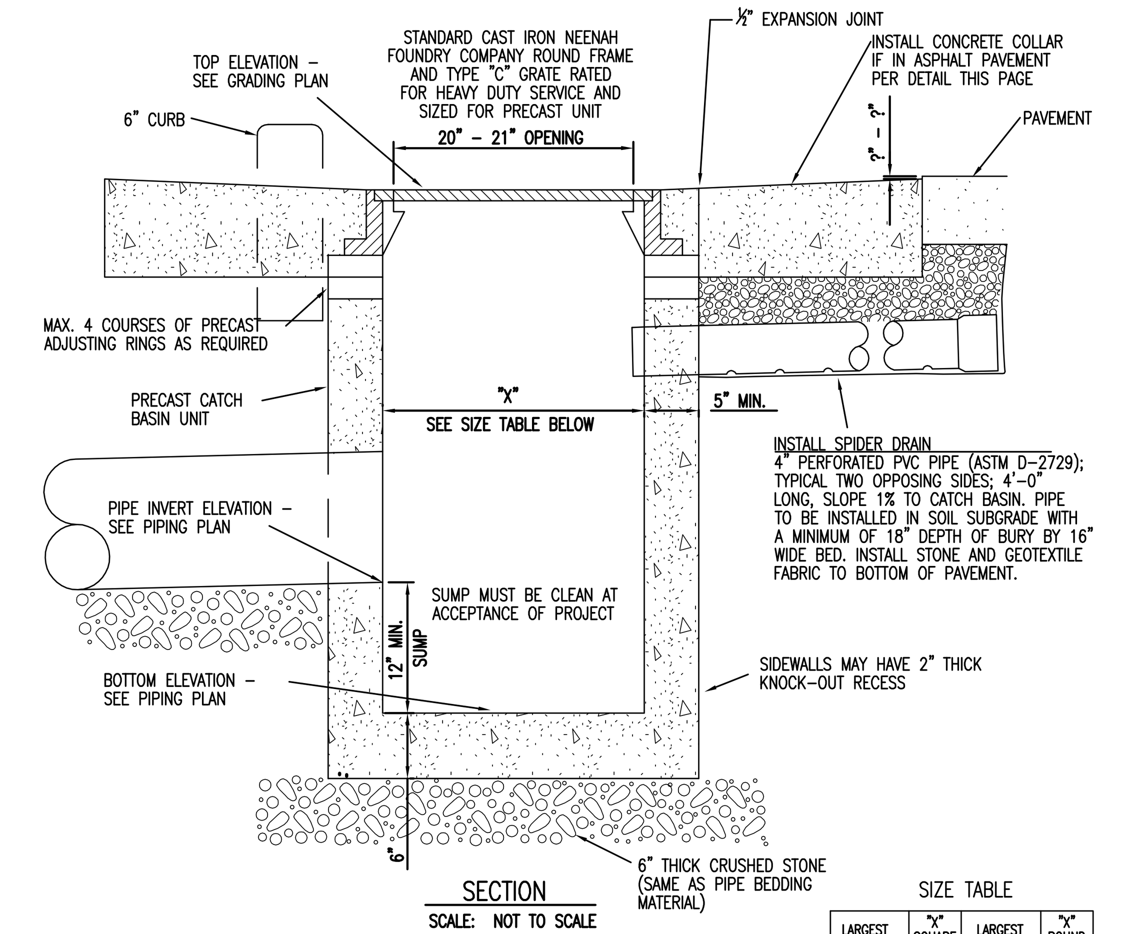
PIPE DIA.	APPROX. QTY. (lbs)	Z	Y	X	L	W	T	R	APPROX. SLOPE
12"	530	4"	2'–0"	4'–0 7/8"	6'–0 7/8"	2'–0"	2"	9"	1:3



1. CONCRETE FOR FLARED END SECTIONS AND REINFORCEMENT IN THE AREA DIMENSIONED AS "X" SHALL CONFIRM TO THE APPLICABLE REQUIREMENTS OF A.A.S.H.T.O. DESIGNATION M170, M207, FOR CLASS 2 PIPE.
2. IN ADDITION TO THE REINFORCING BARS SHOWN, REINFORCEMENT IN THE AREA DIMENSIONED AS "Y" SHALL HAVE A CROSS–SECTIONAL AREA EQUAL TO THAT OF ONE LAYER OF STEEL IN THE AREA DIMENSIONED AS "X".
3. ALL STEEL SHALL CONFIRM TO THE REQUIREMENTS OF A.S.T.M. A575 GRADE 1020 STEEL.
4. THREE SEPARATE COATS OF PAINT SHALL BE APPLIED TO ALL UNGALVANIZED STEEL MATERIAL. THE FIRST TWO COATS SHALL BE INORGANIC ZINC RICH PRIMER AND THE THIRD COAT SHALL BE HI–BUILD VINYL GREEN BRIDGE PAINT. BOTH THE INORGANIC ZINC PRIMER AND THE VINYL TOPCOAT SHALL BE APPLIED SO EACH COAT WILL PROVIDE AN AVERAGE DRY FILM THICKNESS OF AT LEAST 3 MILS. MINIMUM DRY FILM THICKNESS MEASURED AT ANY POINT FOR EACH COAT SHALL BE 2.5 MILS. ALL PAINTING MAY BE DONE IN THE SHOP, UNLESS OTHERWISE SPECIFIED. BARS AND PLATES MAY BE GALVANIZED OR PAINTED.
5. GALVANIZATION SHALL BE IN ACCORDANCE WITH A.S.T.M. A123.

FLARED END SECTION

SCALE: NOT TO SCALE



SIZE TABLE

LARGEST PIPE DIA.	"X" SQUARE C.B.	LARGEST PIPE DIA.	"X" ROUND C.B.
21"	24"	15"	30"
33"	36"	24"	42"
42"	48"	30"	48"
54"	60"	36"	60"
72"	72"	48"	72"

NOTE: TRAFFIC RATED REINFORCED PRE–CAST CONCRETE TOP TO BE USED WITH LARGER CATCH BASINS.

- THE PRECAST CATCH BASIN UNIT SHALL CONFORM TO THE APPLICABLE STANDARD STATE D.O.T. SPECIFICATIONS. THE UNIT SHALL BE PROPERLY REINFORCED TO PREVENT DAMAGE DURING TRANSPORT AND INSTALLATION.
- SEE GRADING AND/OR PIPING PLAN FOR TOP, INVERT, AND BOTTOM ELEVATIONS, SIZE, AND ARRANGEMENT OF INLET/OUTLET PIPING.
- MORTAR ALL INLET, OUTLET PIPE OPENINGS WITH HYDRAULIC CEMENT GROUT.
- ADDITIONAL MASONRY BRICK OR BLOCK WORK IS NOT PERMITTED TO MEET SURFACE ELEVATION.

STANDARD DUTY CATCH BASIN

TO BE USED IN NORMAL STRENGTH PAVEMENT AREAS ONLY

GEOTEXTILE FABRIC SPECIFICATIONS

8 OZ. NONWOVEN NEEDLE PUNCHED FABRIC; AMOCO 4553, PHILLIPS SUPAC 8NP, OR EQUAL

GENERAL NOTES:

1. ALL STORM AND SANITARY PIPING SHALL BE THE SIZE AND TYPE SHOWN ON THE GRADING OR PIPING PLAN, AND SHALL CONFORM TO THE ASTM AND AASHTO STANDARD SPECIFICATIONS LISTED HERE, UNLESS OTHERWISE REQUIRED BY GOVERNING AUTHORITIES.
2. CONTRACTOR SHALL COMPLY WITH ALL REQUIREMENTS OF DIVISION 15 OF MARATHON PETROLEUM'S STANDARD SPECIFICATIONS.
3. CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES PRIOR TO STARTING ANY BELOW GRADE WORK TO LOCATE UNDERGROUND FACILITIES.
4. ALL SANITARY SEWERS SHALL HAVE "PREMIUM" SEALED JOINTS. STORM SEWERS WITHIN 20' OF HYDROCARBON PRODUCT PIPING OR UNDERGROUND TANKS SHALL HAVE "PREMIUM SEALED JOINTS.
5. THE PIPE INVERT SHALL BE STRAIGHT LINE GRADED BETWEEN ELEVATIONS SHOWN ON THE PLAN.
6. PIPE SHALL BE LAID FROM THE LOWER ELEVATION TO THE HIGHER ELEVATION.
7. CONTRACTOR SHALL VERIFY EXISTING ELEVATIONS PRIOR TO BEGINING WORK. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER'S REPRESENTATIVE.
8. PIPING TO BE MIN. 6" BELOW PAVEMENT THICKNESS (INCLUDING BASE).
9. SEE DRAWING # STD–SB–1 FOR CANOPY DOWNSPOUT DRAIN DETAILS.

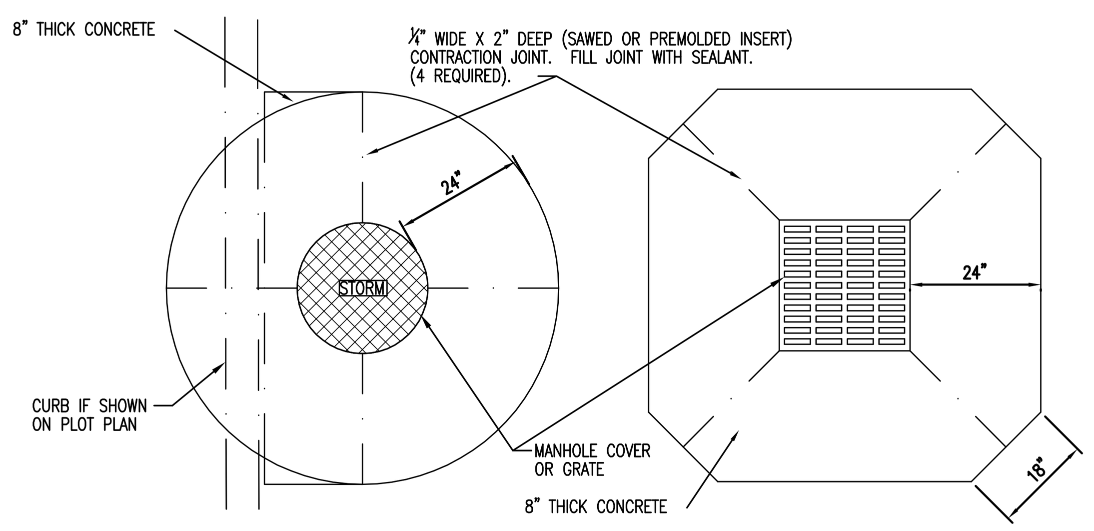
MINIMUM DEPTH OF BURY:

(SEE NOTE #8)

PVC ———————— 18"
RCP ———————— 15"
HDPE ———————— 12"

PIPE SLOPES

Pipe Diameter (Inches)	MINIMUM PIPE SLOPES (%) TYPE OF PIPE and "n" VALUES: POLY–VYNYL CHLORIDE (PVC) 0.010	SMOOTH LINED CORRUGATED HDPE 0.012	REINFORCED CONCRETE (RCP) & DUCTILE IRON (DIP) 0.013	MAXIMUM PIPE SLOPES (%) TYPE OF PIPE and "n" VALUES: POLY–VYNYL CHLORIDE (PVC) 0.010	SMOOTH LINED CORRUGATED HDPE 0.012	REINFORCED CONCRETE (RCP) & DUCTILE IRON (DIP) 0.013
4	0.81	1.44	1.69	8.98	15.96	18.73
6	0.47	0.84	0.98	5.23	9.30	10.91
8	0.32	0.57	0.67	3.56	6.33	7.43
10	0.24	0.42	0.50	2.65	4.70	5.52
12	0.19	0.33	0.39	2.08	3.69	4.33
15	0.14	0.25	0.29	1.54	2.74	3.22
18	0.11	0.19	0.23	1.21	2.15	2.52
21	0.09	0.16	0.18	0.98	1.75	2.05
24	0.07	0.13	0.15	0.82	1.46	1.72
27	0.06	0.11	0.13	0.70	1.25	1.47
30	0.06	0.10	0.11	0.61	1.09	1.28
36	0.04	0.08	0.09	0.48	0.85	1.00
48	0.03	0.05	0.06	0.33	0.58	0.68
60	0.02	0.04	0.05	0.24	0.43	0.51



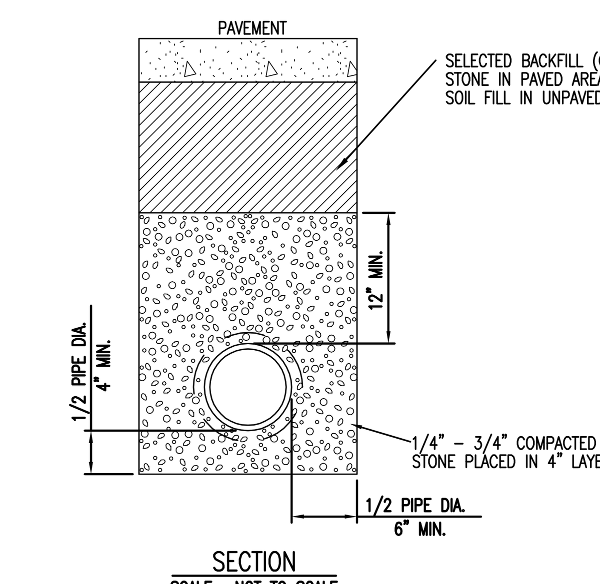
NOTE: TO BE USED WHEN MANHOLE OR CATCH BASIN CASTING OCCURS IN ASPHALT PAVEMENT.

CONCRETE COLLAR – ROUND GRATE & FRAME

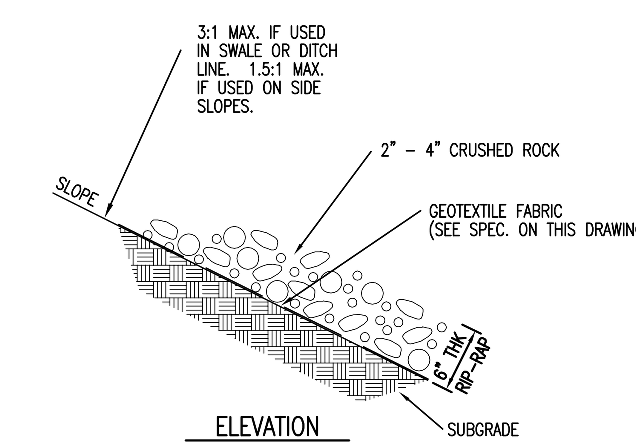
SCALE: NOT TO SCALE

CONCRETE COLLAR – SQUARE GRATE & FRAME

SCALE: NOT TO SCALE

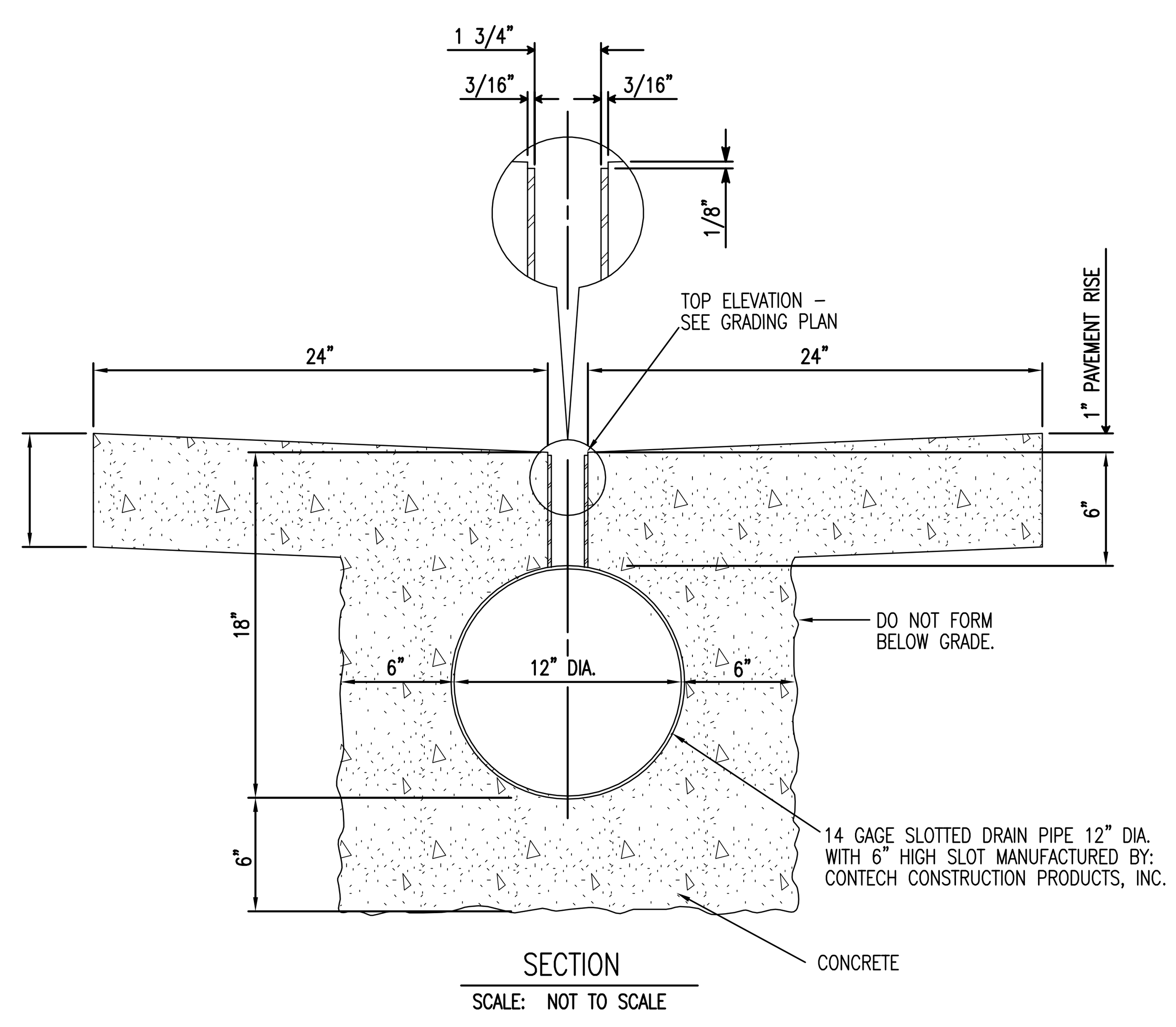


PIPE BEDDING

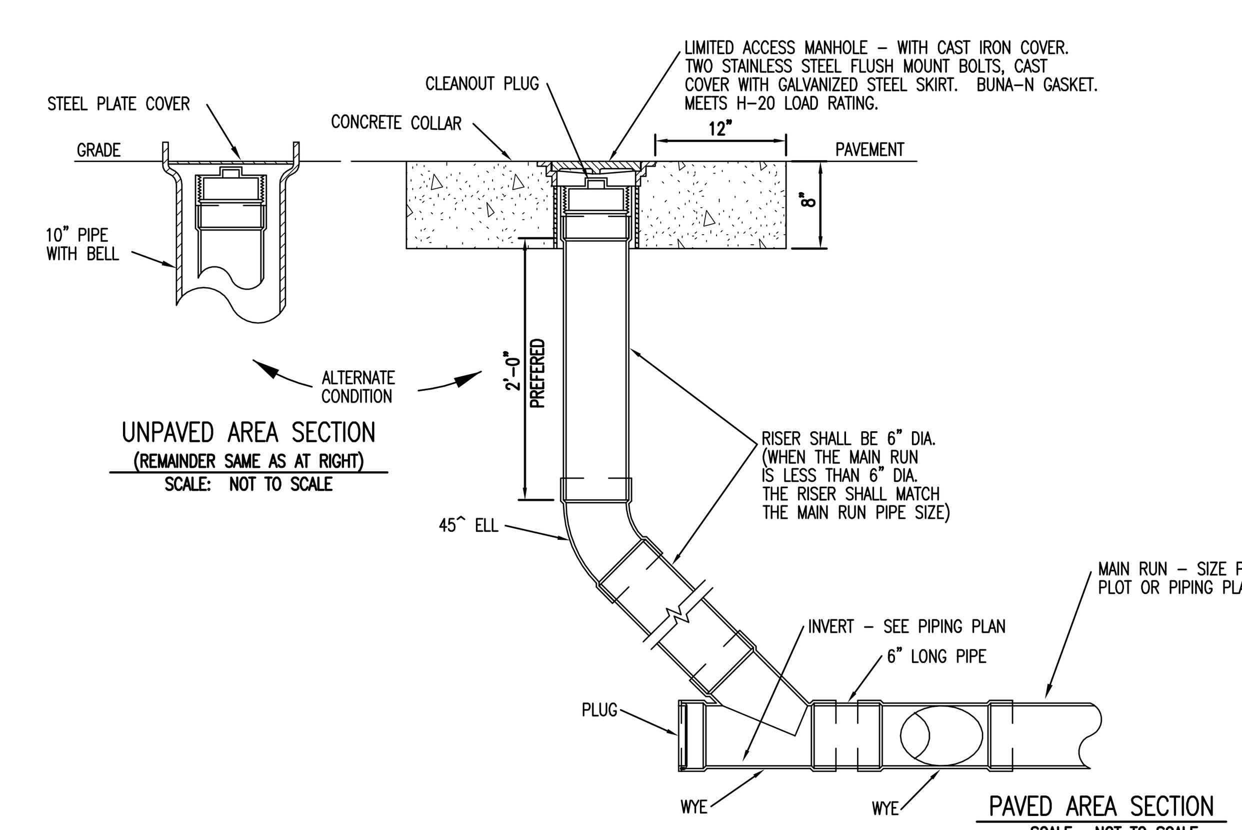


NOTE:
AT PIPE OUTLETS RIP–RAP SIZE 4–6" SHALL BE PLACED 12" THICK AS SHOWN ON THE PLANS. A GEOTEXTILE FABRIC SHALL BE PLACED PRIOR TO PLACING THE RIP–RAP.

RIP–RAP SPECIFICATIONS



SLOTTED DRAIN



UTILITIES PIPE CLEAN–OUT

PIPE SPECIFICATIONS

TYPE OF PIPE	"n" VALUES	SIZES PERMITTED	SEVICE AND USE	PIPE SPECIFICATION	INSTALLATION SPECIFICATION	JOINT SPECIFICATION	PREMIUM JOINTS (SEE NOTE #4)
POLY–VINYL CHLORIDE (PVC)	0.01	4" – 6"	SANITARY SEWER	ASTM D–3034 SDR 35 STANDARD SPECIFICATION FOR TYPE PSM PVC SEWER PIPE AND FITTINGS	ASTM D–2321 STANDARD PRACTICE FOR INSTALLATION OF FLEXIBLE THERMOPLASTIC SEWER PIPE CLASS I BEDDING FOR PAVED AREAS	ASTM D–3212 STANDARD SPECIFICATION FOR JOINTS FOR DRAIN AND SEWER PLASTIC PIPES USING FLEXIBLE ELASTOMERIC SEALS	ASTM F–477 ELASTOMERIC SEALS FOR JOINING PLASTIC PIPE (OIL RESISTANT) HIGH NITRILE (NBR), EPICHLOROHYDRIN (ECO), NEOPRENE (CR), POLYSULFIDE (T), OR FLUORO ELASTOMER (FPM)
		8" – 12"	STORM DRAINAGE				
REINFORCED CONCRETE (RCP)	0.013	12" DIA. AND LARGER	STORM DRAINAGE	ASTM C–76 CLASS 3, WALL B– TONGUE AND GROOVE STANDARD SPECIFICATION FOR REINFORCED CONCRETE CULVERT, STORM DRAIN, AND SEWER PIPE	CLASS B BEDDING FOR PAVED AREAS WHEN OUTLETTING TO SURFACE GRADE FLARED END SECTION MUST BE USED	BITUMINOUS MASTIC	ASTM C–443 STANDARD SPECIFICATION FOR JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE, USING RUBBER GASKETS (OIL RESISTANT)
SMOOTH LINED CORRUGATED HDPE N–12 BY ADVANCED DRAINAGE SYSTEMS (800) 733–9554	0.012	8" AND LARGER	STORM DRAINAGE	AASHTO M294–S	ASTM D–2321 CLASS 1 BEDDING FOR PAVED AREAS	STANDARD COUPLERS (PRO LINK) USE GASKET IN FINE SOILS	PVC DOUBLE BELL COUPLER WITH GASKET (PRO LINK 10.8) AVAILABLE THROUGH 24"
SMOOTH LINED CORRUGATED HDPE SURE–LOK BY HANCOR (800) 537–9520	0.012	12" AND LARGER	STORM DRAINAGE	AASHTO M294–S	ASTM D–2321 CLASS 1 BEDDING FOR PAVED AREAS	BELL & SPIGOT WITH GASKET (SURE–LOK)	BELL & SPIGOT WITH POLYISOPRENE GASKET (SURE–LOK 10.8) AVAILABLE THROUGH 30"
DUCTILE IRON (DI)	0.012	4" – 12"	SPECIAL	ASTM A–746 CLASS 50 STANDARD SPECIFICATION FOR DUCTILE IRON GRAVITY SEWER PIPE	TYPE 5 BEDDING FOR PAVED AREAS	RUBBER GASKET COMPRESSION TYPE JOINT	GASKET TO BE OIL RESISTANT NITRILE–BUTADIENE (NBR)
POLYETHYLENE (PE)	0.010	4" – 6"	UNDERDRAINS AND SEPTIC DISPOSAL FIELDS ONLY	ASTM F–405 STANDARD SPECIFICATION FOR CORRUGATED POLYETHYLENE TUBING AND FITTINGS	SEE UNDERDRAIN DETAIL	STANDARD COUPLINGS	N/A

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Engineering and Construction Dept.
Enon, OH 45323

REVISIONS

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MDEQ REVIEW	11/19/14	11/19/14	11/19/14
	DRAIN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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DRAINAGE & UTILITY DETAILS
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

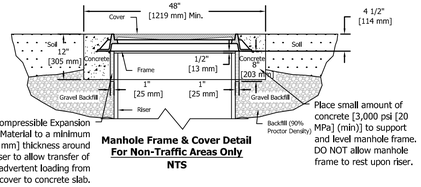
STORE OR BLDG NO. 1830
VERSION OR AFE NO. 72526
SCALE
AS NOTED

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

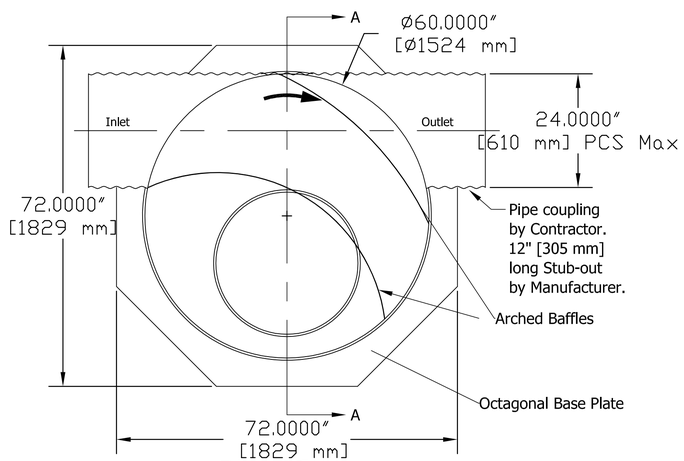
DRWG. NO.
1830–PS–1

Aqua-Swirl Polymer Coated Steel (PCS)
Stormwater Treatment System

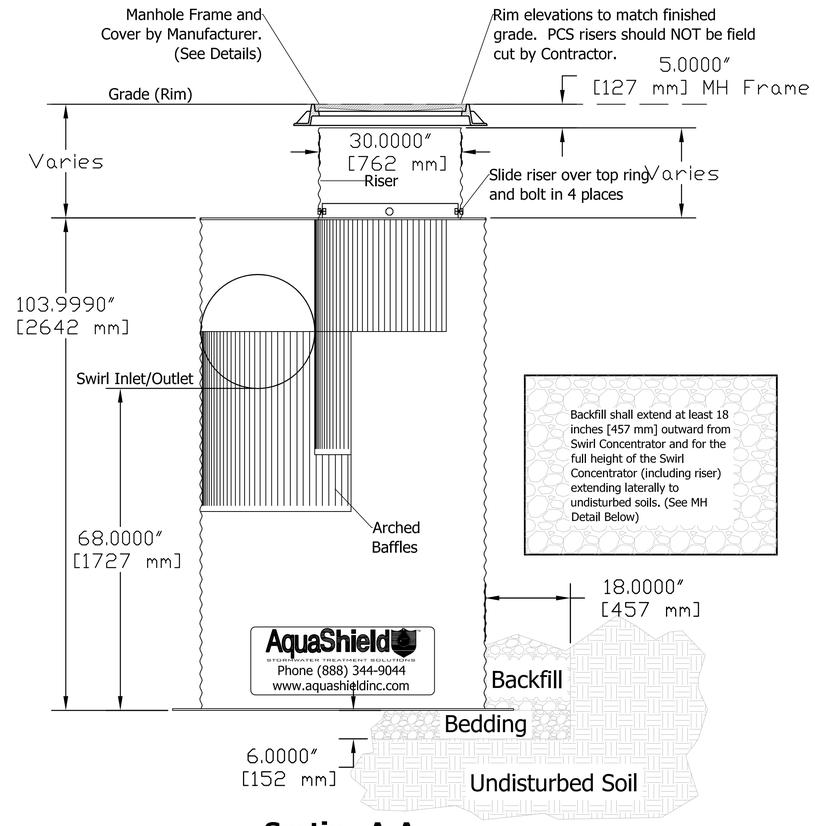
Unless other traffic barriers are present, bollards shall be placed around access riser(s) in non-traffic areas to prevent inadvertent loading by maintenance vehicles.



Manhole Frame & Cover Detail
For Non-Traffic Areas Only
NTS



Plan View



Section A-A

Aqua-Swirl Concentrator Model AS-5 CFD PCS Standard Detail

MAINTENANCE

1. AQUASHIELD™ RECOMMENDS THAT PERIODIC SYSTEM INSPECTIONS BE PERFORMED TO DETERMINE WHETHER THE DISPOSAL OF CAPTURED MATERIAL IS NEEDED TO ENSURE PROPER OPERATION OF THE AQUA-SWIRL™ TREATMENT SYSTEM. IT IS IMPORTANT TO KEEP IN MIND THAT ALL BMPS REQUIRE SOME DEGREE OF MAINTENANCE. MAINTENANCE CYCLES ARE ULTIMATELY DEPENDENT ON SITE-SPECIFIC POLLUTANT LOADING CONDITIONS.

2. UPON INSTALLATION AND DURING CONSTRUCTION, WE RECOMMEND THAT AN AQUA-SWIRL™ BE INSPECTED EVERY THREE MONTHS AND CLEANED AS NEEDED. AN INSPECTION AND MAINTENANCE MANUAL IS FURNISHED FOR EACH PROJECT INSTALLATION FOR AN END USER(S) TO TRACK AND DOCUMENT SYSTEM OPERATIONS. A TYPICAL MAINTENANCE EVENT FOR THE CLEANING OF THE SWIRL CHAMBER CAN BE ACCOMPLISHED WITH A VACUUM TRUCK. THE UNIT SHOULD BE INSPECTED AND CLEANED AT THE END OF CONSTRUCTION REGARDLESS OF WHETHER IT HAS REACHED ITS CAPACITY FOR SEDIMENT OR OIL STORAGE. DURING THE FIRST YEAR POST-CONSTRUCTION, THE UNIT SHOULD AGAIN BE INSPECTED EVERY THREE MONTHS AND CLEANED AS NEEDED. IT IS ALSO RECOMMENDED THAT THE SYSTEM BE INSPECTED AND CLEANED ONCE ANNUALLY REGARDLESS OF WHETHER IT HAS REACHED ITS SEDIMENT OR FLOATABLE POLLUTANT STORAGE CAPACITY. FOR THE SECOND AND SUBSEQUENT YEARS POST-CONSTRUCTION, THE AQUA-SWIRL™ CAN BE INSPECTED AND CLEANED ONCE ANNUALLY IF THE SYSTEM DID NOT REACH FULL SEDIMENT OR FLOATABLE POLLUTANT CAPACITY IN THE FIRST YEAR POST-CONSTRUCTION. IF THE AQUA-SWIRL™ REACHED FULL SEDIMENT OR FLOATABLE POLLUTANT CAPACITY IN LESS THAN 12 MONTHS IN THE FIRST YEAR POST-CONSTRUCTION, THE SYSTEM SHOULD BE INSPECTED ONCE EVERY SIX MONTHS AND CLEANED AS NEEDED. AQUASHIELD™ FURTHER RECOMMENDS THAT EXTERNAL BYPASS (DIVERSION) AND CONVERGENCE STRUCTURES SHOULD BE INSPECTED AND CLEANED WHEN FEASIBLE DURING INSPECTION AND MAINTENANCE EVENTS.

3. ESSENTIAL ELEMENTS OF A SWIRL CHAMBER INSPECTION INCLUDE OBSERVING FLOATING MATERIALS AND MEASURING THE ACCUMULATED SEDIMENT AT THE BASE OF THE SWIRL CHAMBER. THESE TWO ACTIVITIES CAN BE PERFORMED AT THE GROUND SURFACE AND THERE IS NO NEED TO ENTER THE DEVICE. A TYPICAL MAINTENANCE EVENT INCLUDES THE VACUUMING AND DISPOSAL OF FLOATABLE POLLUTANTS AND SEDIMENT FROM THE SWIRL CHAMBER. PROPER HEALTH AND SAFETY PROTOCOLS SHOULD BE FOLLOWED DURING ALL INSPECTION AND MAINTENANCE EVENTS. AQUASHIELD™ RECOMMENDS THAT ALL MATERIALS REMOVED DURING THE MAINTENANCE PROCESS BE HANDLED AND DISPOSED IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL GUIDELINES. DEPENDING ON THE INFLUENT POLLUTANT CHARACTERISTICS OF THE SYSTEM DRAINAGE AREA, IT MAY BE APPROPRIATE TO PERFORM TOXICITY CHARACTERISTICS LEACHING PROCEDURE (TCLP) ANALYSES ON REPRESENTATIVE SAMPLES OF THE REMOVED MATERIAL TO ENSURE THAT THE HANDLING AND DISPOSITION OF MATERIALS COMPLIES WITH APPLICABLE ENVIRONMENTAL REGULATIONS.

AQUA-SWIRL™ PCS SPECIFICATION NOTES 03-19-13

1. MANUFACTURER SHALL BE RESPONSIBLE FOR COMPLETE ASSEMBLY OF SWIRL CONCENTRATOR.

2. POLYMER COATED STEEL (PCS) SWIRL CONCENTRATOR SHALL BE FABRICATED FROM POLYMER PRE-COATED STEEL SHEET FOR CORRUGATED STEEL PIPE, AND SHALL COMPLY WITH ASTM A 760 AND ASTM A 742.

3. STUB OUTS AND INTERNAL COMPONENTS SHALL BE SUPPLIED BY MANUFACTURER AND MIG WELDED USING ACCEPTED WELDING PRACTICES.

4. MANUFACTURER SHALL SUPPLY DIRECT ACCESS TO SWIRL CONCENTRATOR VIA 30-INCH ID RISER(S). RISER SHOULD NOT BE FIELD CUT BY CONTRACTOR, RISER SHOULD MAINTAIN ITS FINISH CUT LENGTH AS SUPPLIED BY MANUFACTURER TO MATCH FINAL GRADE PER APPROVED SITE ELEVATIONS (AS INDICATED ON APPROVED SHOP DRAWING). IF NECESSARY TO EXTEND RISER, CONTRACTOR SHOULD USE ADJUSTING RINGS TO BRING TOP OF STRUCTURE TO GRADE.

5. CONTRACTOR SHALL SUPPLY PIPE COUPLINGS TO AND FROM SWIRL CONCENTRATOR, WHICH SHALL BE MAR-MAC, FERNCO, OR MISSION STYLE FLEXIBLE BOOT WITH STAINLESS STEEL TENSION BANDS AND SHEAR GUARD. MAR-MAC COUPLINGS SHOULD BE USED FOR CONNECTIONS TO CORRUGATED PLASTIC PIPE AND ARE RECOMMENDED FOR USE WITH LARGER DIAMETER PIPE (E.G. 24" ID AND LARGER). A CONCRETE CRADLE IS RECOMMENDED BENEATH MAR MAC'S TO PREVENT JOINT MOVEMENT.

6. CONTRACTOR SHALL PREPARE EXCAVATION AND OFF-LOAD SWIRL CONCENTRATOR. CONTRACTOR IS RESPONSIBLE FOR BEDDING AND BACKFILL AROUND SWIRL CONCENTRATOR AS DETAILED ON SITE PLAN. (SEE NOTES 11 AND 12)

7. MANUFACTURER SHALL SUPPLY STANDARD MANHOLE FRAME(S) AND COVER(S). (TRAFFIC RATED H20)

8. WHERE TRAFFIC LOADING (H-20) IS REQUIRED OR ANTICIPATED, A 4-FOOT DIAMETER, 14-INCH THICK REINFORCED CONCRETE PAD MUST BE PLACED OVER THE SWIRL CONCENTRATOR TO SUPPORT AND LEVEL THE MANHOLE FRAME. THE TOP OF RISER PIPE MUST BE WRAPPED WITH COMPRESSIBLE EXPANSION JOINT MATERIAL TO A MINIMUM 1-INCH THICKNESS TO ALLOW TRANSFER OF WHEEL LOADS FROM MANHOLE COVER TO CONCRETE SLAB. MANHOLE COVER SHALL BEAR ON CONCRETE SLAB AND NOT ON RISER PIPE. THE CONCRETE SLAB SHALL HAVE A MINIMUM STRENGTH OF 3,000 PSI AND BE REINFORCED WITH #4 REINFORCING STEEL (PER DRAWING). MINIMUM COVER OVER REINFORCING STEEL SHALL BE 1-INCH. TOP OF MANHOLE COVER AND CONCRETE SLAB SHALL BE LEVEL WITH FINISH GRADE.

9. UNLESS OTHER TRAFFIC BARRIERS ARE PRESENT, BOLLARDS SHALL BE PLACED AROUND ACCESS RISERS IN NON-TRAFFIC AREAS TO PREVENT INADVERTENT LOADING BY MAINTENANCE VEHICLES. SAMPLE OF TYPICAL BOLLARD INSTALLATION DETAIL AND RECOMMENDED LOCATIONS OF BOLLARDS AROUND THE SWIRL CONCENTRATOR CAN BE PROVIDED UPON REQUEST.

10. WHERE HIGH GROUNDWATER ELEVATIONS ARE PRESENT OR ANTICIPATED, CONTRACTOR SHALL SUPPLY CONCRETE ANTI-FLOATATION PAD UNDERNEATH AND POURED OVER THE OCTAGONAL BASE PLATE OF THE SWIRL (SEE ANTI-FLOATATION BASE DETAIL) TO PREVENT BUOYANCY AND BASE PLATE DEFLECTION (DETAILS, IF NECESSARY, AVAILABLE UPON REQUEST).

11. EXCAVATION AND BEDDING – THE TRENCH AND TRENCH BOTTOM SHALL BE CONSTRUCTED IN ACCORDANCE WITH ASTM A 798 SECTION 5, TRENCH EXCAVATION, SECTION 6, FOUNDATION, AND SECTION 7, BEDDING. THE PCS SWIRL CONCENTRATOR SHALL BE INSTALLED ON A STABLE BASE CONSISTING OF AT LEAST 6-INCHES OF FINE, READILY COMPACTED SOIL OR GRANULAR FILL MATERIAL, AND COMPACTED TO 95% PROCTOR DENSITY. BEDDING SHALL NOT CONTAIN STONES RETAINED ON A 3-INCH RING, FROZEN LUMPS, HIGHLY PLASTIC CLAY, ORGANIC MATERIAL, CORROSIVE MATERIAL, OR OTHER DELETERIOUS FOREIGN MATERIALS. ALL REQUIRED SAFETY PRECAUTIONS FOR SWIRL CONCENTRATOR INSTALLATION ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SHALL BE PER OSHA APPROVED METHODS.

12. BACKFILL REQUIREMENTS – BACKFILL MATERIALS SHALL BE FINE, READILY COMPACTED SOIL OR GRANULAR FILL MATERIAL, AND COMPACTED TO 90% PROCTOR DENSITY. PROCESSED GRANULAR MATERIALS WITH EXCELLENT STRUCTURAL CHARACTERISTICS ARE PREFERRED. COARSE GRAINED SOILS OF USCS GROUPS GW, GP, GM, GC, SW, AND SP AS DESCRIBED IN ASTM D 2487 ARE GENERALLY ACCEPTABLE MATERIALS WHEN COMPACTED TO 90% PROCTOR DENSITY. BACKFILL SHALL NOT CONTAIN STONES RETAINED ON A 3-INCH RING, FROZEN LUMPS, HIGHLY PLASTIC CLAY, ORGANIC MATERIAL, CORROSIVE MATERIAL, OR OTHER DELETERIOUS FOREIGN MATERIALS. BACKFILLING SHALL CONFORM TO ASTM A 798, SECTION 10, STRUCTURAL BACKFILL PLACEMENT. BACKFILL SHALL BE PLACED IN 6 TO 12 INCH LAYERS OR "LIFTS" AND COMPACTED BEFORE ADDING THE NEXT LIFT. BACKFILL SHALL EXTEND AT LEAST 18 INCHES OUTWARD FROM SWIRL CONCENTRATOR AND FOR THE FULL HEIGHT OF THE SWIRL CONCENTRATOR (INCLUDING RISER(S)) EXTENDING LATERALLY TO UNDISTURBED SOILS.

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Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER MEDO REVIEW	11/19/14	11/19/14	11/19/14
	DRAW. / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW 2	06/02/15	06/02/15	06/02/15
	SITE PLAN REVIEW 3	06/29/15	06/29/15	06/29/15

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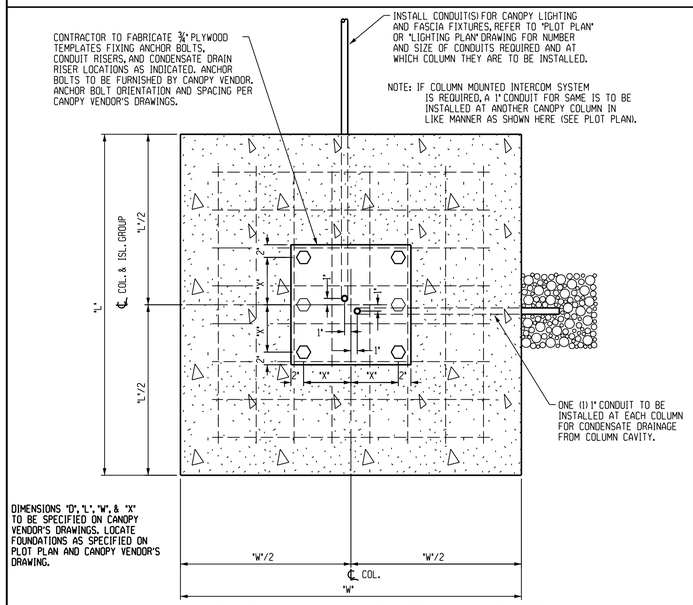
AQUA SWIRL DETAILS
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO. 1830
VERSION OR AFE NO. 72526
SCALE AS NOTED

DESIGN TEAM		DATE
DGNR.	PARK	01/20/15
PM./DP.	WLODYKA	01/20/15
RVR./DP.	COUGHLIN	01/20/15

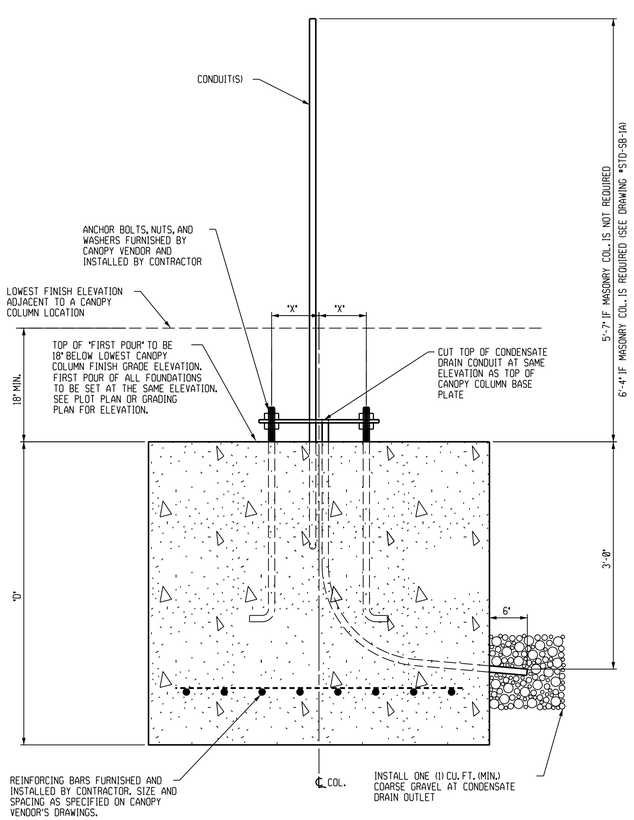
DRWG. NO. 1830-PS-2

FIRST POUR



NOTE: COLUMN FOUNDATION MAY BE SQUARE (4 BOLTS) OR RECTANGULAR (6 BOLTS). REFER TO VENDOR'S DRAWINGS TO VERIFY ORIENTATION OF RECTANGULAR BASES RELATIVE TO ISLAND GROUP CENTERLINE.

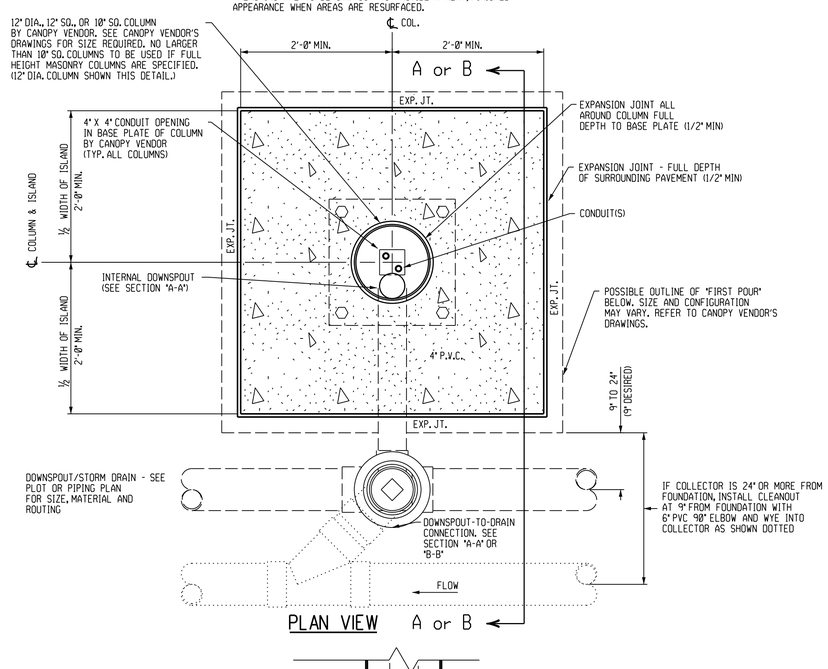
PLAN VIEW



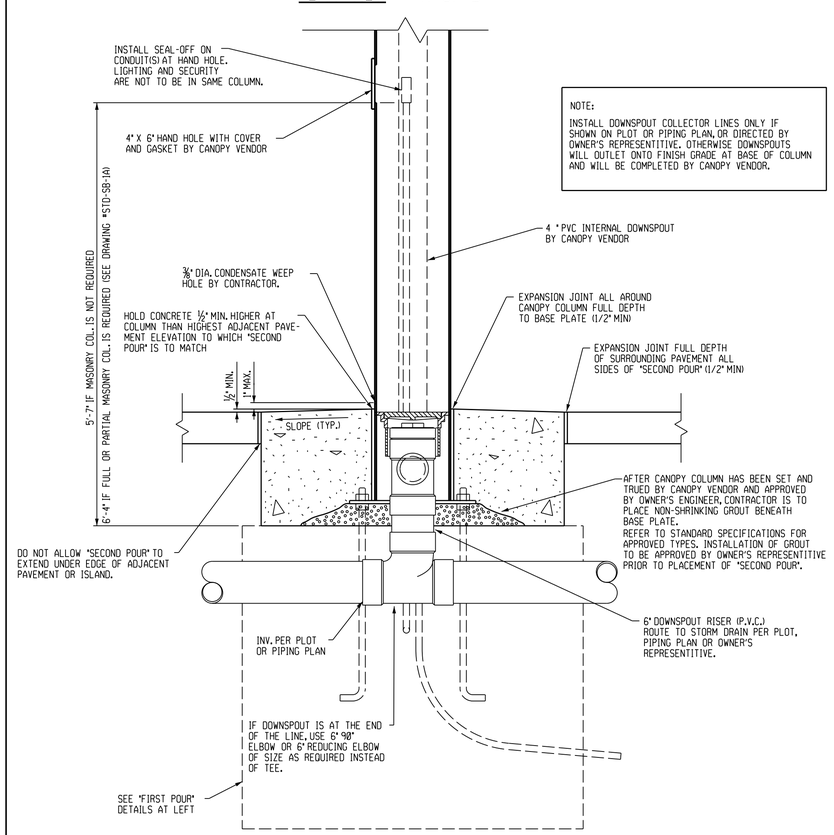
ELEVATION

SECOND POUR

NOTE: IF COLUMNS ARE INSTALLED AT EXISTING LOCATIONS WHERE ADJACENT PAVING IS TO REMAIN, THE AREAS REMOVED FOR EXCAVATION AND TRENCHING ARE TO BE SAW CUT TO PROVIDE A NEAT, FINISHED APPEARANCE WHEN AREAS ARE RESURFACED.

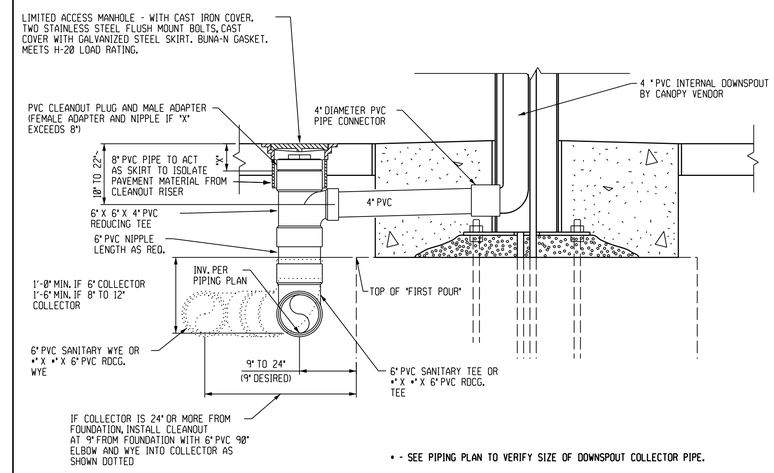


PLAN VIEW A or B



ELEVATION

CANOPY DRAIN DETAILS



• - SEE PIPING PLAN TO VERIFY SIZE OF DOWNSPOUT COLLECTOR PIPE.

SECTION "A-A"
INTERNAL DOWNSPOUT

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Speedway
Engineering and Construction Dept.
Elyria, OH 44323

NO.	REVISIONS	DESIGNER	DATE	REVIEWER	DATE
1	REVISED ALL REFERENCES TO USING SANITARY WYES OR TEES.	J.SCHW	11-18-97	F.EP	11-18-97
2	REVISED ALL REFERENCES TO EXTERNAL DOWNSPOUT.	J.SCHW	11-18-97	J.WP	11-18-97
		S.SCR	12-30-02	J.WP	12-30-02

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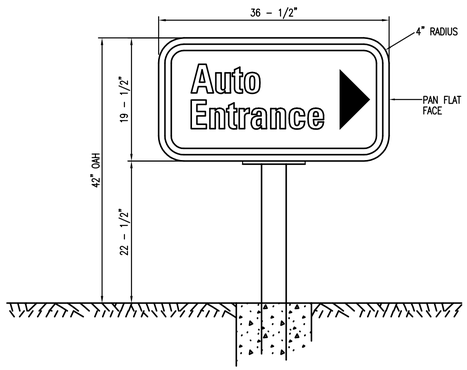
STANDARD CANOPY BASE DETAIL

SCALE 0 — AS SHOWN

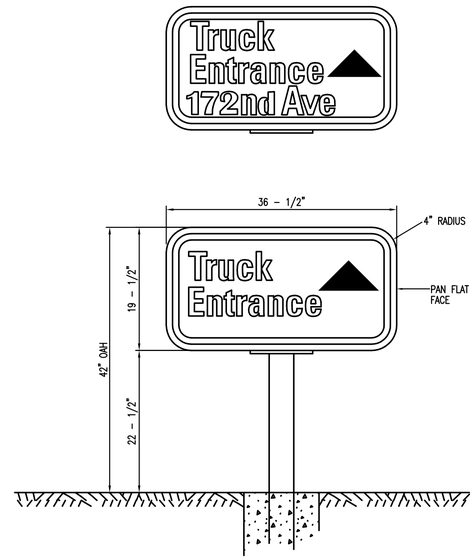
DESIGN TEAM		DATE
DGNR.	E.SWEAT	11-18-95
PM./DP.	J.KINN	11-18-95
RVR./DP.	F.T.PLEASANTS	11-18-95

DRWG. NO. STD-SB-1

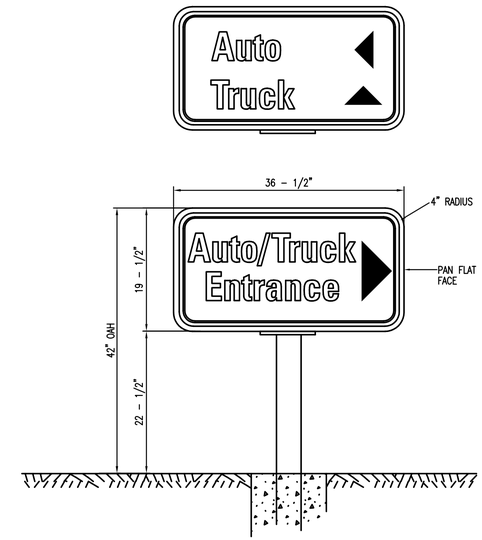
$STYLES$STYLESHEET
$STD-SPECS.MDOH-SPECS.MDOH-SPECS



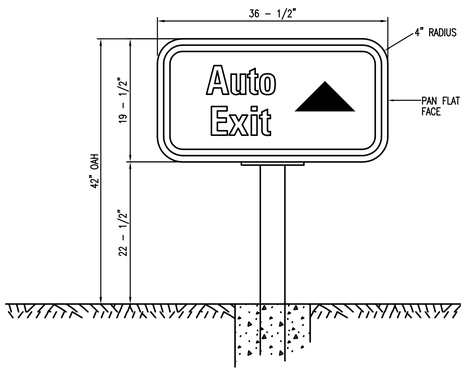
AUTO ENTRANCE
ELEVATION



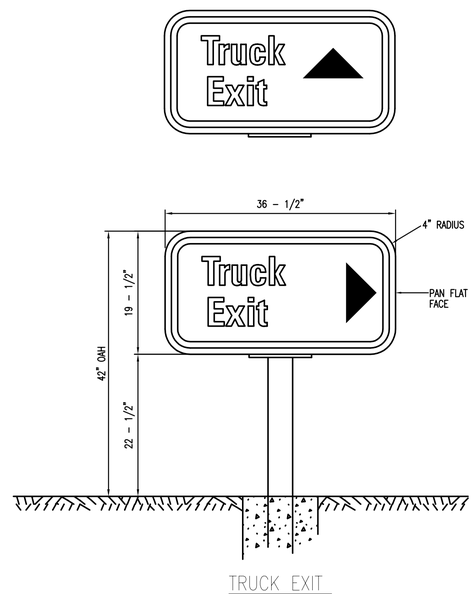
TRUCK ENTRANCE
ELEVATION



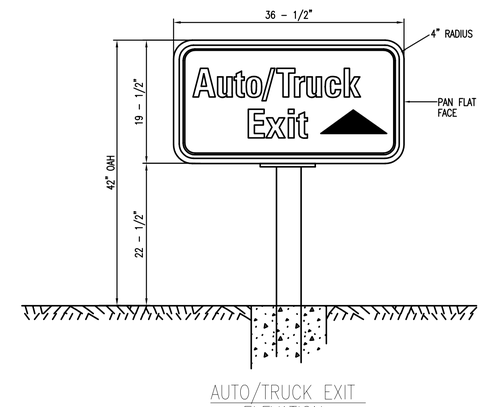
AUTO/TRUCK
ENTRANCE
ELEVATION



AUTO EXIT
ELEVATION



TRUCK EXIT
ELEVATION



AUTO/TRUCK EXIT
ELEVATION

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Enon, OH 45323

NO.	REVISIONS	DESIGN PROJECT	DRAWN PROJECT	CHECK PROJECT	REVIEW PROJECT

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DIRECTIONAL SIGNAGE ENTER AND EXIT

STORE OR BLDG NO.

VERSION OR PROJECT ID

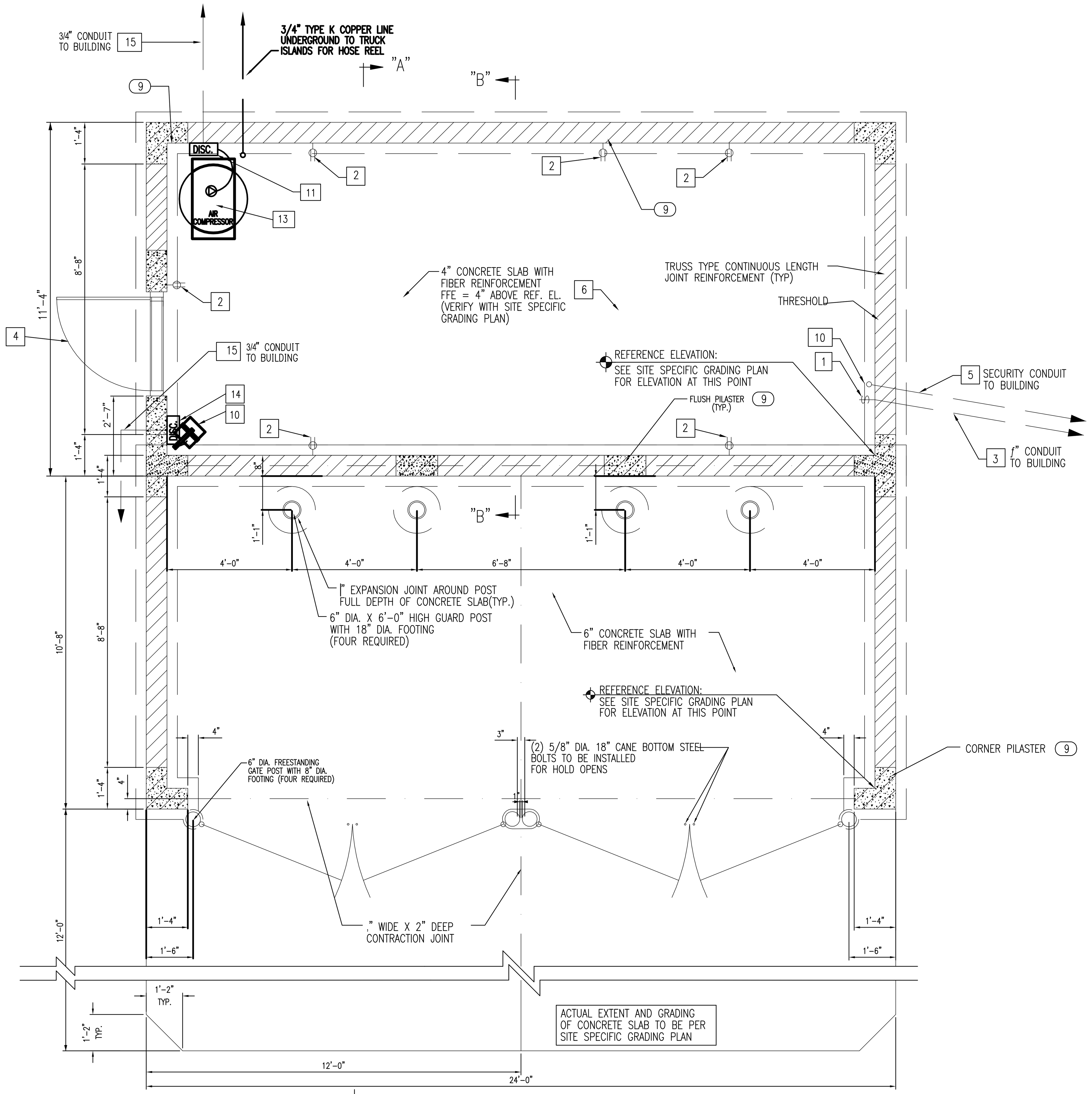
SCALE 0 1" 2" 3" 4" 1" = 1'-0"

DESIGN TEAM	DATE
DGNR. Bauder	03/09/06
P.MGR.	
RVWR. J. COUCH	03/09/06

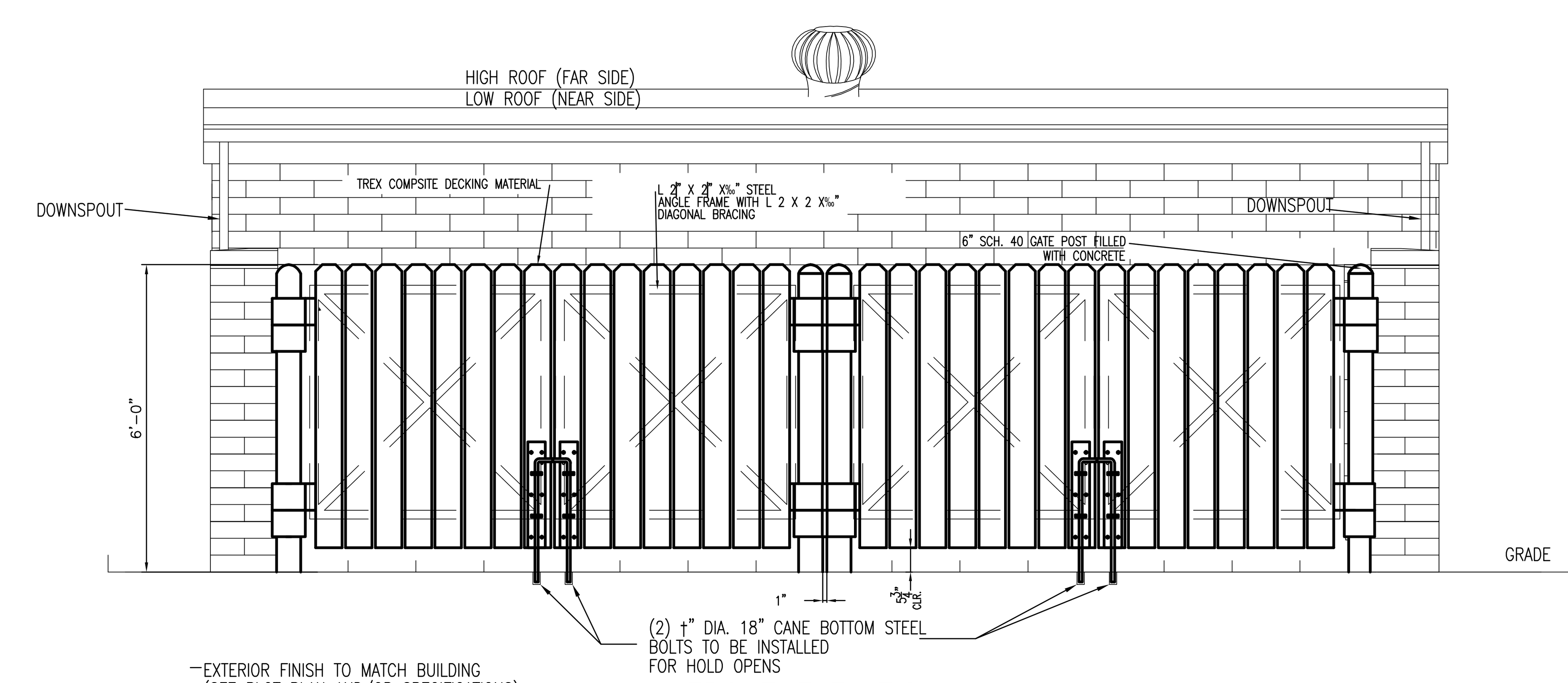
DRWG. NO. DS-SS

Contract Documents
DSW-SS-1 DSW-SS-2 DSW-SS-3 DSW-SS-4 DSW-SS-5

FOUNDATION PLAN & FRONT ELEVATION



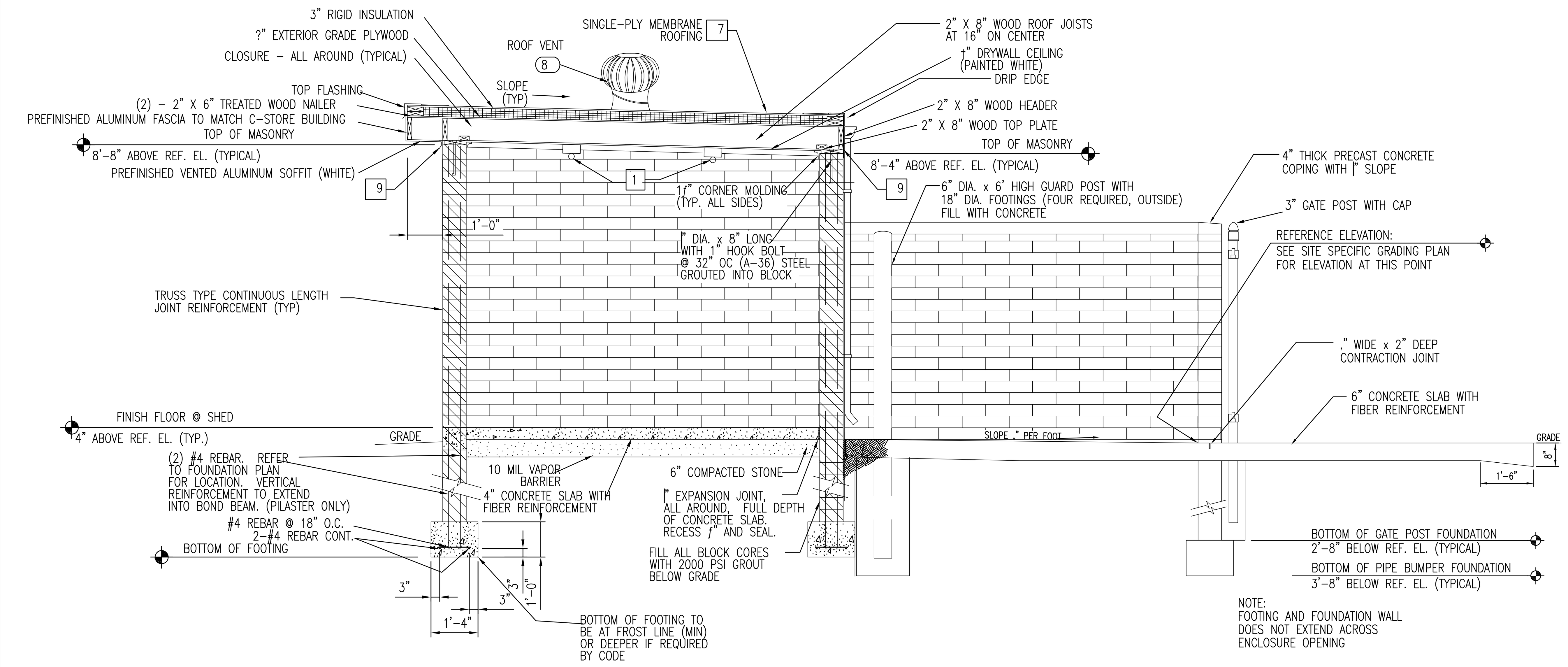
FOUNDATION PLAN



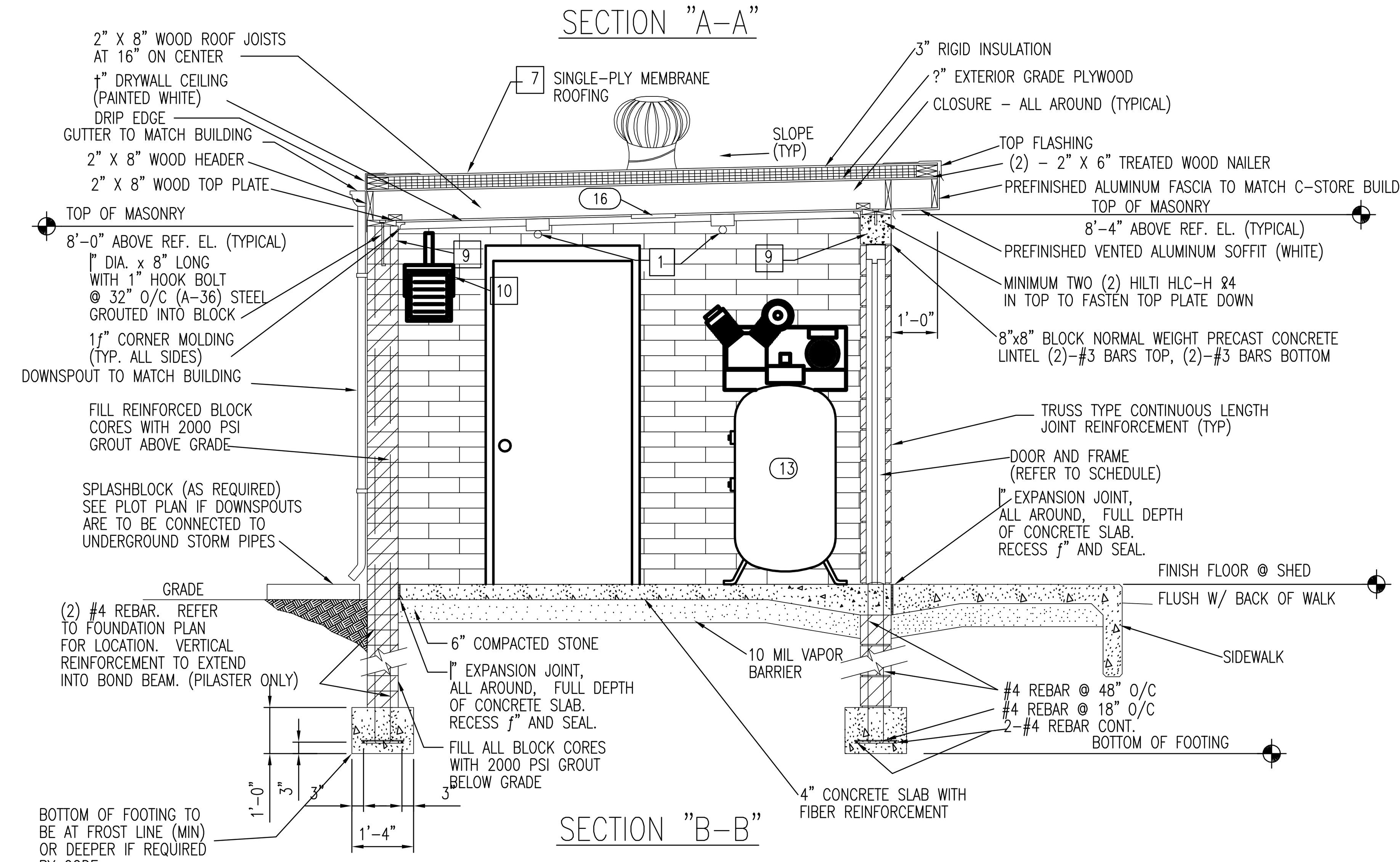
FRONT ELEVATION

$SYTIME$ $SYTIME$SYTIME$
$DGN-SPEC$..$DGN-SPEC$..$DGN-SPEC$

SECTIONS AND DETAILS



SECTION "A-A"



SECTION "B-B"

CONSTRUCTION NOTES

1. CONTRACTOR SHALL FURNISH AND INSTALL TWO (2) 4' FLOURESCENT STRIP LIGHTS. (COOPER – MODEL #SSF-232-120-EB81-U (2) LAMPS, OR EQUIVALENT). LAMPS SHALL BE FURNISHED AND INSTALLED WITH CLEAR TUBE GUARDS ("McGIL" MODEL #2295 OR EQUIVALENT) PROVIDE SINGLE-POLE WALL SWITCH (HUBBELL #1221, 20A, 125 VAC, OR EQUIVALENT) AT DOOR. MOUNT @ 48" AFF. WITH STAINLESS STEEL COVER PLATE.
2. FURNISH & INSTALL THREE (3) DUPLEX RECEPTACLES (HUBBELL #5362-I) ON A GFCI PROTECTED CIRCUIT. MOUNT @ 36" AFF.
3. CONTRACTOR SHALL INSTALL ONE (1) 1-1/2" PVC CONDUIT WITH (4) #2 AWG AND #8 AWG GND FROM THE STORAGE SHED TO THE BUILDING ELECTRICAL EQUIPMENT PANEL "G".
4. DOOR SHALL NORMALLY SWING AWAY FROM THE MAIN BUILDING, SO THE SWING MAY BE REVERSED FROM WHAT IS SHOWN ON THIS DRAWING. SEE PLOT PLAN OR OWNER'S REPRESENTATIVE.
5. INSTALL A 3/4" PVC CONDUIT WITH PULL STRING FOR FUTURE SECURITY DEVICE (STUBBED UP 12" AFF). ROUTE TO SECURITY PANEL AS SHOWN ON THE BUILDING ELECTRICAL DRAWINGS, OR AS DIRECTED BY OWNER'S REPRESENTATIVE.
6. 4" FLOOR SLAB SHALL HAVE THE FOLLOWING SPECIFICATION: FIBERS SHALL BE 100% POLYPROPYLENE MULTIFILAMENT FIBERS MANUFACTURED FOR USE AS CONCRETE REINFORCEMENT. THEY SHALL BE 1/2" TO 3/4" IN LENGTH WITH AN ADDITION RATE OF 1-1/2 LB/CU.YD. OF CONCRETE. THE USE OF THE FIBERS SHALL BE IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.
7. SINGLE-PLY MEMBRANE ROOFING SYSTEM SHALL BE AS MANUFACTURED BY:
DUROLAST INC.
525 MORLEY DRIVE
SAGINAW, MICHIGAN 48601
(800) 248-0260
8. FURNISH AND & INSTALL ONE (1) 12" WIND TURBINE, GALVANIZED BROWN AIR VENT 52607 OR EQUIVALENT.
9. TRUSS TYPE CONTINUOUS LENGTH JOINT REINFORCEMENT (ALTERNATE OVERLAP EVERY OTHER COURSE) TO BE PLACED IN THE FIRST TWO COURSES, AND THE LAST TWO COURSES, BEGINNING AT THE FOOTING. AND EVERY OTHER COURSE BETWEEN. REINFORCEMENT SHALL NOT BE CONTINUOUS THROUGH CONTROL JOINTS.
10. CONTRACTOR SHALL PROVIDE AND INSTALL ALL WIRING AND CONNECT ELECTRIC UNIT HEATER TO PANEL "H". REFER TO NOTE 15.
11. CONTRACTOR SHALL INSTALL ELECTRICAL FEEDER TO COMPRESSOR FROM PANEL "H". REFER TO NOTE 15.
12. BLOCK WALL CORES NOT INDICATED FOR REINFORCING SHALL BE POURED FULL OF PERLITE GRANULAR INSULATION.
13. CONTRACTOR SHALL PROVIDE AND INSTALL ONE (1) TWO STAGE ELECTRIC POWERED AIR COMPRESSOR, WHERE SHOWN. INGERSOLL RAND – MODEL# 2475N7.5-P
14. CONTRACTOR SHALL PROVIDE AND INSTALL ONE (1) COMPACT UNIT HEATER WITH THERMOSTAT CONTROL. MOUNT ON WALL WHERE SHOWN. SET THERMOSTAT AT 40 DEGREES F. DIMPLEX COMPACT UNIT HEATER MODEL # CUH05B31T OR EQUAL.
15. CONTRACTOR SHALL PROVIDE AND INSTALL (1) 100A 12 SPACE MLO SERVICE PANEL "H". PANEL SHALL INCLUDE (1) 40/3 BREAKER FOR AIR COMPRESSOR, (1) 30/2 BREAKER FOR HEATER, AND (1) 20/1 BREAKER FOR OUTLETS AND LIGHTS.
LIGHTS & RECEPTACLES: (2) #12 AWG (MIN.)
(1) #12 AWG. (MIN.) GND
COMPRESSOR: (3) #8 AWG (MIN.)
(1) #10 AWG (MIN.) GND
HEATER: (2) #10 AWG (MIN.)
(1) #10 AWG (MIN.) GND
16. INSTALL ALUMINUM ADJUSTABLE LOUVER IN DRYWALL CEILING. HART/COOLEY A718MS OR EQUIVALENT.
17. PLACE SIGN ON DOOR OR NEAR LIGHT SWITCH "CLOSE CEILING AND DOOR VENT DURING WINTER / OPEN DURING SUMMER".

GENERAL NOTES

1. SLABS SHALL HAVE THE FOLLOWING SPECIFICATION: FIBERS SHALL BE 100% POLYPROPYLENE MULTIFILAMENT FIBERS MANUFACTURED FOR USE AS CONCRETE REINFORCEMENT. MULTIFILAMENT FIBERS MANUFACTURED FOR USE AS CONCRETE REINFORCEMENT. THEY SHALL BE |" TO f" IN LENGTH WITH AN ADDITION RATE RATE OF |LB/CU.YD. OF CONCRETE. THE USE OF THE FIBERS SHALL BE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS OR RECOMMENDATIONS.
2. THE MINIMUM LAP FOR BOTH CONCRETE & MASONRY SPLICES SHALL BE THE FOLLOWING:
#4 – 2'-0"
#5 – 2'-6"
#6 – 3'-0"
3. STANDARD CONSTRUCTION TO BE 8" X 8" X 16" CONCRETE UNITS –(TO MATCH BUILDING) LAID IN RUNNING BOND. SEE PLOT PLAN, SPECIFICATIONS AND/OR OWNER'S REPRESENTATIVE FOR VARIATIONS IN FINISH & COLORS.
4. REFER TO GRADING PLAN FOR PAVEMENT ELEVATIONS.

DOOR AND HARDWARE SCHEDULE

1 – 3'-10" X 7'-4" X 5 3/4", 16 GAGE HOLLOW METAL FRAME, TO BE INTERNALLY PAINTED WITH RUST INHIBITIVE PRIMER
1 – 3'-6" X 7'-0" X 1?" 18 GAGE HOLLOW METAL DOOR WITH 24" X 24" LOUVER
1? – PAIR, STANLEY #FBB 179 HINGES X USP X 4?" X 4?"
1 – SARGENT #1431 OR HAGER #5200 DOOR CLOSER
1 – SARGENT #28-8LG05 LL x 26D BORED LOCK
1 – REESE #S204A THRESHOLD
1 – REESE #323C SWEEP
1 – REESE #D569C WEATHERSTRIP

Speedway®

Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE
1	ADDED ROOF WIND TURBINE, ADJUSTABLE LOUVER, CORRESPONDING NOTES	B. ENEIX 3/5/2014		J. DILK 3/6/2014

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QUIK-BRIK
DUMPSTER ENCLOSURE

STORE OR BLDG NO.

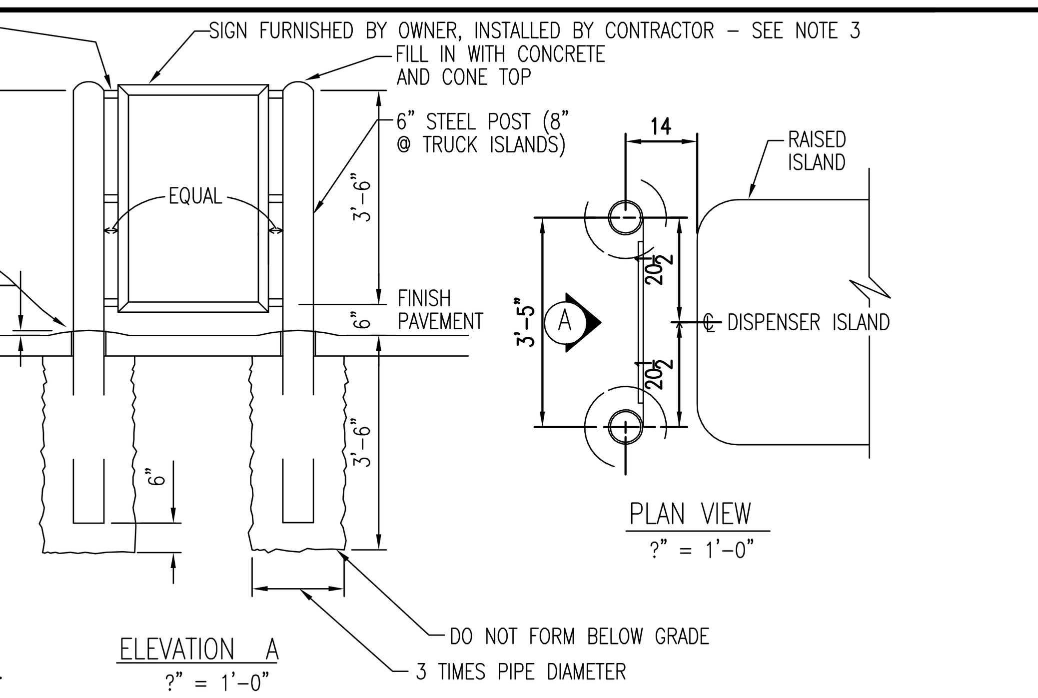
VERSION OR PROJECT ID

SCALE 3/8" = 1'-0"

DESIGN TEAM		DATE
DGNR.	B. ENEIX	10/10/13
PM./DP.	S. FARRELL	10/31/13
RVR./DP.	J. FRYE	10/31/13

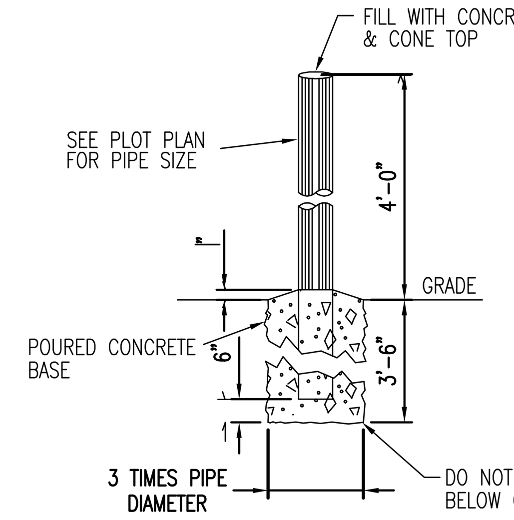
DRWG. NO. STD-SS-2E2.3

AREA YARD GUARDS

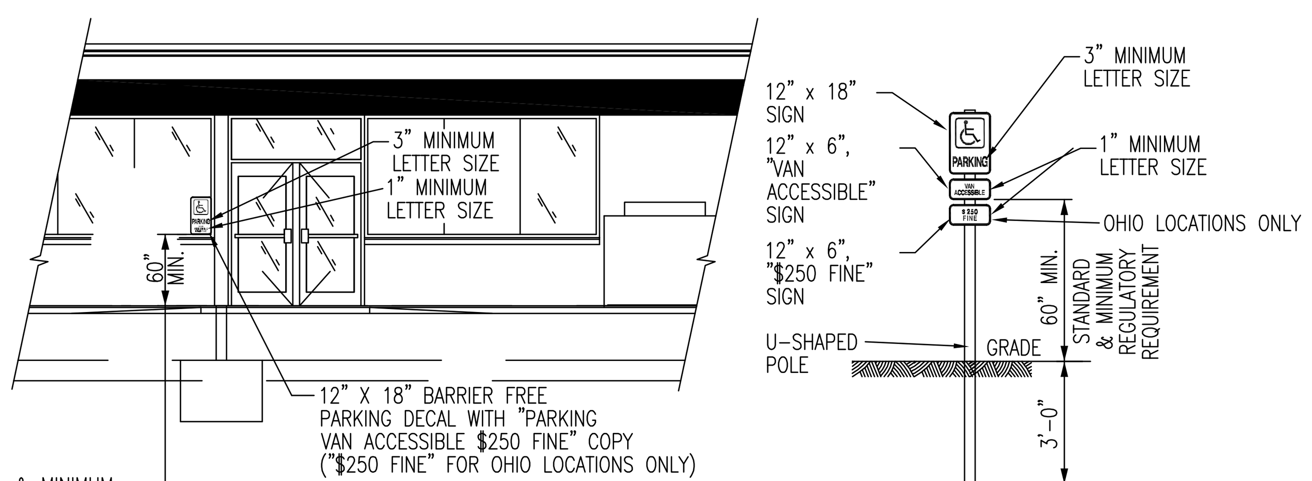


1. GUARD POST FURNISHED & INSTALLED BY CONTRACTOR. PAINT RED.
2. REFER TO PLOT PLAN OR DISPENSER ISLAND LAYOUT FOR VARIATIONS IN GUARD POST SIZE, SPACING AND NUMBER REQUIRED.
3. HORIZONTAL STEEL FRAMES AND SIGNS REQUIRED WHEN CALLED FOR ON PLOT PLAN.

ISLAND GUARD POST & SIGN INSTALLATION



GUARD POST



STANDARD:
ACCESSIBLE PARKING DECAL FURNISHED BY OWNER INSTALLED BY CONTRACTOR

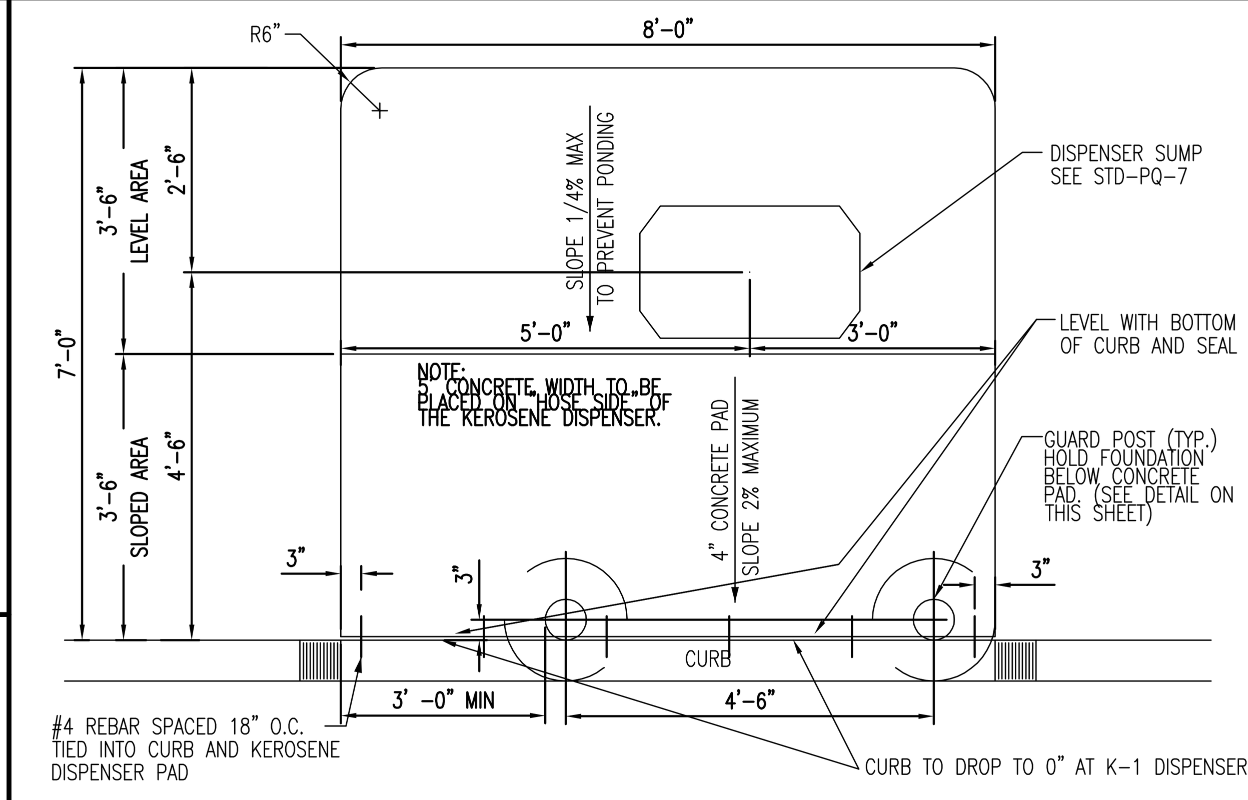
ALTERNATE:
WHEN CALLED FOR ON PLOT PLAN - SIGNS & U-SHAPED POLE FURNISHED & INSTALLED BY CONTRACTOR

ACCESSIBLE PARKING SIGNAGE

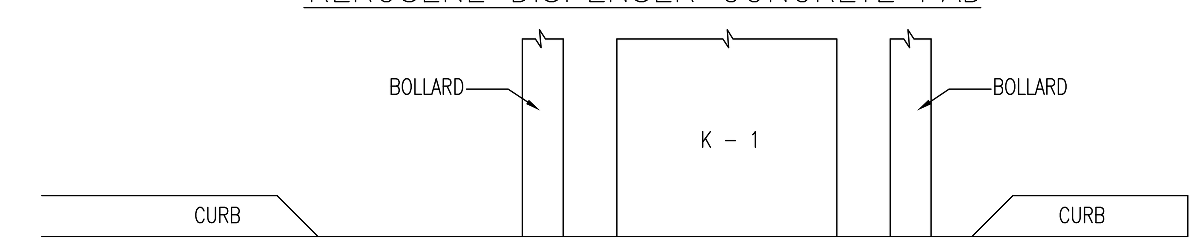
NEENAH FOUNDRY CAT. R-8403-43DC
36 INCHES, 86 Lbs.

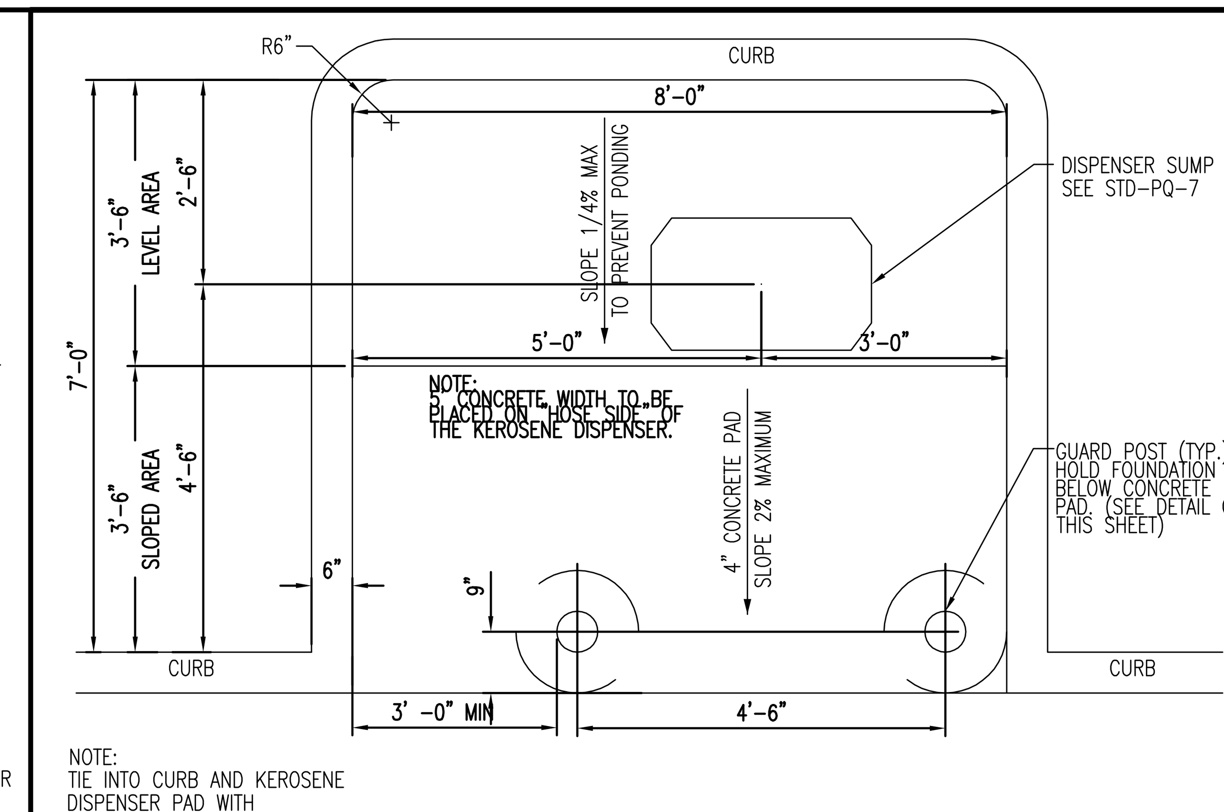
DECORATIVE GUARD POST

YARD EQUIPMENT AND FOUNDATION DETAILS



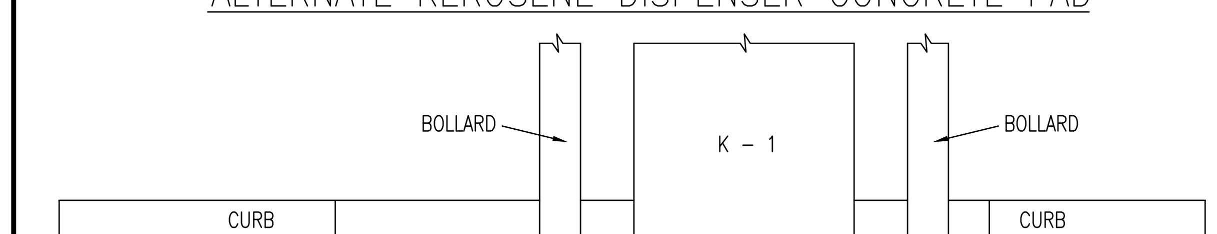
KEROSENE DISPENSER CONCRETE PAD

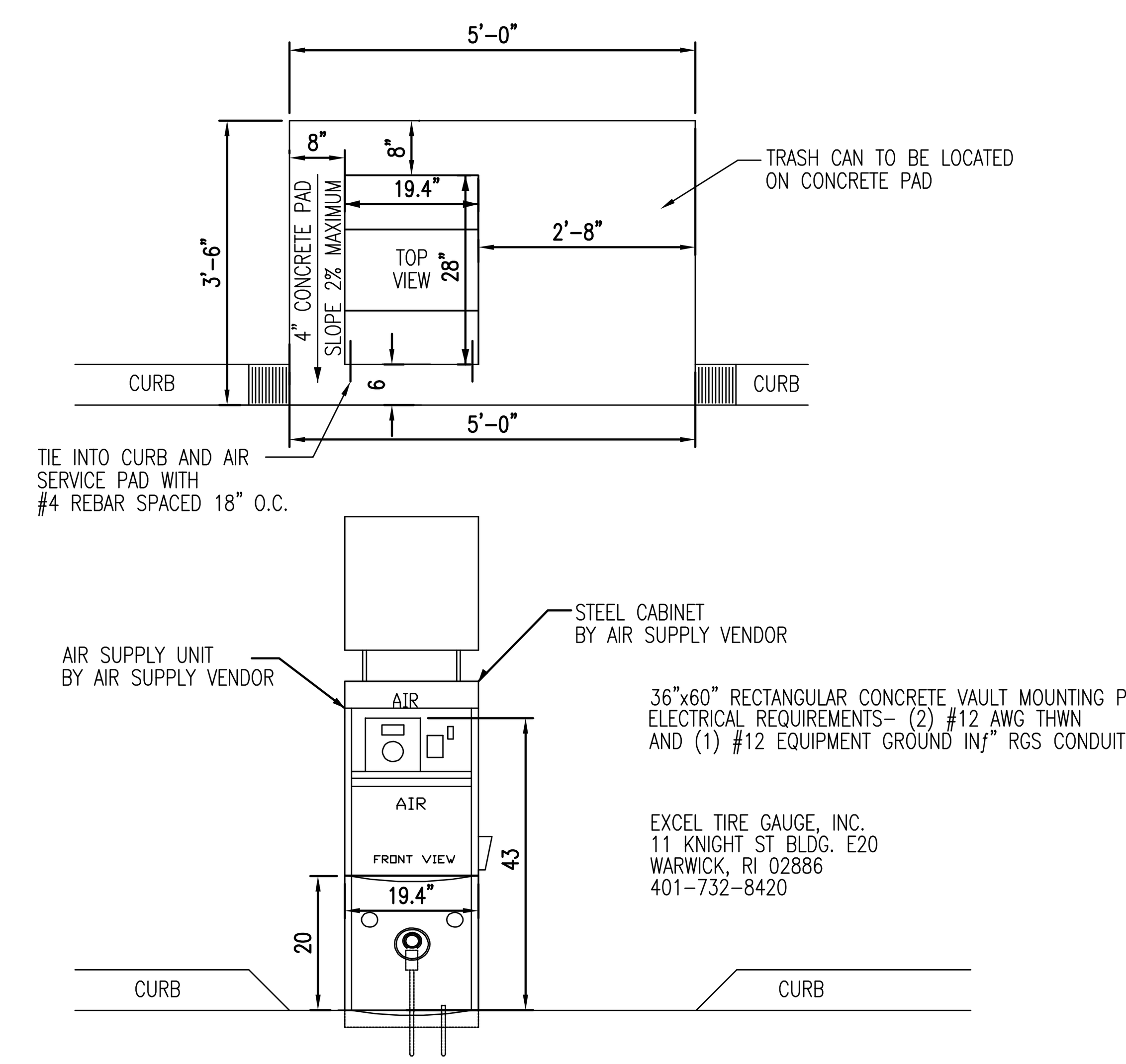




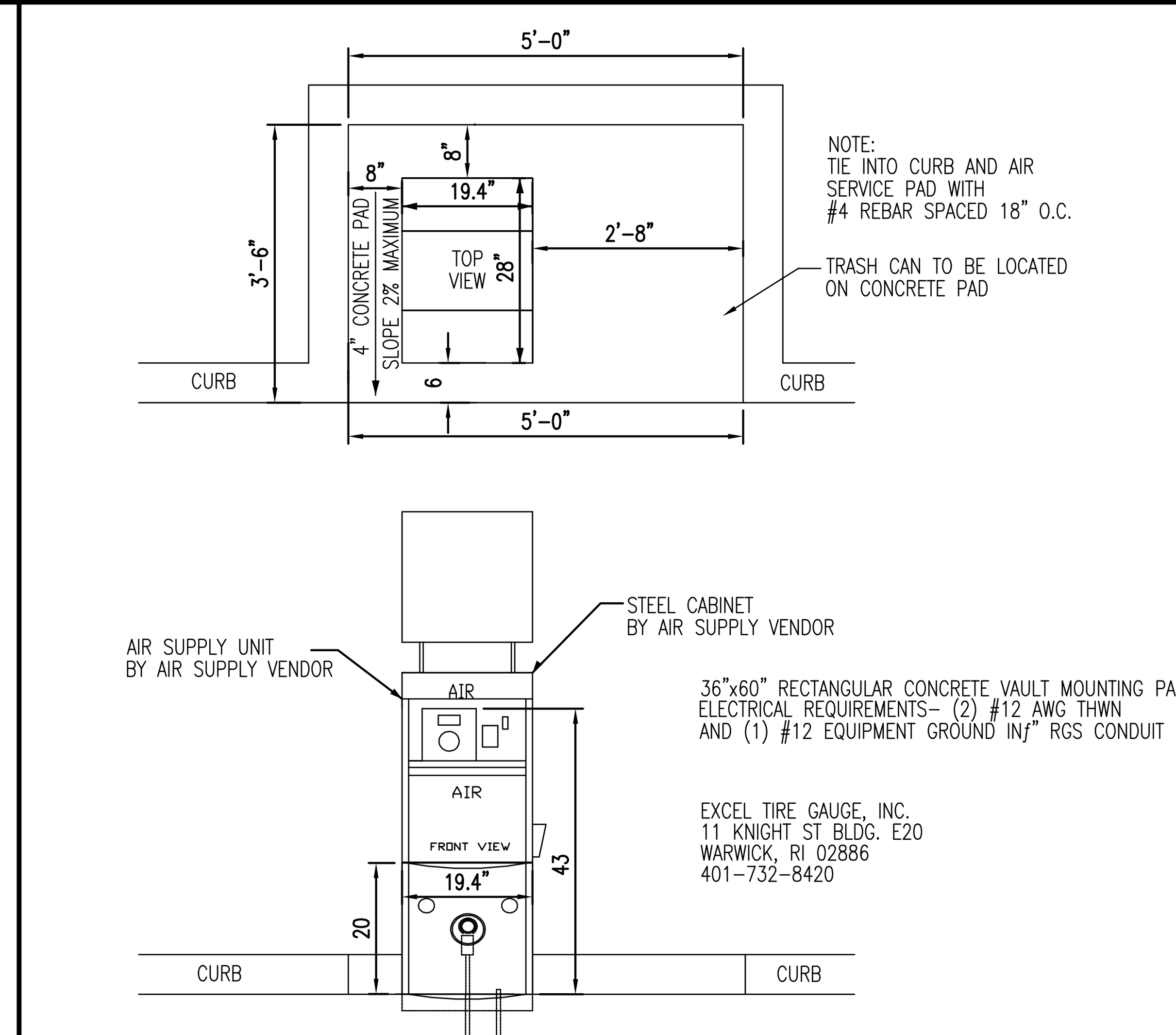
NOTE:
TIE INTO CURB AND KEROSENE DISPENSER PAD WITH #4 REBAR SPACED 18" O.C.

ALTERNATE KEROSENE DISPENSER CONCRETE PAD



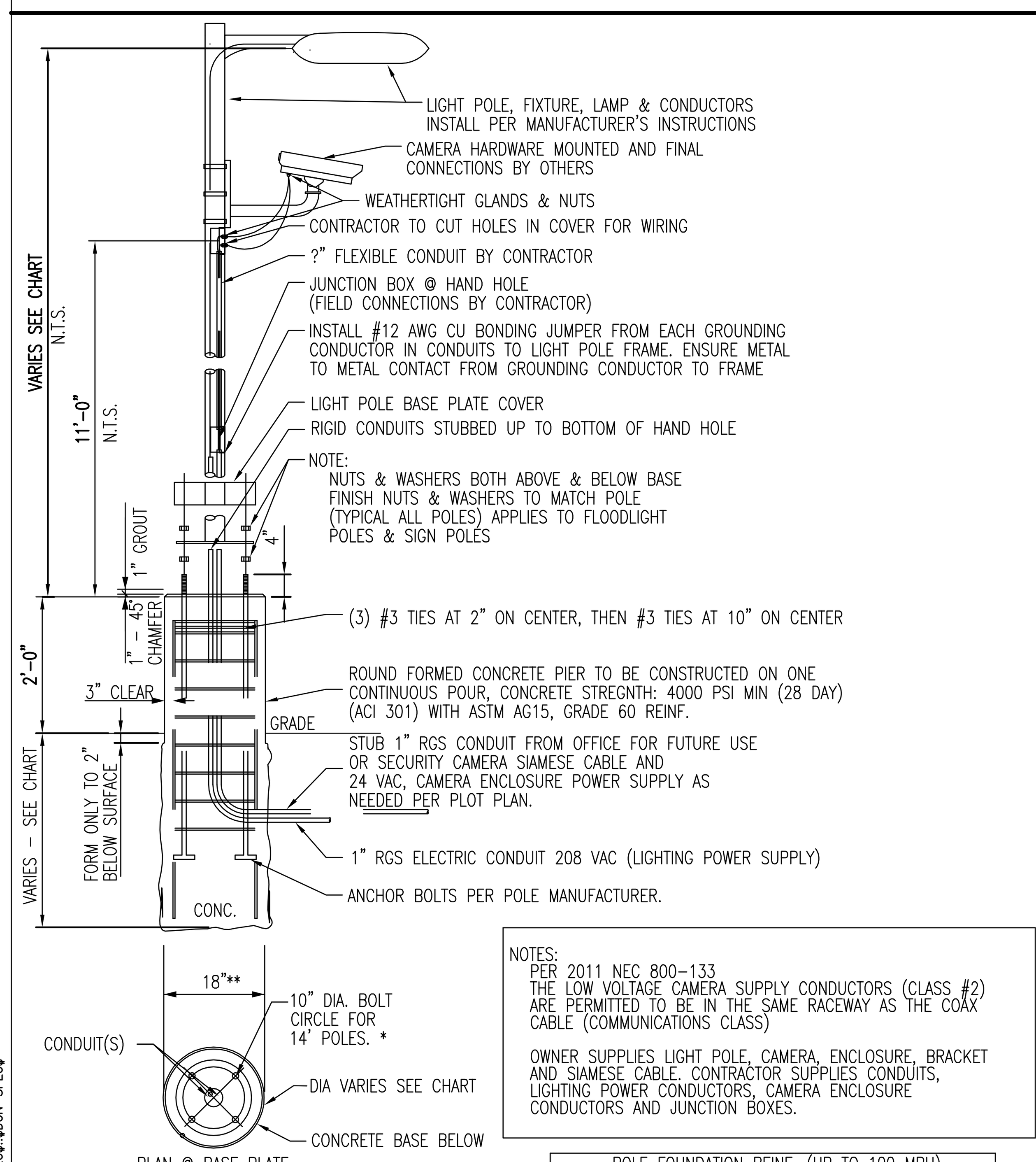


REMOTE SELF-CONTAINED AIR SERVICE



ALTERNATE REMOTE SELF-CONTAINED AIR SERVICE

AREA LIGHT POLE FOUNDATION DETAILS



* CONTACT LIGHT POLE SUPPLIER FOR INFORMATION WITH REGARDS TO 30' POLE.
** MINIMUM DIMENSION. IT MAY BE NECESSARY TO INCREASE DIMENSIONS TO FIT BASE PLATE, ANCHOR RODS INSIDE REINFORCEMENT CAGE.

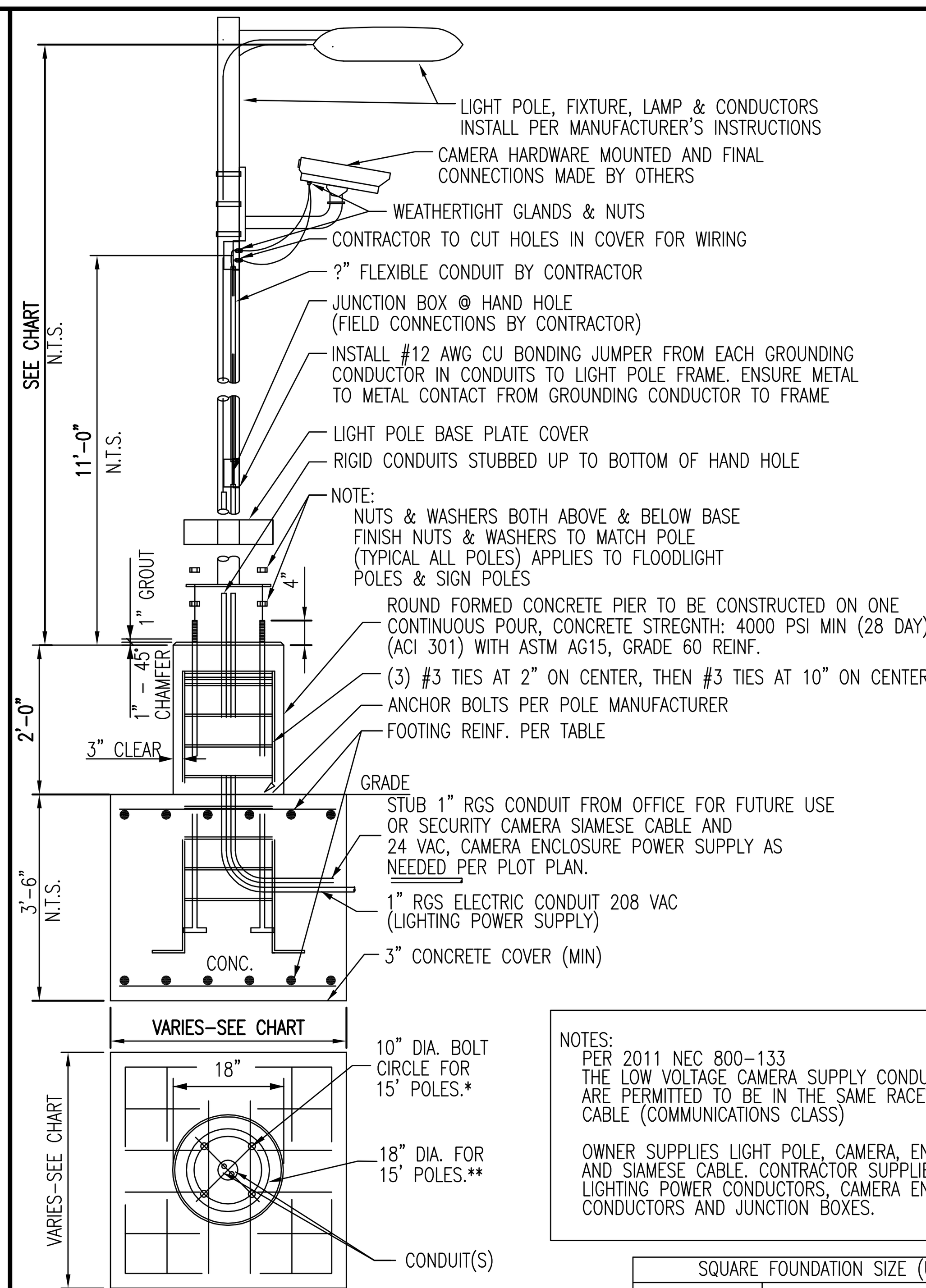
NOTES:
PER 2011 NEC 800-133
THE LOW VOLTAGE CAMERA SUPPLY CONDUCTORS (CLASS #2) ARE PERMITTED TO BE IN THE SAME RACEWAY AS THE COAX CABLE (COMMUNICATIONS CLASS)

OWNER SUPPLIES LIGHT POLE, CAMERA, ENCLOSURE, BRACKET AND SIAMESE CABLE. CONTRACTOR SUPPLIES CONDUITS, LIGHTING POWER CONDUCTORS, CAMERA ENCLOSURE CONDUCTORS AND JUNCTION BOXES.

POLE FOUNDATION REINF. (UP TO 100 MPH)			
POLE SIZE	DIAMETER	FOOTING REINF.	DEPTH
15'	18"	4 #5	6'0"
30'	24"	6 #5	7'0"

GEOTECHNICAL ENGINEER TO VERIFY EVACUATION, (2000 PSF ALLOWABLE BEARING, AND 300 PSF ALLOWABLE LATERAL PERSSURE) BEFORE PLACING REINFORCED CONCRETE.

CLAY-LIKE SOIL CONDITIONS



* CONTACT LIGHT POLE SUPPLIER FOR INFORMATION WITH REGARDS TO 30' POLE.
** MINIMUM DIMENSION. IT MAY BE NECESSARY TO INCREASE DIMENSIONS TO FIT BASE PLATE, ANCHOR RODS INSIDE REINFORCEMENT CAGE.

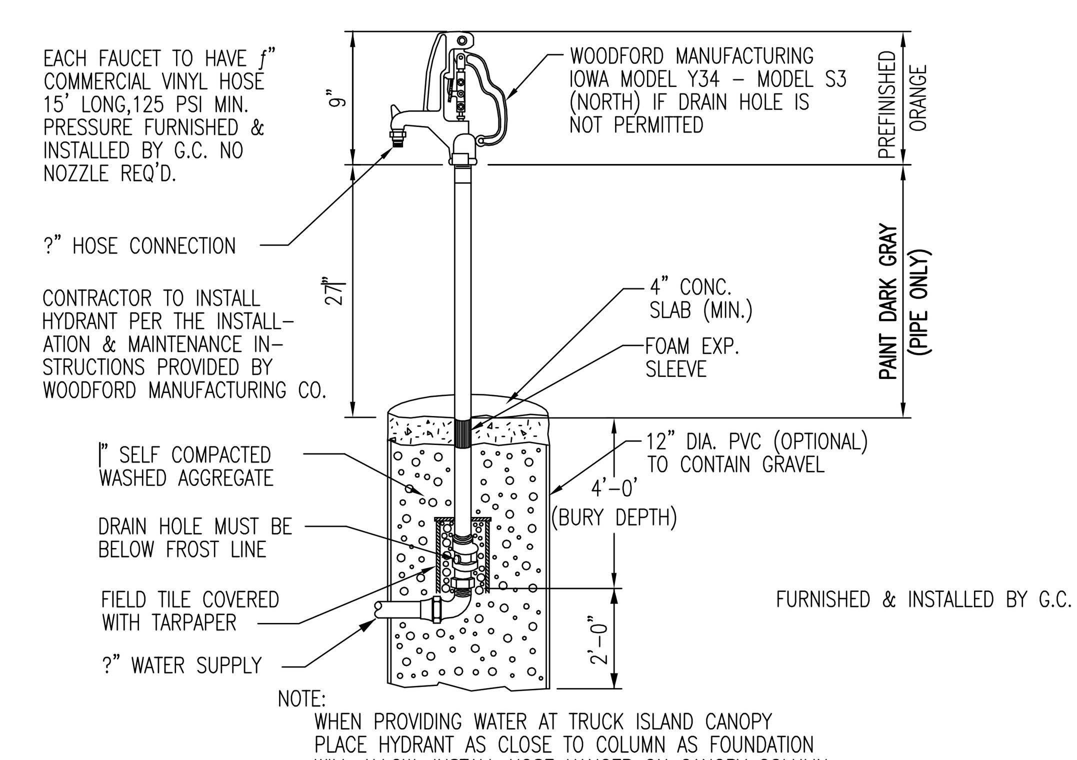
NOTES:
PER 2011 NEC 800-133
THE LOW VOLTAGE CAMERA SUPPLY CONDUCTORS (CLASS #2) ARE PERMITTED TO BE IN THE SAME RACEWAY AS THE COAX CABLE (COMMUNICATIONS CLASS)

OWNER SUPPLIES LIGHT POLE, CAMERA, ENCLOSURE, BRACKET AND SIAMESE CABLE. CONTRACTOR SUPPLIES CONDUITS, LIGHTING POWER CONDUCTORS, CAMERA ENCLOSURE CONDUCTORS AND JUNCTION BOXES.

SQUARE FOUNDATION SIZE (UP TO 100 MPH)		
POLE SIZE	FOOTING SIZE	FOOTING REINF.
15'	4"-0" SQ. X 3'-6"	6 #4 E.U. T&B
30'	5'-6" SQ. X 3'-6"	6 #6 E.U. T&B

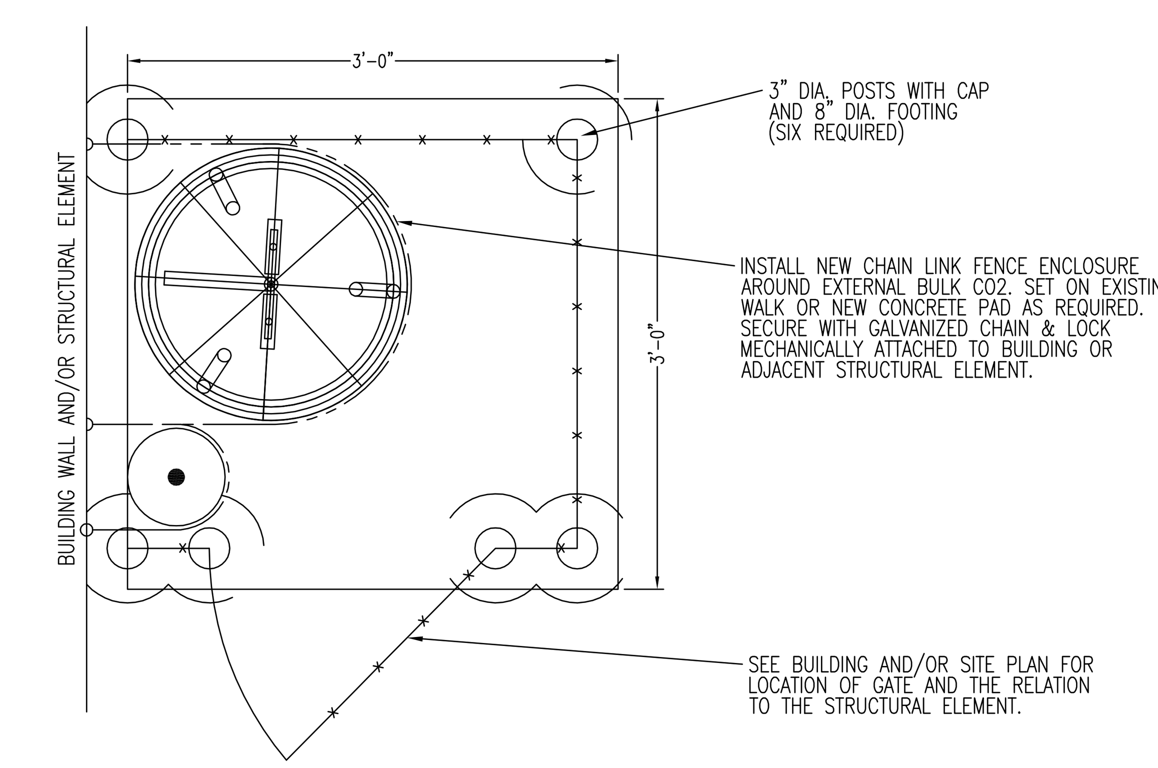
GEOTECHNICAL ENGINEER TO VERIFY EVACUATION, (2500 PSF ALLOWABLE BEARING) BEFORE PLACING REINFORCED CONCRETE.

ROCKY/SANDY SOIL CONDITIONS



NOTE:
WHEN PROVIDING WATER AT TRUCK ISLAND CANOPY PLACE HYDRANT AS CLOSE TO COLUMN AS FOUNDATION WILL ALLOW. INSTALL HOSE HANGER ON CANOPY COLUMN

FREEZELESS YARD & TRUCK ISLAND HYDRANT



EXTERIOR BULK CO2

SCALE: 1'-0" = 1"

Speedway®
Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE

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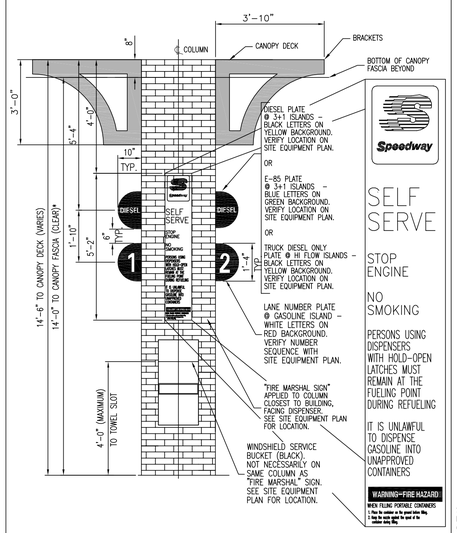
YARD EQUIPMENT INSTALLATION

STORE OR BLDG NO.
VERSION OR PROJECT ID
SCALE 0 AS SHOWN

DESIGN TEAM		DATE
DGNR.	E.SWEAT	6-1-05
P.MGR.	J.KINN	6-7-05
RVWR.	F.T.PLEASANTS	6-7-05

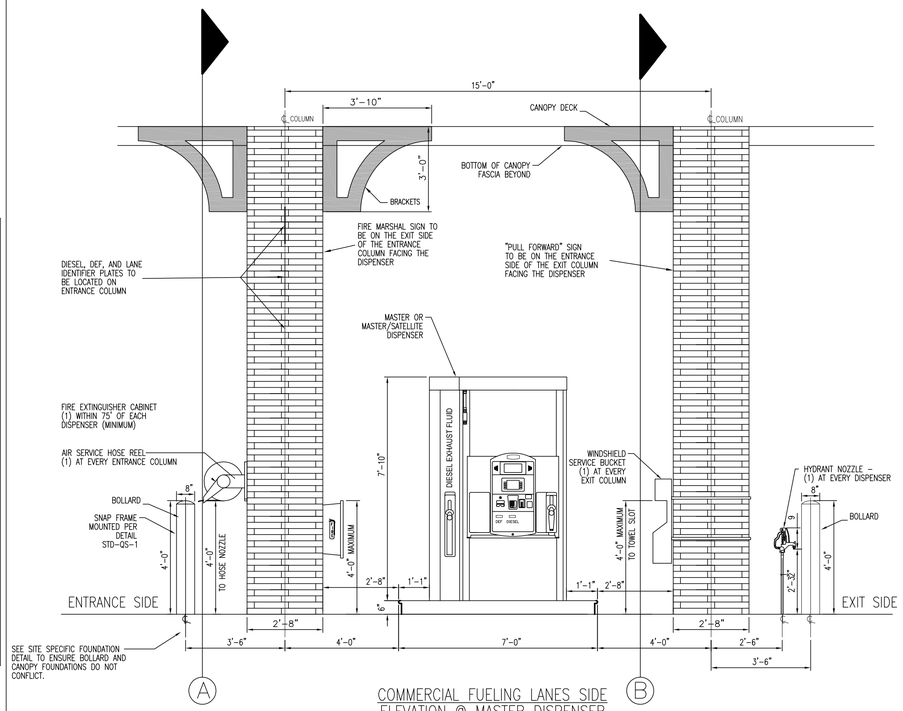
DRWG. NO. STD-QS-1

$SYTIME$..$SYTIME$
$DGN-SPEC$..$DGN-SPEC$..$DGN-SPEC$

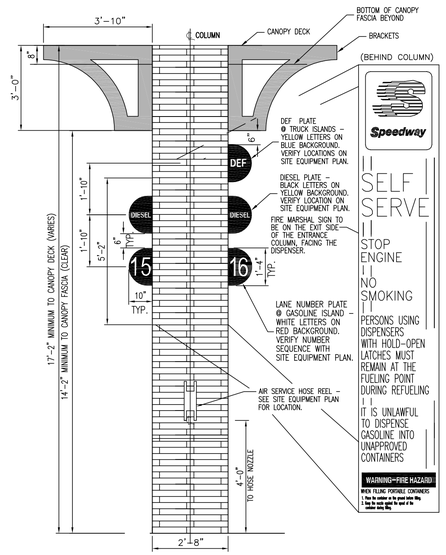


FRONT ELEVATION @ FIRE MARSHAL SIGN WITH AUTO DSL AND FULL BRICK WRAP OPTION

* NOTE:
14'-0" CANOPY CLEARANCE IS WITHOUT THE USE OF ORNAMENTAL BRACKETS. IF ORNAMENTAL BRACKETS ARE REQUIRED A 16'-6" CANOPY CLEARANCE IS REQUIRED.

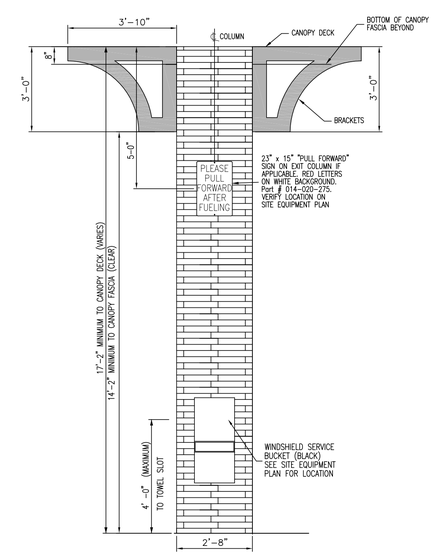


COMMERCIAL FUELING LANES SIDE ELEVATION @ MASTER DISPENSER



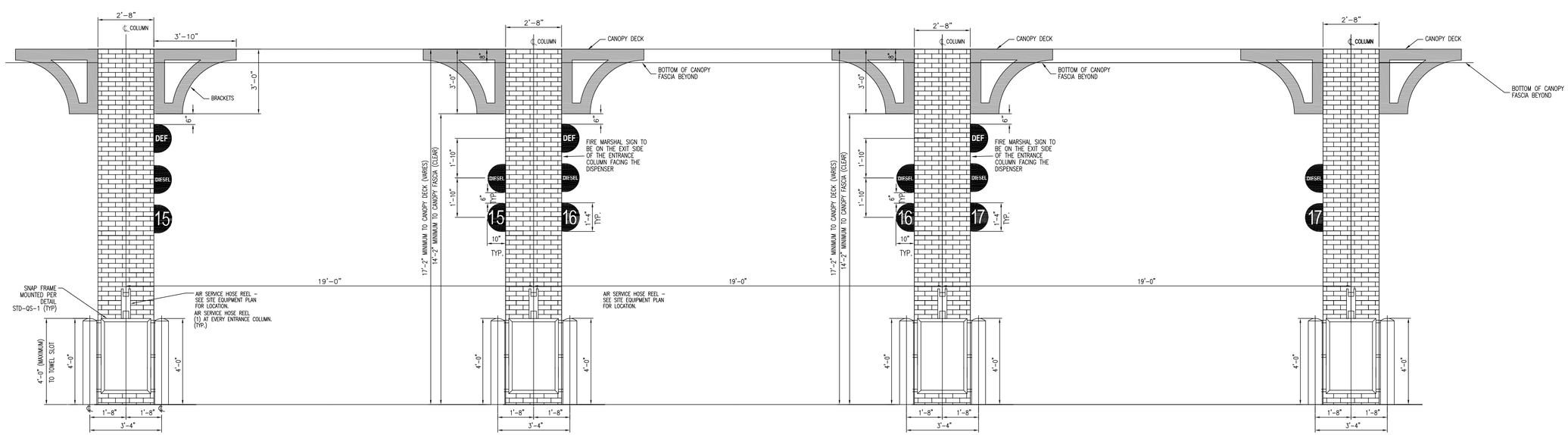
FRONT ELEVATION FOR COMMERCIAL FUELING LANES, ENTRANCE COLUMN W/ DEF LANE IDENTIFIERS

A



FRONT ELEVATION FOR COMMERCIAL FUELING LANES, CANOPY EXIT COLUMN

B



ENTRANCE ELEVATION @ MASTER DISPENSER

ENTRANCE ELEVATION @ MASTER/SATELLITE DISPENSER

ENTRANCE ELEVATION @ MASTER/SATELLITE DISPENSER

ENTRANCE ELEVATION @ SATELLITE DISPENSER

COMMERCIAL FUELING LANES
CANOPY ENTRANCE COLUMN ELEVATIONS

Speedway®
Prepared by:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PROJ. MGR. DATE	REVIEWER DATE

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CANOPY COLUMN DETAILS
AUTO & CFL

STORE OR BLDG NO.
VERSION OR AFE NO.
SCALE 0 2
3/8" = 1'-0"

DESIGN TEAM		DATE
DGNR.	R. THORNTON	07/10/14
P.MGR.		
RVWR.	J. COUCH	07/10/14

DRWG. NO.
1830-CC-DET

SURVEY CREATED ON 24"x36" LAYOUT.
FOR PURPOSE OF THIS PLAN SET, THE SHEET WAS REDUCED TO A 22"x34" SHEET SIZE.
AS A RESULT, DRAWING IS NOT TO SCALE.

0 60 60

1 inch = 30 ft.
CONTOUR INTERVAL 1 FT.

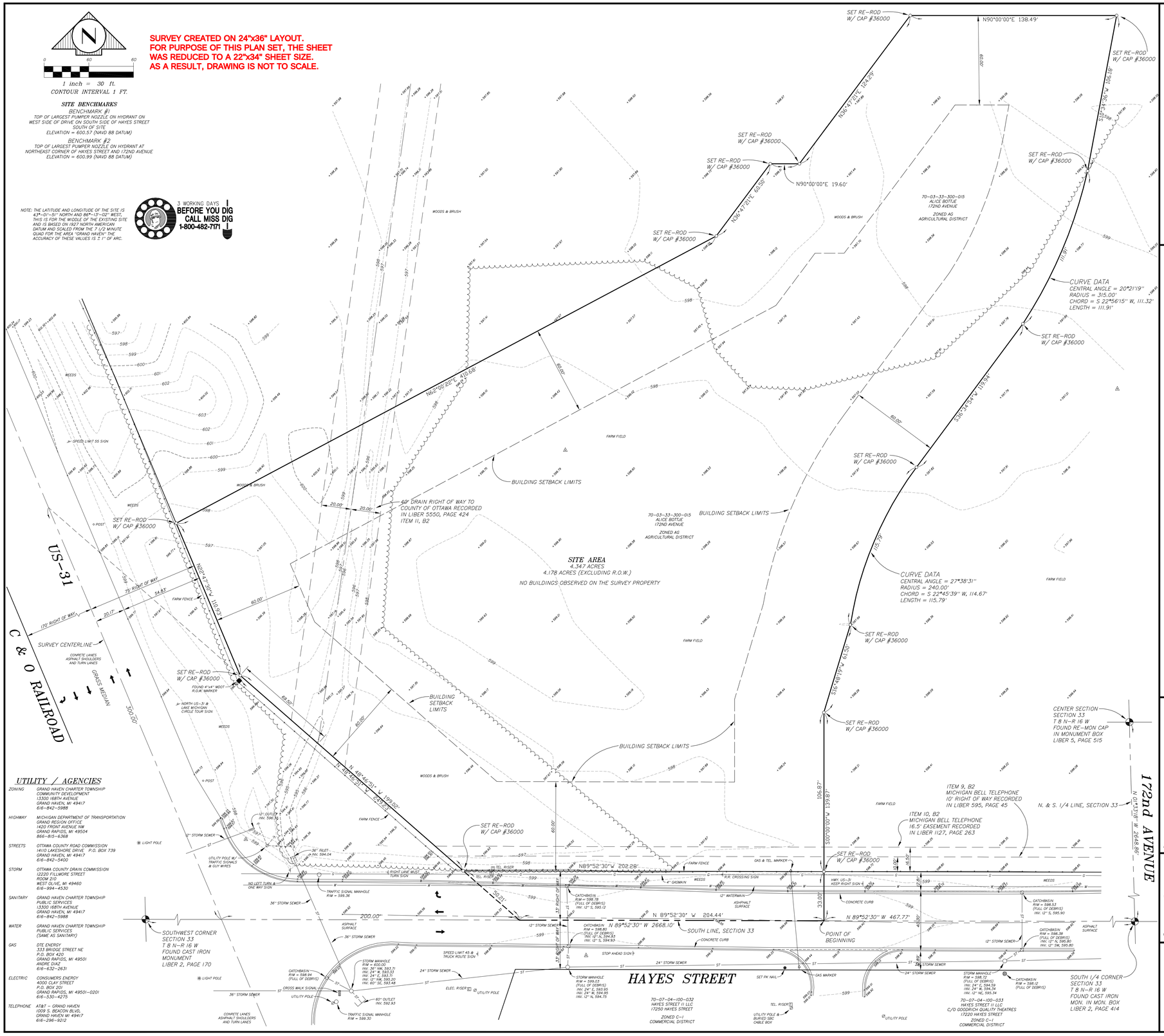
SITE BENCHMARKS

BENCHMARK #1
TOP OF LARGEST PUMPER NOZZLE ON HYDRANT ON WEST SIDE OF DRIVE ON SOUTH SIDE OF HAYES STREET SOUTH OF SITE
ELEVATION = 600.57 (NAVD 88 DATUM)

BENCHMARK #2
TOP OF LARGEST PUMPER NOZZLE ON HYDRANT AT NORTHEAST CORNER OF HAYES STREET AND 172ND AVENUE
ELEVATION = 600.99 (NAVD 88 DATUM)

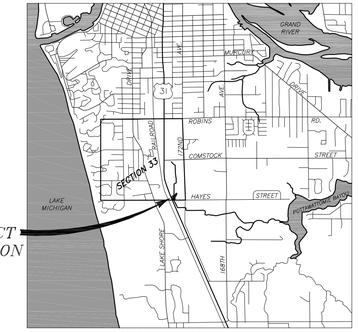
NOTE: THE LATITUDE AND LONGITUDE OF THE SITE IS 43°-01'-51" NORTH AND 86°-13'-02" WEST, THIS IS FOR THE MIDDLE OF THE EXISTING SITE AND IS BASED ON 1927 NORTH AMERICAN DATUM AND SCALED FROM THE 7 1/2 MINUTE QUAD FOR THE AREA "GRAND HAVEN" THE ACCURACY OF THESE VALUES IS ± 1' OF ARC.

3 WORKING DAYS
BEFORE YOU DIG
CALL MISS DIG
1-800-482-7171



UTILITY / AGENCIES

ZONING	GRAND HAVEN CHARTER TOWNSHIP COMMUNITY DEVELOPMENT 13300 168TH AVENUE GRAND HAVEN, MI 49417 616-842-5988
HIGHWAY	MICHIGAN DEPARTMENT OF TRANSPORTATION GRAND REGION OFFICE 1420 FRONT AVENUE NW GRAND RAPIDS, MI 49504 866-855-6368
STREETS	OTTAWA COUNTY ROAD COMMISSION 1410 LAKESHORE DRIVE, P.O. BOX 739 GRAND HAVEN, MI 49417 616-842-5400
STORM	OTTAWA COUNTY DRAIN COMMISSION 12220 FILLMORE STREET ROOM 210 WEST OLIVE, MI 49460 616-994-4530
SANITARY	GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES 13300 168TH AVENUE GRAND HAVEN, MI 49417 616-842-5988
WATER	GRAND HAVEN CHARTER TOWNSHIP PUBLIC SERVICES (SAME AS SANITARY)
GAS	DTE ENERGY 333 BRIDGE STREET NE P.O. BOX 420 GRAND RAPIDS, MI 49501 ANDRE DIAZ 616-632-2631
ELECTRIC	CONSUMERS ENERGY 4000 CLAY STREET P.O. BOX 201 GRAND RAPIDS, MI 49501-0201 616-530-4275
TELEPHONE	AT&T - GRAND HAVEN 1009 S. BEACON BLVD. GRAND HAVEN, MI 49417 616-296-9212



LOCATION MAP
(NO SCALE)

PARENT PARCEL LEGAL DESCRIPTION

(AS PROVIDED FROM FIDELITY NATIONAL TITLE INSURANCE COMPANY COMMITMENT No. N-107719, DATED OCTOBER 17, 2012)
LAND SITUATED IN THE TOWNSHIP OF GRAND HAVEN, COUNTY OF OTTAWA, AND STATE OF MICHIGAN, DESCRIBED AS:
THAT PART OF THE SOUTH 9/16 OF THE EAST 1/2 OF THE SOUTHWEST 1/4, LYING EAST OF NEW U.S. 31, SECTION 33, TOWN 8 NORTH, RANGE 16 WEST. EXCEPTING THEREFROM THAT PART DEEDED FOR ROAD IN LIBER 1853, PAGE 29, DESCRIBED AS A PARCEL OF LAND LOCATED IN THE SOUTH 9/16 OF THE EAST 1/2 OF THE SOUTHWEST 1/4, OF SECTION 33, LYING EAST OF US-31, TOWNSHIP 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, COMMENCING AT THE SOUTH 1/4 CORNER OF SAID SECTION; THENCE NORTH ALONG THE NORTH-SOUTH 1/4 LINE 800.0 FEET; THENCE WEST PARALLEL TO THE SOUTH LINE OF SAID SECTION 33.0 FEET; THENCE SOUTHWESTERLY TO A POINT ON THE SOUTH LINE OF SAID SECTION WHICH IS 98.52 FEET WEST OF SAID SOUTH 1/4 CORNER; THENCE EAST ALONG SAID SOUTH LINE 98.52 FEET TO THE POINT OF BEGINNING.

PURCHASE PARCEL LEGAL DESCRIPTION

A PARCEL OF LAND LOCATED IN THE E 1/2 OF THE SW 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN DESCRIBED AS: BEGINNING AT A POINT ON THE SOUTH LINE OF SAID SECTION 33, WHICH IS N 89°52'30" W, 467.77 FEET FROM THE SOUTH 1/4 CORNER; THENCE CONTINUING N 89°52'30" W, 204.44 FEET TO THE EASTERLY RIGHT-OF-WAY OF HIGHWAY US-31; THENCE ALONG SAID RIGHT-OF-WAY FOR THE NEXT TWO COURSES, N 48°46'51" W, 249.23 FEET; THENCE N 22°47'30" W, 110.93 FEET; THENCE N 62°00'22" E, 410.68 FEET; THENCE N 36°47'21" E, 60.50 FEET; THENCE N 90°00'00" E, 19.60 FEET; THENCE N 36°47'21" E, 124.29 FEET; THENCE N 90°00'00" E, 138.49 FEET; THENCE S 10°34'36" W, 106.18 FEET; THENCE ALONG A 315.00 FOOT RADIUS CURVE TO THE RIGHT (CENTRAL ANGLE = 20°21'19", CHORD DIST. = 111.32 FEET, CHORD BEARING = S 22°56'15" W) FOR 111.91 FEET; THENCE S 36°34'54" W, 119.94 FEET; THENCE ALONG A 240.00 FOOT RADIUS CURVE TO THE LEFT (CENTRAL ANGLE = 27°38'31", CHORD DIST. = 114.67 FEET, CHORD BEARING = S 22°45'39" W) FOR 115.79; THENCE S 16°48'19" W, 61.50 FEET; THENCE S 00°00'00" E, 139.87 FEET TO THE POINT OF BEGINNING. CONTAINING 4.358 ACRES. SUBJECT TO THE RIGHT-OF-WAY OF HAYES ROAD OVER THE SOUTHERLY 33 FEET THEREOF.

GENERAL NOTES

1. THIS SURVEY WAS CONDUCTED BY LOCATING THE FOUR SECTION CORNERS AND LEGAL DESCRIPTION PROVIDED. THE CORNERS WERE FOUND OR SET AS NOTED ON THE DRAWING.
2. THE BASIS OF BEARING IS BASED ON THE SOUTH LINE OF SECTION 33 FROM THE LEGAL DESCRIPTION PROVIDED.
3. THE BENCHMARKS WERE ESTABLISHED BY GPS USING GRAND RAPIDS CORS STATION OPERATED BY MDOT CORS (NAVD 88 DATUM).
4. THE PARCEL IS ZONED "PUD-C".
5. THE UTILITIES SHOWN ARE LOCATED ACCORDING TO DATA GATHERED IN THE FIELD AND INFORMATION SUPPLIED BY GRAND HAVEN TOWNSHIP. INVERT ELEVATIONS ARE FROM PLANS AND WERE NOT MEASURED.
6. THE PROPERTY IS LOCATED IN ZONE X (AREAS DETERMINED TO BE OUTSIDE OF THE 0.2± ANNUAL CHANCE FLOODPLAIN). AS DEFINED BY THE FEDERAL FLOOD INSURANCE PROGRAM. MAP NO. 26139C0087E, DATED DECEMBER 16, 2011.
7. THERE ARE NO PLACES OF PUBLIC GATHERING WITHIN 500 FEET OF THE PROPERTY.

EASEMENTS

1. ITEM 6, B2 OF COMMITMENT No. N-107719, RIGHT OF WAY IN FAVOR OF CONSUMERS POWER COMPANY, AS RECORDED IN LIBER 284, PAGE 198. (DOES NOT APPLY)
2. ITEM 7, B2 OF COMMITMENT No. N-107719, PIPE LINE EASEMENT, AND THE TERMS, CONDITIONS AND PROVISIONS CONTAINED THEREIN, IN FAVOR OF WOLVERINE PIPE LINE COMPANY, A DELAWARE CORPORATION, AS RECORDED IN LIBER 511, PAGE 202. (DOES NOT APPLY)
3. ITEM 8, B2 OF COMMITMENT No. N-107719, RIGHT-OF-WAY EASEMENT FOR WOLVERINE ELECTRIC COOPERATIVE TRANSMISSION LINE, AND THE TERMS, CONDITIONS AND PROVISIONS CONTAINED THEREIN, IN FAVOR OF WOLVERINE ELECTRIC COOPERATIVE INCORPORATED, AS RECORDED IN LIBER 526, PAGE 240. REAFFIRMATION AND AMENDMENT TO RIGHT OF WAY EASEMENT AGREEMENT RECORDED IN INSTRUMENT NO. 2012-0029230. (DOES NOT APPLY)
4. ITEM 9, B2 OF COMMITMENT No. N-107719, RIGHT OF WAY IN FAVOR OF MICHIGAN BELL TELEPHONE COMPANY, A MICHIGAN CORPORATION, AS RECORDED IN LIBER 595, PAGE 45. (APPLIES AS SHOWN)
5. ITEM 10, B2 OF COMMITMENT No. N-107719, EASEMENT IN FAVOR OF MICHIGAN BELL TELEPHONE COMPANY, A MICHIGAN CORPORATION, AS RECORDED IN LIBER 1127, PAGE 263. (APPLIES AS SHOWN)
6. ITEM 11, B2 OF COMMITMENT No. N-107719, RELEASE OF RIGHT OF WAY IN FAVOR OF THE COUNTY DRAIN COMMISSIONER OF THE COUNTY OF OTTAWA AND STATE OF MICHIGAN, AS RECORDED IN LIBER 5550, PAGE 424. (APPLIES AS SHOWN)

CERTIFICATE

TO: Speedway LLC and Fidelity National Title Insurance Company.

This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2011 Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS and includes items 1, 3-5, 6a, 7a, 8-9, 11, 11b, 13, 17 and 22 (Marathon Standards) of Table A thereof The field work was completed November 12-14, 2012.

This survey was made in accordance with the minimum standard requirements for land surveys in the State of Michigan and meets all requirements with regards to minimum angle, distance and closure for this class of survey.

Date: NOVEMBER 28, 2012 — Stephen K. Smith, P.S. 36000

BOUNDARY AMENDED DECEMBER 12, 2014 & JUNE 17, 2015.

LEGEND

P	PARKING SPACE					△	SURVEY CONTROL POINT
●	FOUND PROPERTY CORNER	G	BURIED GAS MAIN		GAS FILL VALVE	G	GAS METER
○-	SET PROPERTY CORNER	W	WATERMAIN		STOP BOX	E	ELECTRIC METER
----->	UTILITY POLE W/ GUY WIRE	T	TELEPHONE		PHONE BOOTH		U.G. UTILITY MARKER
	METAL LGT. POLE, CONC. BASE	OH	OVERHEAD WIRES	569.13	SPOT ELEVATIONS		CATCHBASINS
	HYDRANT	S	SANITARY SEWER		WATER VALVE		MANHOLE
	ROAD SIGN	ST	STORM DRAIN		CONTOUR LINE		METAL POST
	SIGN	TV	CABLE TELEVISION		MONITORING WELL		MAILBOX

ALTA/ACSM Land Title Survey for:

SPEEDWAY LLC

500 SPEEDWAY DRIVE
ENON, OHIO 45323

PREPARED BY:

INLAND SEAS ENGINEERING

MAILING ADDRESS
P.O. BOX 6820, TRAVERSE CITY, MI 49696
SHIPPING ADDRESS
1755 BARLOW STREET, TRAVERSE CITY, MI 49686
(231) 933-4041

SHEET 1 OF 1
PROJECT # 12164

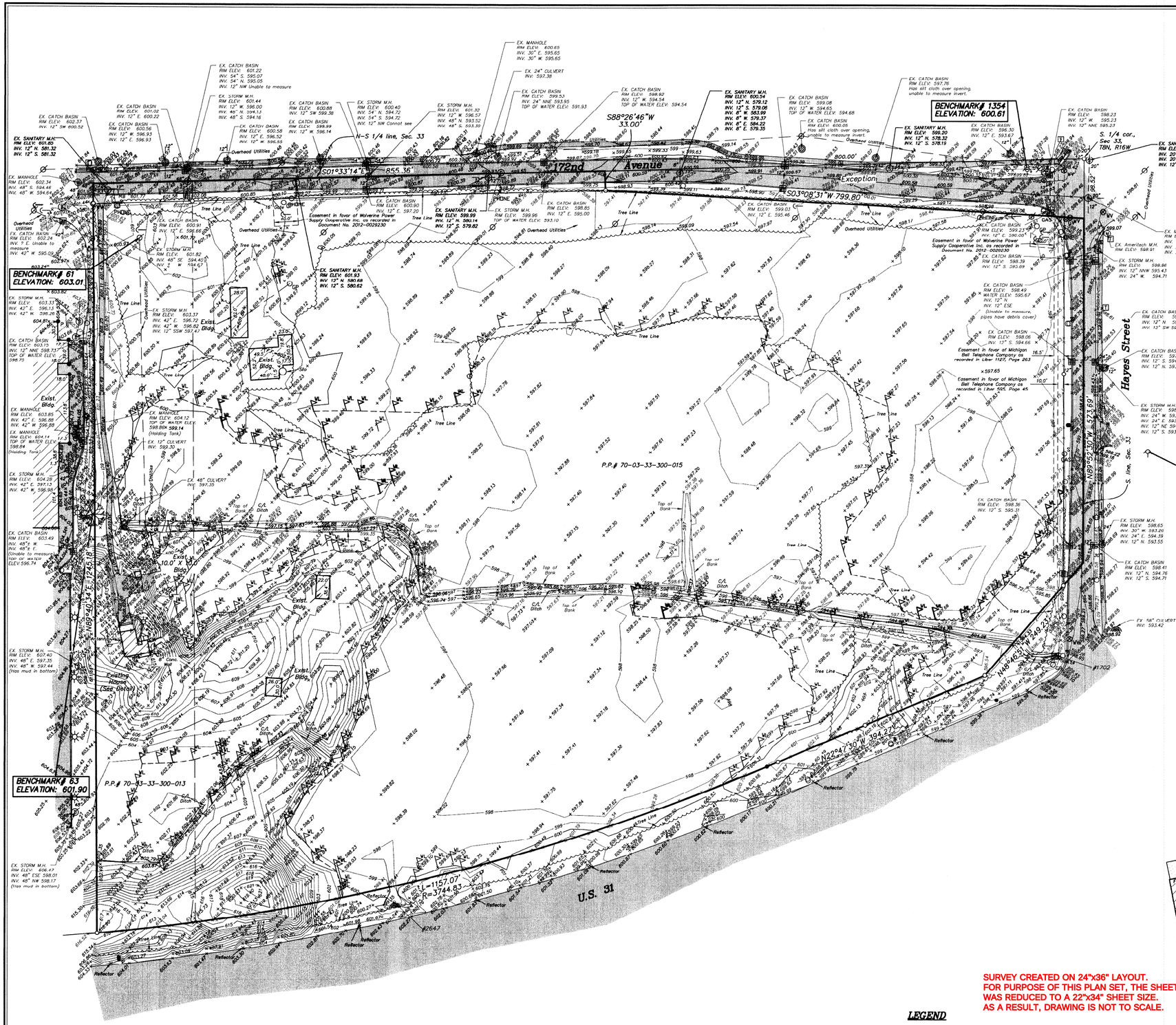
SITE LOCATION:

UNIT NO. 100196

HAYES STREET
(HAYES STREET AND US-31)
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY
GRAND HAVEN, MICHIGAN 49417

CPU - L:\LAND PROJECTS 2008\12164\DWG\12164-ALTA.DWG

UNIT #100196



GENERAL NOTES

1. 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.

2. NOTE TO CONTRACTORS: 3 (THREE) WORKING DAYS BEFORE YOU DIG, CALL MISS DIG AT TOLL FREE 1-800-482-7171 FOR UTILITY LOCATIONS ON THE GROUND.

3. This topographic survey was performed during a period of snow and ice covering. While every effort was made to locate all features, snow and/or ice may have prevented all features from being visible.

4. Basis of Bearing is from MDOT US-31 Right-of-Way Map Project 70-41, File No. 70-K-1, sheet No. 8. South line of the SW 1/4 of Section 33 is N89°52'30"E.

SITE BENCHMARKS

BENCHMARK #61 ELEVATION ---------- 603.01 (NAVD88)
Set railroad spike in power pole, pole is 90'± West of 172nd Avenue and 77'± S. of the North property line.

BENCHMARK #63 ELEVATION ---------- 601.90 (NAVD88)
Railroad spike in Northwest side of 14" Tree located 4' North of North property line and 547'± West of 172nd Avenue.

BENCHMARK #1354 ELEVATION ---------- 600.61 (NAVD88)
Top of largest pumper nozzle on hydrant located at the Northeast corner of Hayes Street & 172nd Avenue.

BENCHMARK #1652 ELEVATION ---------- 600.17 (NAVD88)
Top of largest pumper nozzle on hydrant located on the West side of the drive located on the South side of Hayes Street (South of site).

DESCRIPTION:

The land referred to herein below is situated in the Township of Grand Haven, County of Ottawa, and State of Michigan, to wit:

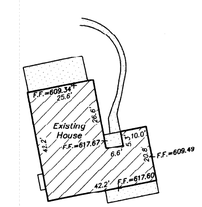
Parcel 1: The North 1/2 of the South 1/2 of the Southwest 1/4 of the Southeast 1/4 of Section 33, Town 8 North, Range 16 West.

Parcel 2: The South 1/2 of the North 1/2 of the Southwest 1/4 of the Southeast 1/4 of Section 33, Town 8 North, Range 16 West.

(Safe Title Commitment No. 025619-ST01, dated March 5, 2013)

HOUSE DETAIL

No Scale



LEGEND

Concrete

Asphalt

SURVEY CREATED ON 24"x36" LAYOUT.
FOR PURPOSE OF THIS PLAN SET, THE SHEET WAS REDUCED TO A 22"x34" SHEET SIZE.
AS A RESULT, DRAWING IS NOT TO SCALE.

N W E S

SCALE 1" = 80'

80 40 0 80 160

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.

NEDERVELD
www.nederveld.com
800.222.1868

ANN ARBOR
3025 Miller Road
Ann Arbor, MI 48103
PHONE: 734.929.6963

CHICAGO
1082 National Parkway
Schaumburg, IL 60173
PHONE: 312.878.3897

COLUMBUS
6355 Old Avery Road, Suite A
Dublin, OH 43016
PHONE: 614.859.1127

GRAND RAPIDS
217 Grandville Ave., Suite 302
Grand Rapids, MI 49503
PHONE: 616.575.5190

HOLLAND
347 Hoover Boulevard
Holland, MI 49423
PHONE: 616.393.0449

INDIANAPOLIS
8459 Castlewood Dr., Suite B
Indianapolis, IN 46250
PHONE: 317.288.3762

Topographic Survey of:

Wilson - Hayes

PART OF THE SW 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

COMPANY NAME/CLIENT
Address of Client
City, State
Phone #

checked	date	no.	comment	date
		1	Revised Wetland Markers	03-11-13
		2	Received Title	03-12-13
		3	Took additional Topo in field & measured structure in mid-13	04-09-13
		4	Took additional Topo in the Northwest corner of property in field & measured additional structure in mid-13	04-29-13
checked by:		date:	drawn by: db	date: 12-12-13

project no.: 13200084

TO.4

sheet no.: 1 OF 1

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13200084.10 CB 12/12/13 9:19

FRONT ELEVATION

REAR ELEVATION

exp U.S. Services Inc.
t: +1.614.744.4300 | f: +1.614.744.4350
150 E. Gay Street
Suite 1510
Columbus, OH 43215
U.S.A.
www.exp.com

Speedway®

Prepared By:
Speedway
Design, Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PM/ APR DATE	ENGINEER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
	REVISED PLAN PER NOTES REVIEW	11/19/14	11/19/14	11/19/14
	DRAWN / ROAD COMMISSION PRELIMINARY PLAN REVIEW SUBMITTAL	01/20/15	01/20/15	01/20/15
	SITE PLAN REVIEW	06/02/15	06/02/15	06/02/15

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EXTERIOR ELEVATIONS
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

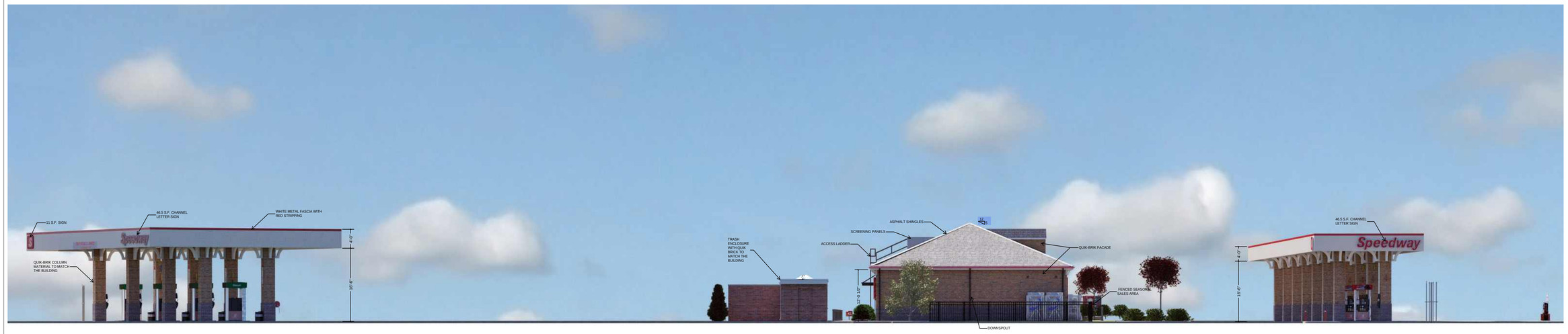
STORE OR BLDG NO. 1830

VERSION OR AFE NO. 72526

SCALE **N/A**

DESIGN TEAM		DATE
DGNR.	SCHRANK	06/05/15
PM./DP.	WLODYKA	06/05/15
RVR./DP.	COUGHLIN	06/05/15

DRWG. NO. 100196-A1



LEFT ELEVATION

RIGHT ELEVATION

exp U.S. Services Inc.
t: +1.614.744.4300 | f: +1.614.744.4350
150 E. Gay Street
Suite 1510
Columbus, OH 43215
U.S.A.
www.exp.com

Prepared By:
Speedway
Engineering and Construction Dept.
Enon, OH 45323

NO.	REVISIONS	DESIGNER DATE	PM/_MGR DATE	ENGINEER DATE
	SITE PLAN APPROVAL ISSUE	8/29/14	8/29/14	8/29/14
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	SITE PLAN REVIEW	06/02/15	06/02/15	06/02/15

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EXTERIOR ELEVATIONS
NEW BUILD
US 31 & HAYES ST
OTTAWA COUNTY
GRAND HAVEN, MI

STORE OR BLDG NO.	1830
VERSION OR AFE NO.	72526
SCALE	N/A

DESIGN TEAM		DATE
DGNR.	SCHRANK	06/05/15
PM./DP.	WLODYKA	06/05/15
RVR./DP.	COUGHLIN	06/05/15

DRWG. NO.
100196-A2

red leonard associates
5630 BRIDGETOWN RD SUITE 2 - CINCINNATI, OH 45248
(513) 574 - 9500 - redleonard.com

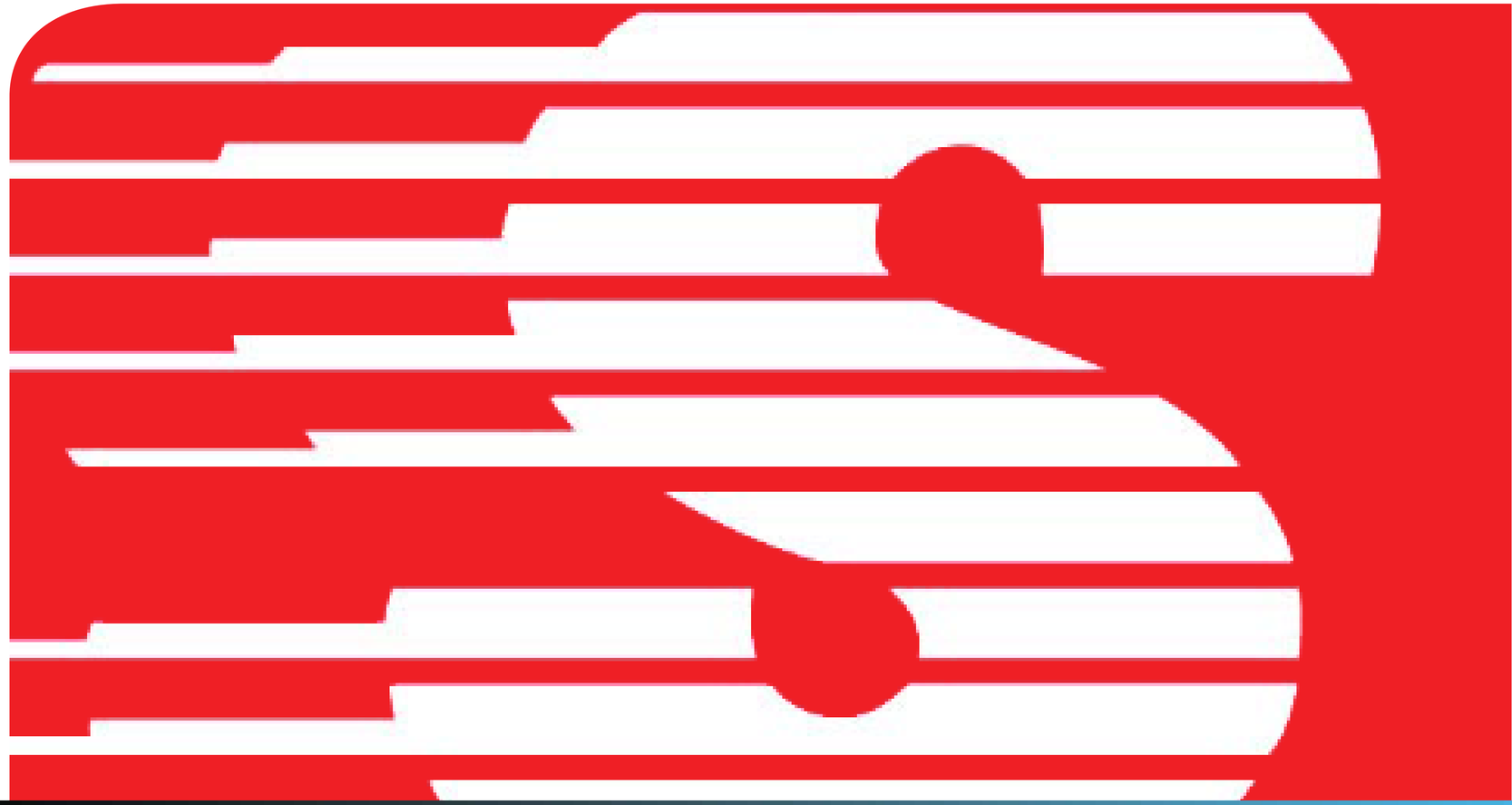
SPEEDWAY #1830

RL-2974-S1-R1

6/25/15

US 31 & HAYES ST
GRAND HAVEN, MI

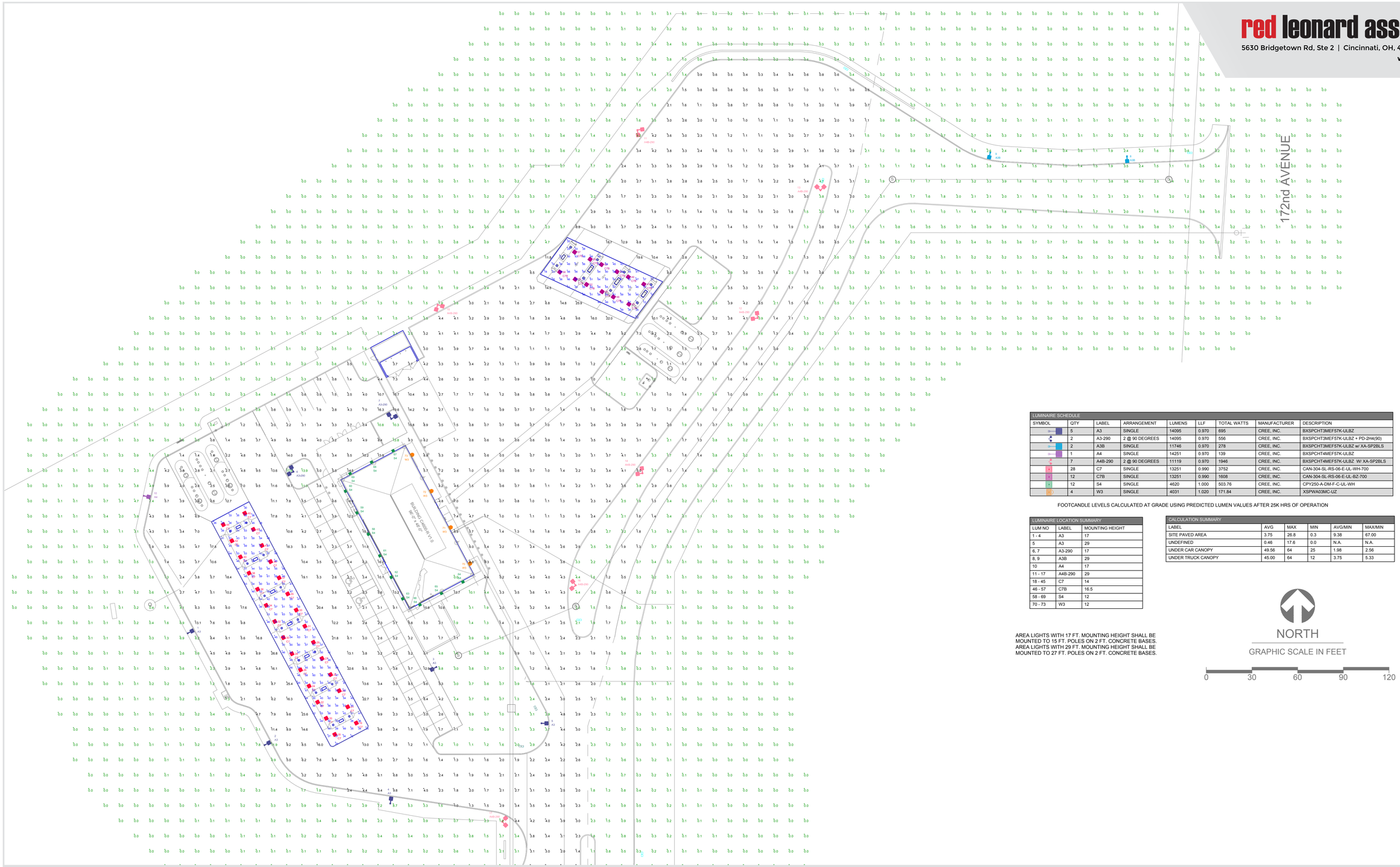
SCAN CODE FOR SITE LOCATION



1. Exterior Photometric Application
2. Fixture Detail
3-5. Fixture Specification

EXTERIOR
LIGHTING LAYOUT

red leonard associates
5630 Bridgetown Rd, Ste 2 | Cincinnati, OH, 45248 | 513-574-9500
www.redleonard.com



LUMINAIRE SCHEDULE								
SYMBOL	QTY	LABEL	ARRANGEMENT	LUMENS	LLF	TOTAL WATTS	MANUFACTURER	DESCRIPTION
	5	A3	SINGLE	14095	0.970	695	CREE, INC.	BXSPCHT3MEF57K-ULBZ
	2	A3-290	2 @ 90 DEGREES	14095	0.970	556	CREE, INC.	BXSPCHT3MEF57K-ULBZ + PD-2H4(90)
	2	A3B	SINGLE	11746	0.970	278	CREE, INC.	BXSPCHT3MEF57K-ULBZ w/ XA-SP2BLS
	1	A4	SINGLE	14251	0.970	139	CREE, INC.	BXSPCHT4MEF57K-ULBZ
	7	A4B-290	2 @ 90 DEGREES	11119	0.970	1946	CREE, INC.	BXSPCHT4MEF57K-ULBZ W/ XA-SP2BLS
	28	C7	SINGLE	13251	0.990	3752	CREE, INC.	CAN-304-SL-RS-06-E-UL-WH-700
	12	C7B	SINGLE	13251	0.990	1608	CREE, INC.	CAN-304-SL-RS-06-E-UL-BZ-700
	12	S4	SINGLE	4620	1.000	503.76	CREE, INC.	CPY250-A-DM-F-C-UL-WH
	4	W3	SINGLE	4031	1.020	171.84	CREE, INC.	XSPWA03MC-UZ

FOOTCANDLE LEVELS CALCULATED AT GRADE USING PREDICTED LUMEN VALUES AFTER 25K HRS OF OPERATION

LUMINAIRE LOCATION SUMMARY		
LUM NO	LABEL	MOUNTING HEIGHT
1 - 4	A3	17
5	A3	29
6, 7	A3-290	17
8, 9	A3B	29
10	A4	17
11 - 17	A4B-290	29
18 - 45	C7	14
46 - 57	C7B	16.5
58 - 69	S4	12
70 - 73	W3	12

AREA LIGHTS WITH 17 FT. MOUNTING HEIGHT SHALL BE MOUNTED TO 15 FT. POLES ON 2 FT. CONCRETE BASES. AREA LIGHTS WITH 29 FT. MOUNTING HEIGHT SHALL BE MOUNTED TO 27 FT. POLES ON 2 FT. CONCRETE BASES.

CALCULATION SUMMARY					
LABEL	AVG	MAX	MIN	AVG/MIN	MAX/MIN
SITE PAVED AREA	3.75	26.8	0.3	9.38	67.00
UNDEFINED	0.46	17.6	0.0	N.A.	N.A.
UNDER CAR CANOPY	49.56	64	25	1.98	2.56
UNDER TRUCK CANOPY	45.00	64	12	3.75	5.33

NORTH

GRAPHIC SCALE IN FEET

0 30 60 90 120

REV.	BY	DATE	DESCRIPTION
R1	DAR	6/24/15	REVISED AREA LIGHTS AND CANOPY LIGHTS - REFER TO LAYOUT AND SCHEDULES
.	.	.	.
.	.	.	.
.	.	.	.

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SCALE: 1" = 30'
DWG SIZE: D
LAYOUT BY: DAR
DATE: 6/12/15

PROJECT NAME:
SPEEDWAY #1830
GRAND HAVEN, MI
DRAWING NUMBER:
RL-2974-S1-R1

rla

SCAN CODE
FOR EXTERIOR OPTIONS

AREA

A3 | A3B | A4

AREA

A3-290 | A4B-290

CANOPY

C13

CANOPY

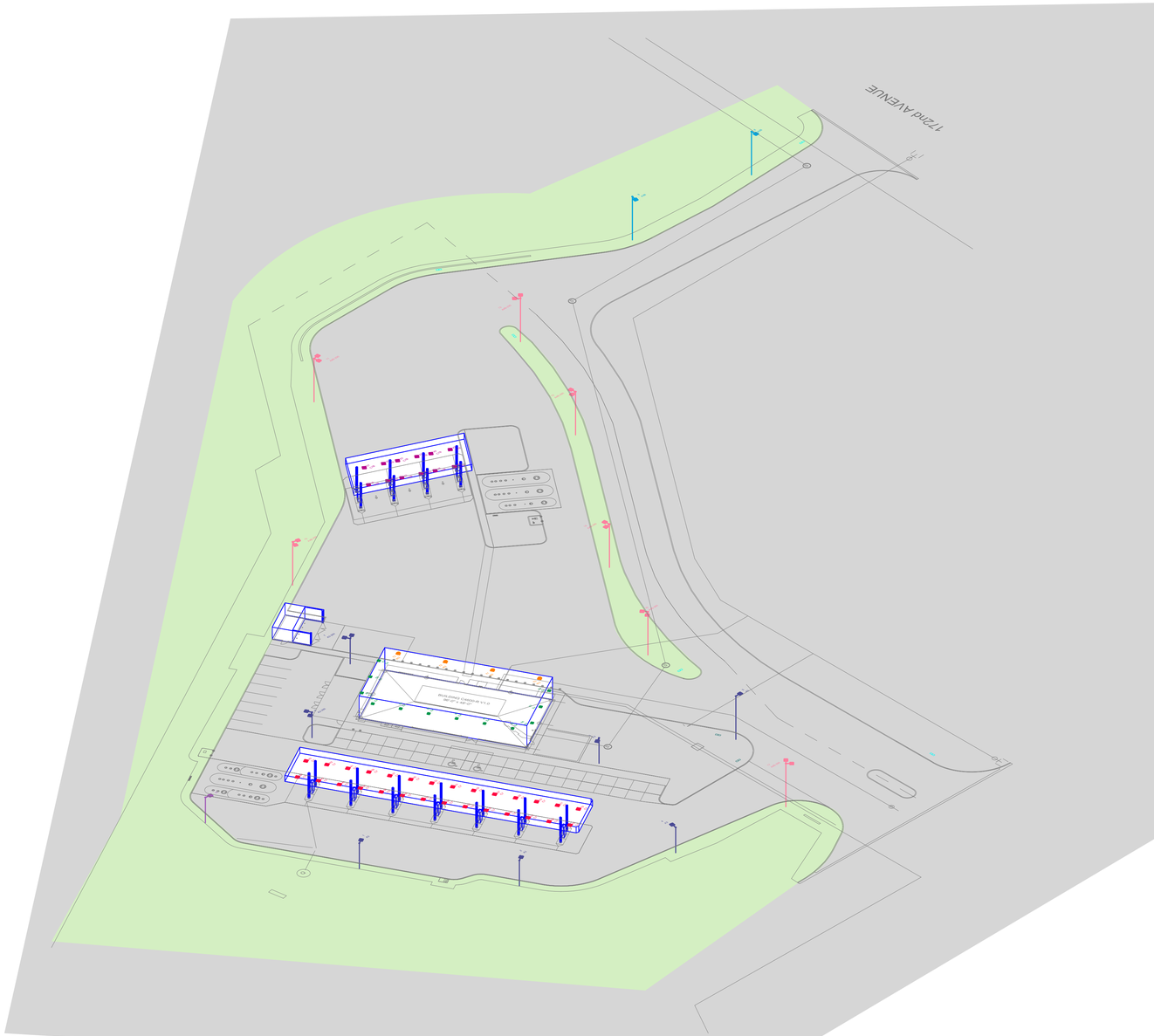
C7B

CANOPY

S4

WALL MOUNTED

W3



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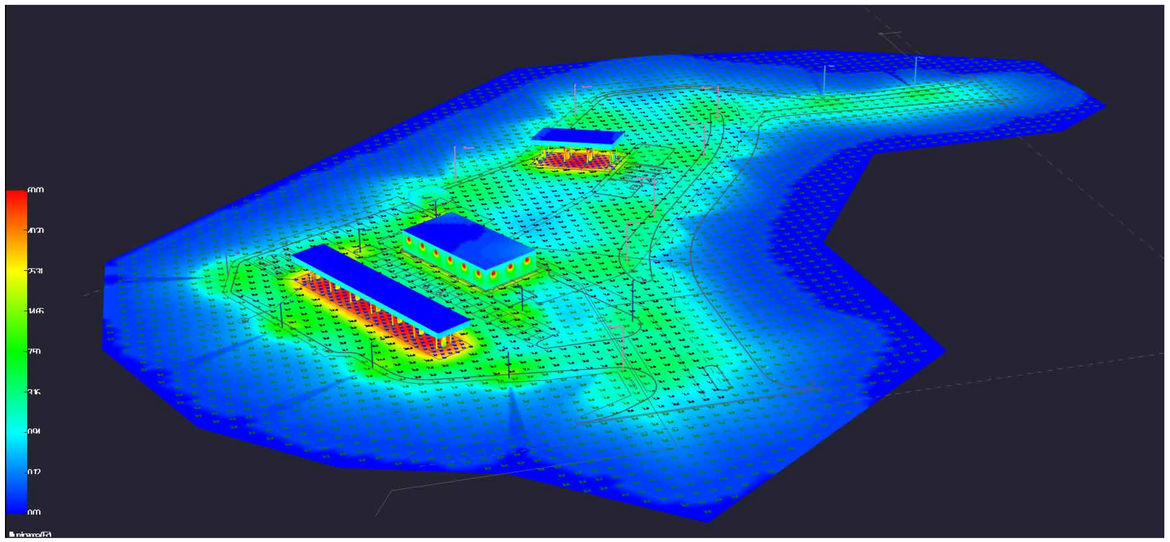

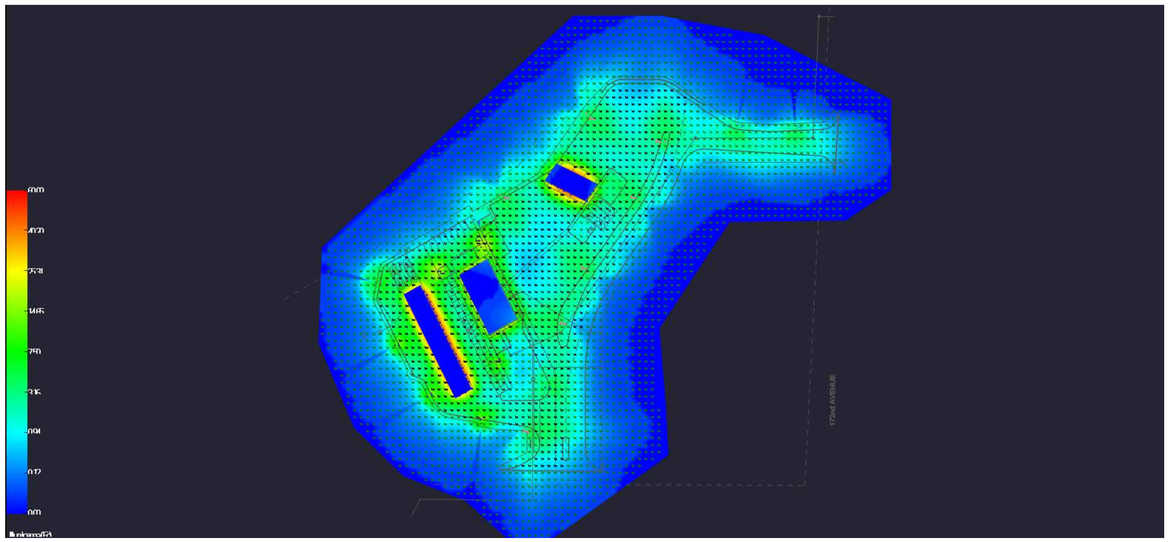

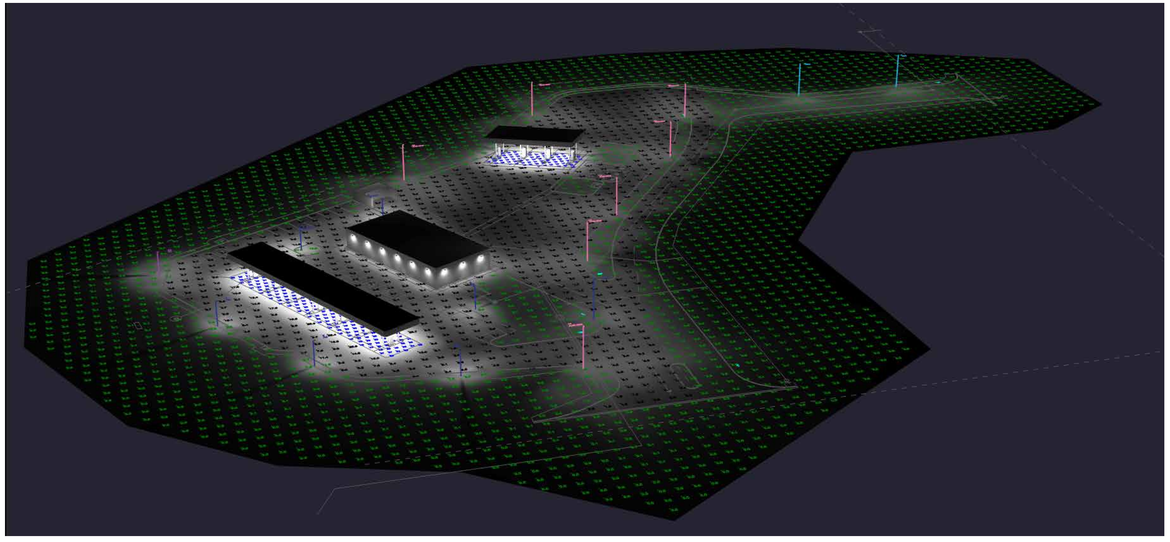

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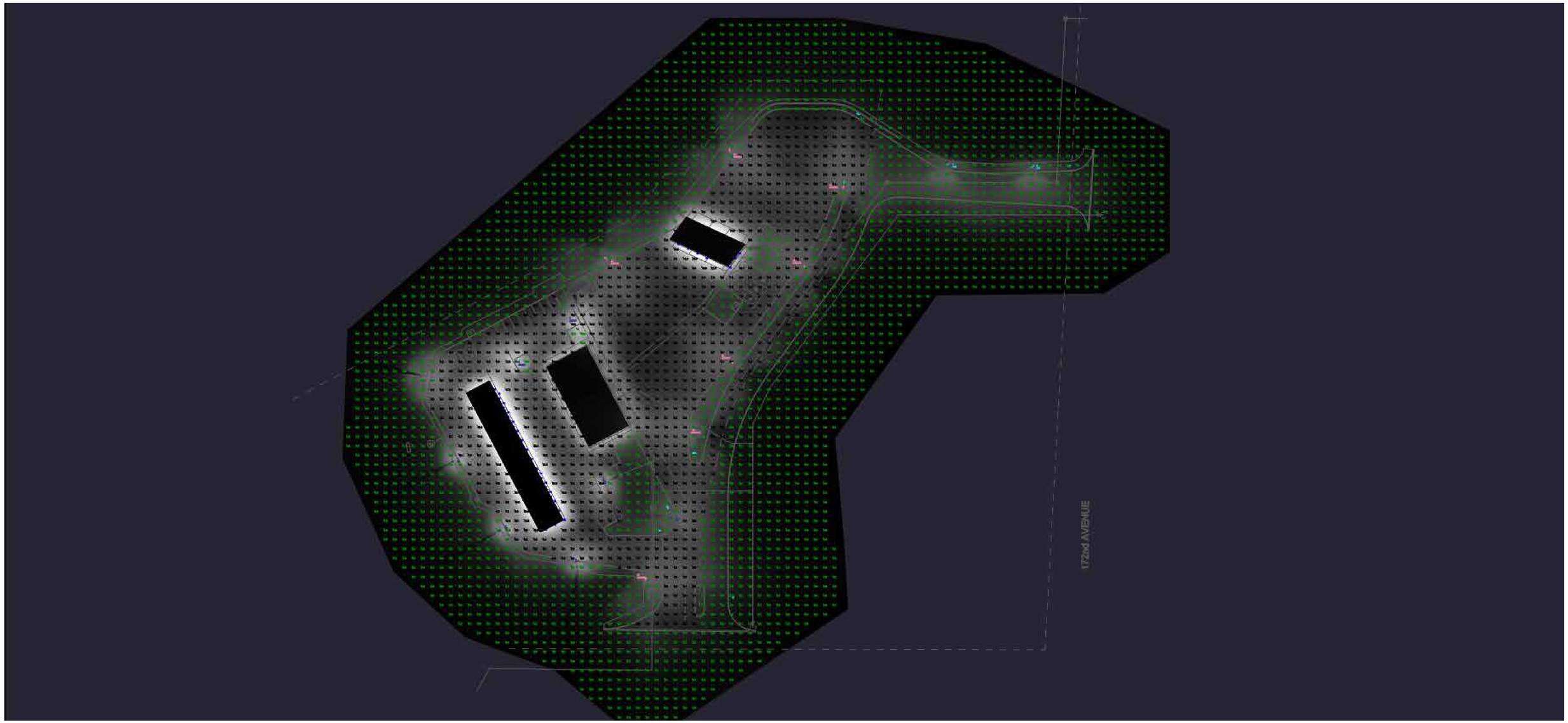

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AREA

SYMBOL	QTY	LABEL
	5	A3

BXSPCHT3MEF57K-ULBZ

SYMBOL	QTY	LABEL
	2	A3-290

BXSPCHT3MEF57K-ULBZ + PD-2H4(90)

SYMBOL	QTY	LABEL
	2	A3B

BXSPCHT3MEF57K-ULBZ W/XA-SP2BLS

SYMBOL	QTY	LABEL
	1	A4-290

BXSPCHT4MEF57K-ULBZ

SYMBOL	QTY	LABEL
	7	A4-290

BXSPCHT4MEF57K-ULBZ W/XA-SP2BLS

CANOPY / SOFFIT

SYMBOL	QTY	LABEL
	28	C7

CAN-304-SL-RS-06-E-UL-WH-700

SYMBOL	QTY	LABEL
	12	C7B

CAN-304-SL-RS-06-E-UL-BZ-700

SYMBOL	QTY	LABEL
	12	S4

CPY250-A-DM-F-C-UL-WH

WALL MOUNTED

SYMBOL	QTY	LABEL
	4	W3

XSPWA03MC-UZ

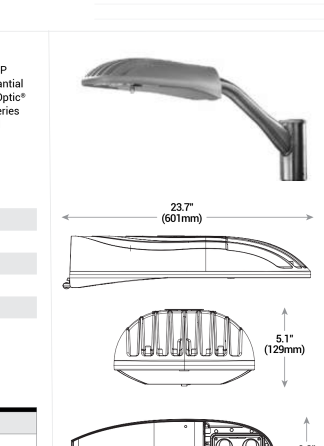
XSP Series
XSP1™ LED Street/Area Light – Single Module – Version C

Product Description

Designed from the ground up as a totally optimized LED street and area lighting system, the XSP Series delivers incredible efficiency without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves greater optical control with our NanoOptic® Precision Delivery Grid™ optic when compared to traditional cobra head luminaires. The XSP Series is the better alternative for traditional street and area lighting with quick payback and improved performance.
Applications: Roadway, parking lots, walkways and general area spaces

Performance Summary

- Utilizes BetaLED® Technology
- NanoOptic® Precision Delivery Grid™ optic
- Made in the U.S.A. of U.S. and imported parts
- **CRI:** Minimum 70 CRI (4000K & 5700K); 80 CRI (3000K)
- **CCT:** 3000K (+/- 300K); 4000K (+/- 300K); 5700K (+/- 500K)
- **Limited Warranty†:** 10 years on luminaire/10 years on Colorfast DeltaGuard® finish



Accessories

Field-Installed	
Backlight Control Shield XA-SP1BLS - Provides 1/2 mounting height cutoff **Bird Spikes** XA-SP1BRDSPK	**Four Point Mounting Kit** XA-XSP4PTMNT - Includes large bracket for mounting to 2" (51mm) IP, 2.375" (60mm) O.D., small bracket for mounting to 1.25" (32mm) IP, 1.66" (42mm) O.D. tenon, and mounting bolts

Ordering Information
Example: BXSP C HT 2ME E 30K-UL SV

Product	Version	Mounting	Optic	Input Power Designator	CCT	–	Voltage	Color Options	Options
BXSP	C	HT		E		–	UL		
BXSP	C	HT Horizontal Tenon	2ME• Type II Medium 2LG• Type II Long 3ME• Type III Medium 4ME• Type IV Medium	E 101W	30K 3000K 40K 4000K 57K 5700K	– US	UL Universal 120-277V	SV Silver BK Black BZ Bronze PB Platinum Bronze WH White	G Small Four Point Mounting - Mounts to 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon; J Large Four Point Mounting - Mounts to 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon; N Utility Label and NEMA® Photocell Receptacle - Includes Q9 option - Refer to Field Adjustable Output spec sheet for details; Q9 Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details; R NEMA® Photocell Receptacle - Photocell by others; UTL Utility - Label per ANSI C136.15 - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q9 option - Refer to Field Adjustable Output spec sheet for details

† See www.cree.com/lighting/products/warranty for warranty terms
• Available with Backlight Shield when ordered with field-installed accessory (see table above)

BetaLED® TECHNOLOGY c UL us Rev. Date: V2 09/16/2014 CREE®
US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

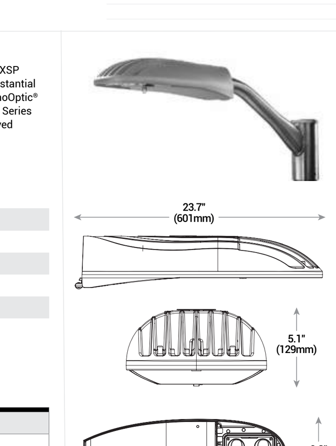
XSP Series
XSP1™ LED Street/Area Light – Single Module – Version C

Product Description

Designed from the ground up as a totally optimized LED street and area lighting system, the XSP Series delivers incredible efficiency without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves greater optical control with our NanoOptic® Precision Delivery Grid™ optic when compared to traditional cobra head luminaires. The XSP Series is the better alternative for traditional street and area lighting with quick payback and improved performance.
Applications: Roadway, parking lots, walkways and general area spaces

Performance Summary

- Utilizes BetaLED® Technology
- NanoOptic® Precision Delivery Grid™ optic
- Made in the U.S.A. of U.S. and imported parts
- **CRI:** Minimum 70 CRI (4000K & 5700K); 80 CRI (3000K)
- **CCT:** 3000K (+/- 300K); 4000K (+/- 300K); 5700K (+/- 500K)
- **Limited Warranty†:** 10 years on luminaire/10 years on Colorfast DeltaGuard® finish



Accessories

Field-Installed	
Backlight Control Shield XA-SP1BLS - Provides 1/2 mounting height cutoff **Bird Spikes** XA-SP1BRDSPK	**Four Point Mounting Kit** XA-XSP4PTMNT - Includes large bracket for mounting to 2" (51mm) IP, 2.375" (60mm) O.D., small bracket for mounting to 1.25" (32mm) IP, 1.66" (42mm) O.D. tenon, and mounting bolts

Ordering Information
Example: BXSP C HT 2ME E 30K-UL SV

Product	Version	Mounting	Optic	Input Power Designator	CCT	–	Voltage	Color Options	Options
BXSP	C	HT		E		–	UL		
BXSP	C	HT Horizontal Tenon	2ME• Type II Medium 2LG• Type II Long 3ME• Type III Medium 4ME• Type IV Medium	E 101W	30K 3000K 40K 4000K 57K 5700K	– US	UL Universal 120-277V	SV Silver BK Black BZ Bronze PB Platinum Bronze WH White	G Small Four Point Mounting - Mounts to 1.25" (32mm) IP, 1.66" (42mm) O.D. horizontal tenon; J Large Four Point Mounting - Mounts to 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon; N Utility Label and NEMA® Photocell Receptacle - Includes Q9 option - Refer to Field Adjustable Output spec sheet for details; Q9 Field Adjustable Output - Refer to Field Adjustable Output spec sheet for details; R NEMA® Photocell Receptacle - Photocell by others; UTL Utility - Label per ANSI C136.15 - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q9 option - Refer to Field Adjustable Output spec sheet for details

† See www.cree.com/lighting/products/warranty for warranty terms
• Available with Backlight Shield when ordered with field-installed accessory (see table above)

BetaLED® TECHNOLOGY c UL us Rev. Date: V2 09/16/2014 CREE®
US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

CPY Series
CPY250™ LED Canopy/Soffit Luminaire

Product Description

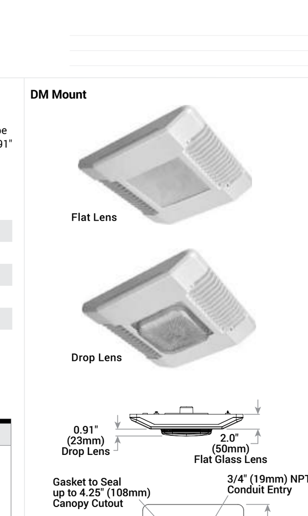
The CPY250™ LED Canopy/Soffit Luminaire has an extremely thin profile constructed of rugged cast aluminum. It can be surface mounted easily from below the canopy deck and also has the ability to be pendant mounted. Direct imaging of the LEDs is eliminated with a highly efficient patterned flat or 0.91" (23mm) drop glass lens.
Applications: Petroleum canopies, CNG fueling stations, low-medium bay general lighting, soffits

Performance Summary

- Made in the U.S.A. of U.S. and imported parts
- **CRI:** Minimum 70 CRI
- **CCT:** 4000K (+/- 300K), 5700K (+/- 500K) Standard
- **Limited Warranty†:** 10 years on luminaire/10 years on Colorfast DeltaGuard® finish
- IP66 Rated (Direct Mount only)
- Class I, Division II Hazardous Location for select models

† See www.cree.com/lighting/products/warranty for warranty terms

DM Mount



Weight
12.5 lbs (5.7kg)

Accessories

Field-Installed	
Direct Mount Luminaires **Canopy Upgrade Kits** XA-BXCCMW – for use with Jet-Philips XA-BXCCNW – for use with Elsco Franciscan XA-BXCCPW – for use with LSI Dakota or Masters XA-BXCCQW – for use with Whiteway Riviera or Rig-A-Lite XA-BXCCRW – for use with Elsco Merrit XA-BXCCSW – for use with LSI Richmond or Whiteway Civic **Direct Mount Junction Box/Stem Kit** XA-BXCCJBOX – 6.0" (152mm) H x 3/4" (19mm) NPT Stem - Watertight - Rated for feed through 8 (4 in, 4 out) #12 AWC conductors **Direct Mount Beauty Plates** XA-BXCCBPW – Plate Only XA-BXCCBPB12W – Plate w/ 12" (305mm) Backer XA-BXCCBPB16W – Plate w/ 16" (406mm) Backer	*Pendant Mount Luminaires* **Fitting** XA-PSFTG – Pendant Fitting **Pendant Mount Kits** XA-PS22KIT* – 22" (559mm) XA-PS12KIT* – 12" (305mm) XA-PS18KIT* – 18" (457mm) - Pendant height from ceiling surface to bottom of fixture; mounting accessories or surface boxes will add to overall height **Hand-Held Remote** XA-SENSREM - For successful implementation of the programmable multi-level option, a minimum of one hand-held remote is required

* Must specify color

Ordering Information
Example: CPY250-A-DM-D-A-UL-SV

Product	Version	Mounting	Optic	Input Power Designator	Voltage	Color Options	Options
CPY250	A						
CPY250	A	DM Direct PD Pendant	D 0.91" (23mm) Drop Lens F Flat Lens	A 82W B 122W C 43W D 140W	UL Universal 120-277V UH Universal 347-480V - Available with A, B & D Input Power Designators only	BK Black BZ Bronze SV Silver WH White	DIM 0-10V Dimming - Available with B & D Input Power Designators only - Control by others - Refer to Dimming spec sheet for details - Can't exceed wattage of specified Input Power Designator; ML Multi-Level - Available with B & D Input Power Designators only - Refer to ML spec sheet for details - High: 100%, Low: 30%; PML Programmable Multi-Level - Available with B & D Input Power Designators only - Refer to PML spec sheet for details; 40K 4000K Color Temperature - Minimum 70 CRI - Color temperature per luminaire

BetaLED® TECHNOLOGY c UL us DLC RoHS Rev. Date: V4 05/29/2015 CREE™
US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415 Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

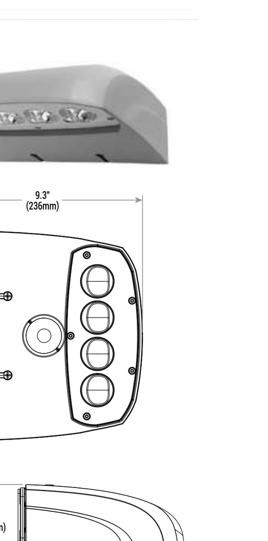
XSP Series
XSPW™ Wall Mount Luminaire

Product Description

The XSPW™ wall mount luminaire has a slim, low profile design intended for outdoor wall mounted applications. The rugged lightweight aluminum housing and mounting box are designed for installation over standard and mud ring single gang J-Boxes. The luminaire allows for through-wired or conduit entry from the top, bottom, sides and rear. The housing design is intended specifically for LED technology including a weathertight LED driver compartment and thermal management. Optic design features industry-leading NanoOptic® Precision Delivery Grid™ system in multiple distributions.
Applications: General area and security lighting

Performance Summary

- Utilizes BetaLED® Technology
- NanoOptic® Precision Delivery Grid™ optic
- Made in the U.S.A. of U.S. and imported parts
- **CRI:** Minimum 70 CRI
- **CCT:** 4000K (+/- 300K), 5700K (+/- 500K)
- **Limited Warranty†:** 10 years on luminaire/10 years on Colorfast DeltaGuard® finish



Ordering Information
Example: XSPWA02FC-UZ

Product	Version	Mounting	Optic	Modules	Input Power Designator	-	Voltage	Color Options	Options
XSPW	A	0							
XSPW	A	0 Wall	2 Type II 3 Type III	F 4000K M 5000K	C 42W G 25W	- US * Canada	U Universal 120-277V 1 120V 2 280-277V 6* 347V	Z Bronze S Silver T Black B Platinum Bronze W White	Y 0-10V Dimming - Control by others - Available with Input Power Designator C only - Refer to Dimming spec sheet for details; P Photocell - Not available with K options - Must specify 1, 2, or 6 voltage; K Multi-Level - Refer to ML spec sheet for details - Available with Input Power Designator C only

† See www.cree.com/lighting/products/warranty for warranty terms
• Available in Canada only

BetaLED® TECHNOLOGY c UL us DLC Rev. Date: V2 08/15/2014 CREE®
US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415 Canada: www.cree.com/canada T (800) 473-1234 F (800) 890-7507

XSP Series - Single Module - Version C

Product Specifications

CONSTRUCTION & MATERIALS
- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" (32mm) IP, 1.66" (42mm) O.D. or 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5˚ to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Luminaire secured with two mounting bolts standard; optional four point mounting available
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, black, bronze, platinum bronze and white are available
- **Weight:** 14.5 lbs. (6.6kg)

ELECTRICAL SYSTEM
- **Input Voltage**: 120-277V, 50/60Hz
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Class 1 driver
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- Meets CALTrans 611 Vibration testing
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA

Electrical Data•

Input Power Designator	System Watts 120-277V	Total Current 120V	208V	240V	277V
E	101	0.89	0.50	0.44	0.39

• Electrical data at 25˚C (77˚F)

Recommended Cree® Outdoor Luminaire Lumen Maintenance Factors (LMF)[1]

Ambient	Input Power Designator	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[3] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	E	1.04	0.97	0.91	0.85	0.79
10˚C (50˚F)	E	1.03	0.96	0.90	0.84	0.79
15˚C (59˚F)	E	1.02	0.95	0.89	0.83	0.78
20˚C (68˚F)	E	1.01	0.94	0.88	0.82	0.77
25˚C (77˚F)	E	1.00	0.93	0.87	0.81	0.76

[1] Lumen maintence values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)

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US: www.cree.com/lighting T (800) 236-6800 F (262) 504-5415

XSP Series - Single Module - Version C

Product Specifications

CONSTRUCTION & MATERIALS
- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" (32mm) IP, 1.66" (42mm) O.D. or 2" (51mm) IP, 2.375" (60mm) O.D. horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5˚ to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Luminaire secured with two mounting bolts standard; optional four point mounting available
- Designed with 0-10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Silver, black, bronze, platinum bronze and white are available
- **Weight:** 14.5 lbs. (6.6kg)

ELECTRICAL SYSTEM
- **Input Voltage**: 120-277V, 50/60Hz
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Class 1 driver
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- Meets CALTrans 611 Vibration testing
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA

Electrical Data•

Input Power Designator	System Watts 120-277V	Total Current 120V	208V	240V	277V
E	101	0.89	0.50	0.44	0.39

• Electrical data at 25˚C (77˚F)

Recommended Cree® Outdoor Luminaire Lumen Maintenance Factors (LMF)[1]

Ambient	Input Power Designator	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[3] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	E	1.04	0.97	0.91	0.85	0.79
10˚C (50˚F)	E	1.03	0.96	0.90	0.84	0.79
15˚C (59˚F)	E	1.02	0.95	0.89	0.83	0.78
20˚C (68˚F)	E	1.01	0.94	0.88	0.82	0.77
25˚C (77˚F)	E	1.00	0.93	0.87	0.81	0.76

[1] Lumen maintence values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)

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CPY250™ LED Canopy/Soffit Luminaire

Product Specifications

CONSTRUCTION & MATERIALS
- Slim, low profile design
- Easy mounting and servicing from below the deck
- Luminaire housing is constructed of rugged cast aluminum with integral heat sink specifically designed for LED
- Flat lens is 0.125" tempered Solite® glass
- Drop lens is 0.157" molded borosilicate glass
- Direct mount is suitable for use in single or double skin canopies with a minimum 4.0" (102mm) wide panels and a minimum 22 gauge, 0.030" (0.7mm) canopy thickness
- Direct mount luminaire mounts directly to the canopy deck with the drilling of a single 2" to 4" (51mm to 102mm) round hole, is secured in place with self-sealing screws that provides a weathertight seal and includes 3/4" (19mm) conduit entry for direct wire feed
- Pendant mount includes J-Box for customer wiring and is intended to be mounted by 3/4 IP pendant (by others)
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Black, bronze, silver and white are available
- **Weight:** 12.5 lbs. (5.7kg)

ELECTRICAL SYSTEM
- **Input Voltage:** 120-277V or 347-480V (A, B and D Input Power Designators only), 50/60Hz, Class 1 drivers
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 6kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used
- **10V Source Current:** 0.15mA
- **Operating Temperature Range:** A Input Power Designator: -40˚C - +40˚C (direct mount to plywood), -40˚C - +45˚C (direct mount to sheet metal/suspended); B Input Power Designator: -40˚C - +35˚C (plywood), -40˚C - +40˚C (sheet metal/suspended); C Input Power Designator: -40˚C - +45˚C (plywood), -40˚C - +50˚C (sheet metal/suspended); D Input Power Designator: -40˚C - +35˚C (sheet metal/suspended)
WARNING: Exceeding maximum operating temperature may result in thermal foldback

REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations when ordered with DM mount
- Suitable for damp locations when ordered with PD mount
- Enclosure rated IP66 per IEC 60529 when ordered with DM mount
- Consult factory for CE Certified products
- 6kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets FCC Part 15 standards for conducted and radiated emissions
- DLC qualified when ordered with A, B & C Input Power Designators. Please refer to www.designlights.org/QPL for most current information
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA
- RoHS compliant when ordered with DM mount. Consult factory for additional details
- Class I, Division II Hazardous Location rated when ordered with the following SKUs: CPY250 A DM D B-UL WH, CPY250 A DM F B-UL WH, CPY250 A DM D B-UH WH and CPY250 A DM F B-UH WH. Consult factory for additional details

Electrical Data*

Input Power Designator	System Watts 120-277V	System Watts 347-480V	Total Current 120V	208V	240V	277V	347V	480V
A	82	84	0.69	0.40	0.35	0.32	0.24	0.18
B	122	137	1.04	0.60	0.52	0.46	0.40	0.29
C	43	N/A	0.35	0.21	0.19	0.17	N/A	N/A
D	140	145	1.24	0.71	0.62	0.54	0.44	0.29

* Electrical data at 25˚C (77˚F)

Recommended CPY Series Lumen Maintenance Factors (LMF)[1]

Ambient	Input Power Designator	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Projected[2] LMF	100K hr Projected[2] LMF
5˚C (41˚F)	A & C	1.05	1.00	0.93	0.87	0.81
	B & D		0.98	0.90	0.83	0.76
10˚C (50˚F)	A & C	1.04	0.99	0.92	0.86	0.80
	B & D		0.98	0.89	0.82	0.75
15˚C (59˚F)	A & C	1.02	0.97	0.91	0.84	0.79
	B & D		0.96	0.88	0.80	0.74
20˚C (68˚F)	A & C	1.01	0.96	0.90	0.84	0.78
	B & D		0.95	0.87	0.80	0.73
25˚C (77˚F)	A & C	1.00	0.95	0.89	0.83	0.77
	B & D		0.94	0.86	0.79	0.72
30˚C (86˚F)	A & C	0.99	0.94	0.88	0.82	0.76
	B & D		0.93	0.85	0.78	0.72

[1] Lumen maintenance values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing on sheet metal
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)

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XSP Series

Product Specifications

CONSTRUCTION & MATERIALS
- Slim, low profile design
- Luminaire housing specifically designed for LED applications with advanced LED thermal management and driver
- Luminaire mounting box designed for installation over standard and mud ring single gang J-Boxes
- Luminaire can also be direct mounted to a wall and surface wired
- Secures to wall with four 3/16" (5mm) screws (by others)
- Conduit entry from top, bottom, sides, and rear
- Designed and UL approved for easy through-wiring
- Designed for downlight applications only
- Exclusive Colorfast DeltaGuard® finish features an E-coat epoxy primer with an ultra-durable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Bronze, silver, black, white, and platinum bronze are available
- **Weight:** 9.5lbs. (4.3kg)

ELECTRICAL SYSTEM
- **Input Voltage:** 120-277V or 347V, 50/60Hz, Class 2 driver
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Enclosure rated IP66 per IEC 60529
- DLC qualified
- Please refer to http://www.designlights.org/QPL for most current information
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- Meets Buy American requirements within ARRA

Electrical Data•

Input Power Designator	System Watts 120-277V	System Watts 347V	Total Current 120V	208V	240V	277V	347V
C	42	46	0.35	0.20	0.18	0.15	0.14
G	25	27	0.21	0.12	0.10	0.09	0.15

• Electrical data at 25˚C (77˚F)

Recommended Cree® Outdoor Luminaire Lumen Maintenance Factors (LMF)[1]

Ambient	Input Power Designator	Initial LMF	25K hr Projected[2] LMF	50K hr Projected[2] LMF	75K hr Calculated[3] LMF	100K hr Calculated[3] LMF
5˚C (41˚F)	C / G	1.04	1.02	1.01	1.00	1.00
10˚C (50˚F)	C / G	1.03	1.01	1.00	0.99	0.99
15˚C (59˚F)	C / G	1.02	1.00	0.99	0.98	0.98
20˚C (68˚F)	C / G	1.01	0.99	0.98	0.97	0.97
25˚C (77˚F)	C / G	1.00	0.98	0.97	0.96	0.96

[1] Lumen maintence values at 25˚C (77˚F) are calculated per TM-21 based on LM-80 data and in-situ luminaire testing
[2] In accordance with IESNA TM-21-11, Projected Values represent interpolated value based on time durations that are within six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)
[3] In accordance with IESNA TM-21-11, Calculated Values represent time durations that exceed six times (6X) the IESNA LM-80-08 total test duration (in hours) for the device under testing ((DUT) i.e. the packaged LED chip)

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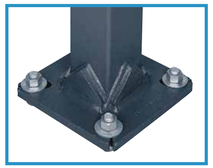
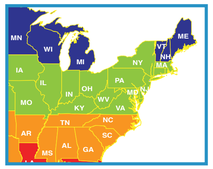


CROWN-WELD®
SQUARE STRAIGHT STEEL POLES
click or scan for information



RECOMMENDED CREE® OUTDOOR LUMINAIRE
LUMEN MAINTENANCE FACTORS (LMF)
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CREE TRUEWHITE® TECHNOLOGY & CRI
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DesignLights Consortium®
(DLC QUALIFIED PRODUCTS LIST)
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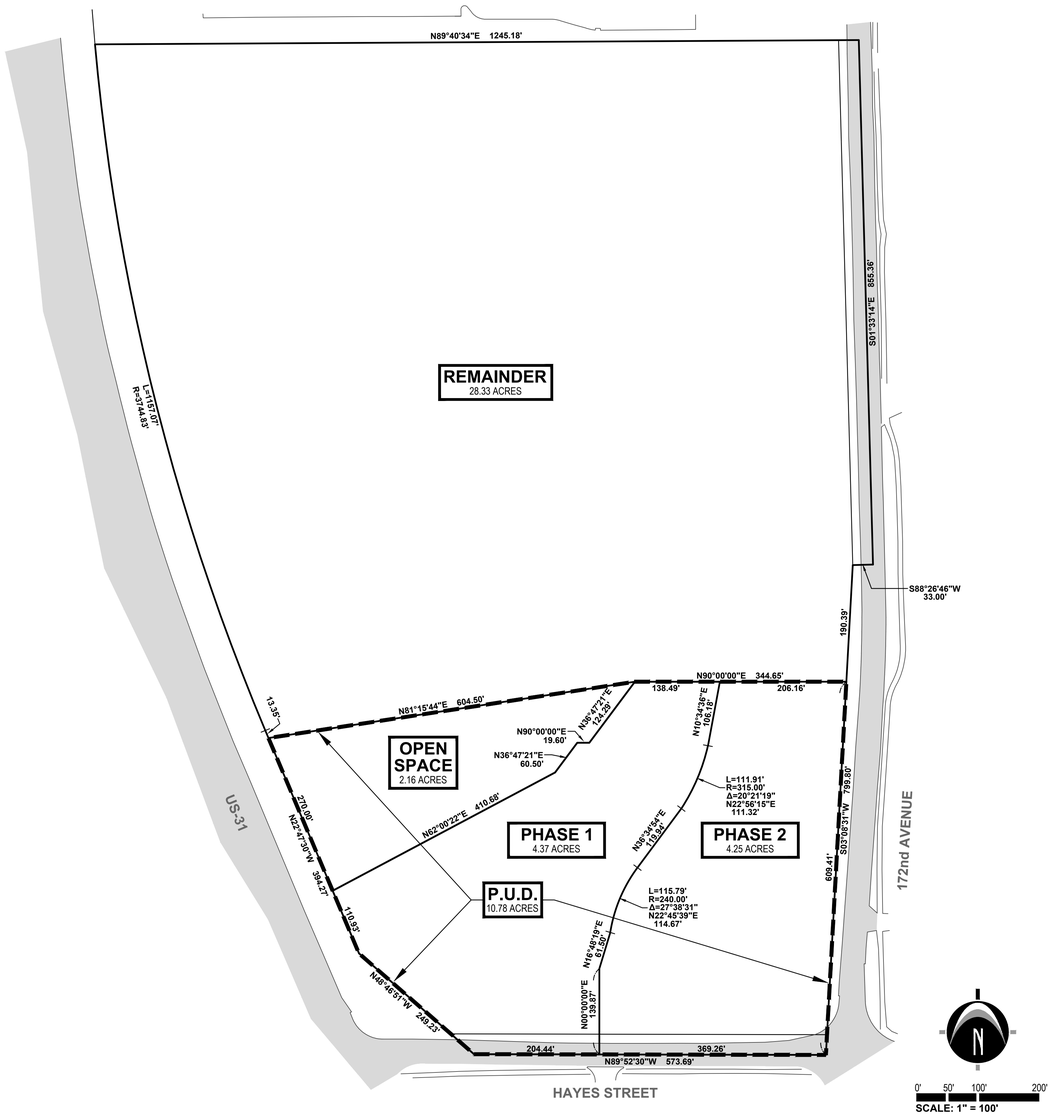
Red Leonard's superior customer service and full applications and project support capabilities ensure that our customer's needs are met every step. We are confident that you will find our complete line of LED lighting solutions to be an excellent choice for your spaces.
Call us today to find out how we can help you make your next project a success!

HAYES AND U.S. 31 COMMERCIAL PUD

GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

LOCATION MAP
NOT TO SCALE



LEGAL DESCRIPTION - OVERALL PARCEL

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE TOWNSHIP OF GRAND HAVEN, COUNTY OF OTTAWA, AND STATE OF MICHIGAN, TO WIT:
PARCEL 1: THE NORTH 1/2 OF THE SOUTH 1/2 OF THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST.
PARCEL 2: THE SOUTH 1/2 OF THE NORTH 1/2 OF THE SOUTHWEST 1/4 OF THE SOUTHEAST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST.
(SAFE TITLE COMMITMENT NO. 0256(19-ST01, DATED MARCH 5, 2013)
PP# 70-03-33-300-015 & 70-03-33-300-013
39.1 ACRES TOTAL

LEGAL DESCRIPTION - PUD

PHASE "2" DESCRIPTION: PART OF THE SOUTHWEST 1/4 OF SECTION 33, TOWN 8 NORTH, RANGE 16 WEST, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN, DESCRIBED AS: COMMENCING AT THE SOUTH 1/4 CORNER OF SAID SECTION 33; THENCE N89°52'30"W 98.52 FEET ALONG THE SOUTH LINE OF SAID SECTION 33 TO THE POINT OF BEGINNING; THENCE CONTINUING N89°52'30"W 369.26 FEET ALONG SAID SOUTH LINE; THENCE N00°00'00"E 139.87 FEET; THENCE N16°48'19"E 61.50 FEET; THENCE NORTHEASTERLY 115.79 FEET ALONG A 240.00 FOOT RADIUS CURVE TO THE RIGHT, THE CHORD OF WHICH BEARS N22°46'39"E 114.67 FEET; THENCE N36°34'54"E 119.94 FEET; THENCE NORTHEASTERLY 111.91 FEET ALONG A 315.00 FOOT RADIUS CURVE TO THE LEFT, THE CHORD OF WHICH BEARS N22°56'15"E 111.32 FEET; THENCE N10°34'36"E 106.18 FEET; THENCE N90°00'00"E 206.16 FEET; THENCE S03°08'31"W 609.41 FEET ALONG THE WESTERLY RIGHT-OF-WAY LINE OF 172ND AVENUE TO THE POINT OF BEGINNING. CONTAINS 4.25 ACRES. SUBJECT TO HIGHWAY RIGHT-OF-WAY FOR HAYES STREET OVER THE MOST SOUTHERLY 33.00 FEET THEREOF. SUBJECT TO EASEMENTS, RESTRICTIONS AND RIGHTS OF WAY OF RECORD.

AND

PHASE "1" DESCRIPTION: A PARCEL OF LAND LOCATED IN THE E 1/2 OF THE SW 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN DESCRIBED AS: BEGINNING AT A POINT ON THE SOUTH LINE OF SAID SECTION 33, WHICH IS N 89°52'30" W, 467.77 FEET FROM THE SOUTH 1/4 CORNER; THENCE CONTINUING N 89°52'30" W, 204.44 FEET TO THE EASTERLY RIGHT-OF-WAY OF HIGHWAY US-31; THENCE ALONG SAID RIGHT-OF-WAY FOR THE NEXT TWO COURSES, N 48°46'51" W, 249.23 FEET; THENCE N 22°47'30" W, 110.93 FEET; THENCE N 36°47'21" E, 60.50 FEET; THENCE N 90°00'00" E, 19.60 FEET; THENCE N 36°47'21" E, 124.29 FEET; THENCE N 90°00'00" E, 138.49 FEET; THENCE S 10°34'36" W, 106.18 FEET; THENCE ALONG A 315.00 FOOT RADIUS CURVE TO THE RIGHT (CENTRAL ANGLE = 20°21'19", CHORD DIST. = 111.32 FEET, CHORD BEARING = S 22°56'15" W) FOR 111.91 FEET; THENCE S 36°34'54" W, 119.94 FEET; THENCE ALONG A 240.00 FOOT RADIUS CURVE TO THE LEFT (CENTRAL ANGLE = 27°38'31", CHORD DIST. = 114.67 FEET, CHORD BEARING = S 22°45'39" W) FOR 114.67'; THENCE S 16°48'19" W, 61.50 FEET; THENCE S 00°00'00" E, 139.87 FEET TO THE POINT OF BEGINNING. CONTAINING 4.365 ACRES. SUBJECT TO THE RIGHT-OF-WAY OF HAYES ROAD OVER THE SOUTHERLY 33 FEET THEREOF.

AND

"OPEN SPACE" DESCRIPTION: A PARCEL OF LAND LOCATED IN THE E 1/2 OF THE SW 1/4 OF SECTION 33, T8N, R16W, GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN DESCRIBED AS: COMMENCING AT THE SOUTH 1/4 CORNER OF SAID SECTION 33; THENCE N 89°52'30" W, 672.21 FEET TO THE EASTERLY RIGHT-OF-WAY OF HIGHWAY US-31; THENCE ALONG SAID RIGHT-OF-WAY FOR THE NEXT TWO COURSES, N 48°46'51" W, 249.23 FEET; THENCE N 22°47'30" W, 110.93' TO THE POINT OF BEGINNING; THENCE CONTINUING ON SAID COURSE 283.35 FEET; THENCE N 81°15'55" E 604.50 FEET; THENCE S 36°47'21" W, 124.29 FEET; THENCE S 90°00'00" W, 19.60 FEET; THENCE S 36°47'21" W, 60.50 FEET; THENCE S 02°00'22" W, 410.58 FEET TO THE POINT OF BEGINNING. CONTAINING 2.157 ACRES. SUBJECT TO THE RIGHT-OF-WAY OF HAYES ROAD OVER THE SOUTHERLY 33 FEET THEREOF.

LEGAL DESCRIPTION - REMAINDER

"REMAINDER" DESCRIPTION: Part of the Southwest 1/4 of Section 33, Town 8 North, Range 16 West, Grand Haven Township, Ottawa County, Michigan, described as: Commencing at the South 1/4 corner of said Section 33; thence N89°52'30"W 98.52 feet along the South line of said Section 33; thence N03°08'31"E 609.41 feet along the Westerly right-of-way line of 172nd Avenue to the Point of Beginning; thence S90°00'00"W 344.65 feet; thence S81°15'44"W 604.50 feet; thence N22°47'30"W 13.35 feet along the Easterly R.O.W. line of US-31; thence Northwesterly 1157.07 feet along a 3744.83 foot radius curve to the right, the chord of which bears N13°56'24"W 1152.48 feet along said Easterly right-of-way line; thence N89°40'34"E 1245.18 feet along the North line of the South 9/16 of the East 1/2 of the Southwest 1/4 of said Section 33; thence S01°33'14"E 855.36 feet along the North-South 1/4 line of said Section 33; thence S88°26'46"W 33.00 feet; thence S03°08'31"W 190.39 feet along the Westerly right-of-way line of 172nd Avenue to the Point of Beginning. Contains 28.33 acres. Subject to highway right-of-way for 172nd Avenue over the most Easterly 33.00 feet thereof. Subject to easements, restrictions and rights of way of record.

SHEET INDEX

Index / Cover Page	C-100	Page 1
Site Survey & Natural Inventory Plan	C-201	Page 2
Tree Survey Plan	C-202	Page 3
1/2 Mile Radius Map	C-204	Page 4
Preliminary P.U.D. Site Layout Plan	C-205	Page 5
Utility Locations Plan	C-400	Page 6

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PREPARED FOR:

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Stephen Wilson

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REVISIONS:

Title: PUD Submittal		V. Date: 01.09.15
Drawn: GAN	Checked: RJB	S. Date: 01.09.15
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Title: Revised PUD		V. Date: 06.29.15
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HAYES AND U.S. 31 COMMERCIAL PUD

Index / Cover Page

Hayes and U.S. 31
PART OF SECTION 33, T8N, R16W,
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

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STATE OF MICHIGAN
ROGER JACK BARR II
ENGINEER
N 41990
LICENSED PROFESSIONAL ENGINEER

PROJECT NO:
13200084

SHEET NO:
C-100

SHEET: 1 OF 6

6/29/15 10:00:09 AM Design-ADD-Land-13200084

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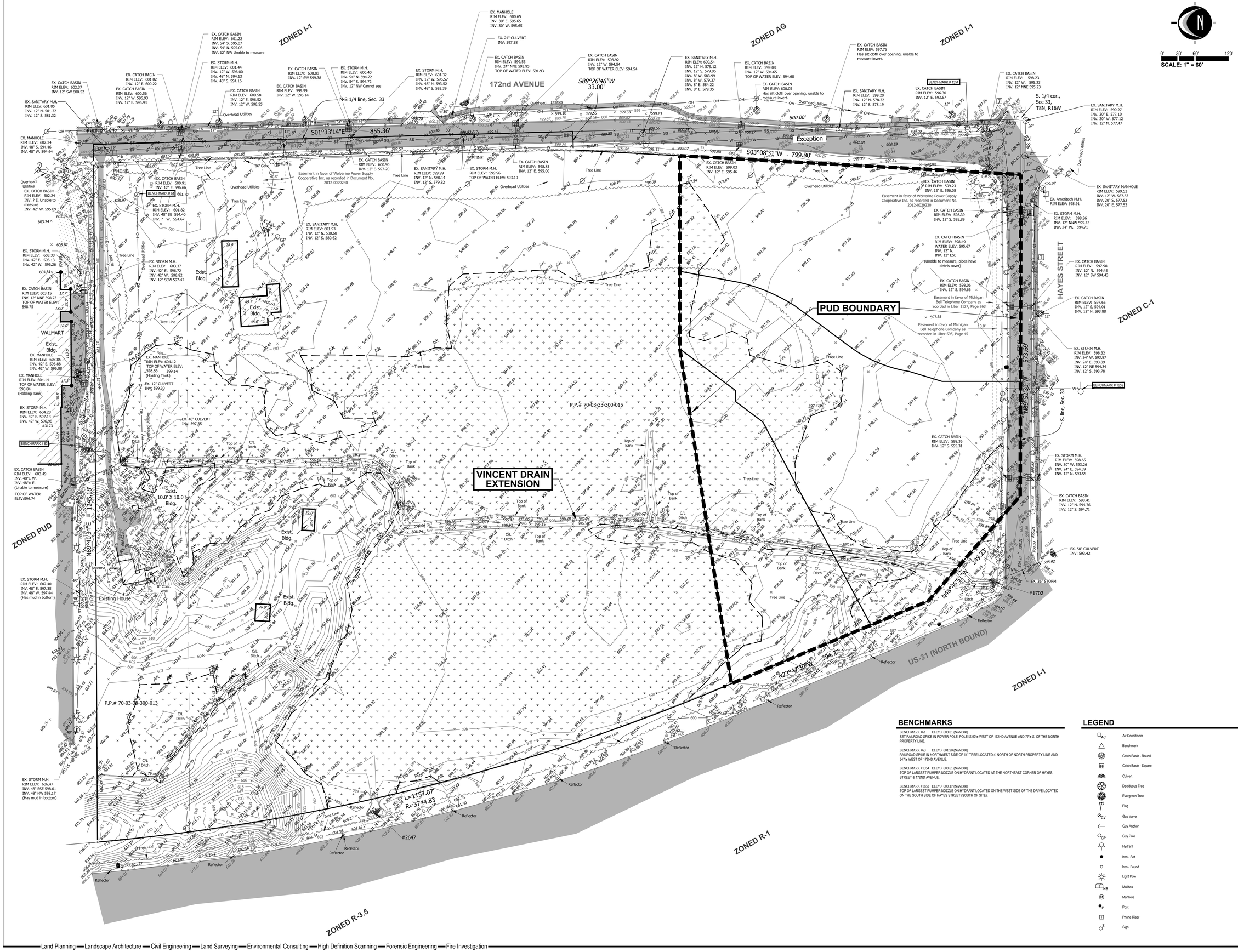

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HAYES AND U.S. 31 COMMERCIAL PUD

Site Survey & Natural Inventory Plan

Hayes and U.S. 31
PART OF SECTION 33, T8N, R16W,
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

BENCHMARKS

BENCHMARK #63 ELEV.= 603.01 (NAVD88)
SET RAILROAD SPIKE IN POWER POLE, POLE IS 90'± WEST OF 172ND AVENUE AND 77'± S. OF THE NORTH PROPERTY LINE.

BENCHMARK #63 ELEV.= 601.90 (NAVD88)
RAILROAD SPIKE IN NORTHWEST SIDE OF 14" TREE LOCATED 4' NORTH OF NORTH PROPERTY LINE AND 547'± WEST OF 172ND AVENUE.

BENCHMARK #1354 ELEV.= 600.61 (NAVD88)
TOP OF LARGEST PUMPER NOZZLE ON HYDRANT LOCATED AT THE NORTHEAST CORNER OF HAYES STREET & 172ND AVENUE

BENCHMARK #1652 ELEV.= 600.17 (NAVD88)
TOP OF LARGEST PUMPER NOZZLE ON HYDRANT LOCATED ON THE WEST SIDE OF THE DRIVE LOCATED ON THE SOUTH SIDE OF HAYES STREET (SOUTH OF SITE).

LEGEND

- AC Air Conditioner
- Benchmark
- Catch Basin - Round
- Catch Basin - Square
- Culvert
- Deciduous Tree
- Evergreen Tree
- Flag
- GV Gas Valve
- Guy Anchor
- GP Guy Pole
- Hydrant
- Iron - Set
- Iron - Found
- Light Pole
- MB Mailbox
- Manhole
- P Post
- Phone Riser
- S Sign

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ROGER JACK BARR II
ENGINEER
N 41990
LICENSED PROFESSIONAL ENGINEER

PROJECT NO: 13200084

SHEET NO: C-201

SHEET: 2 OF 6

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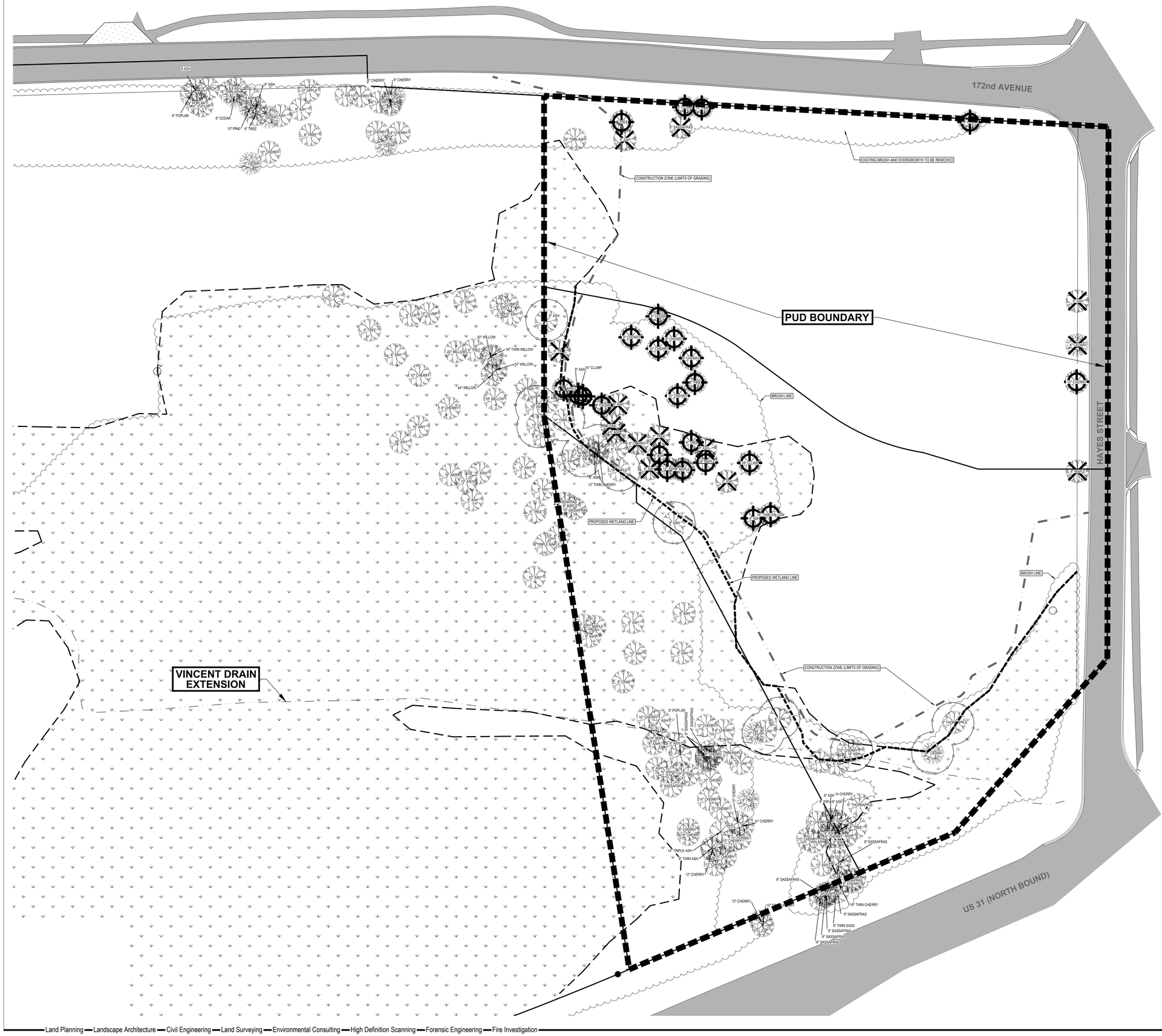


0' 20' 40' 80'

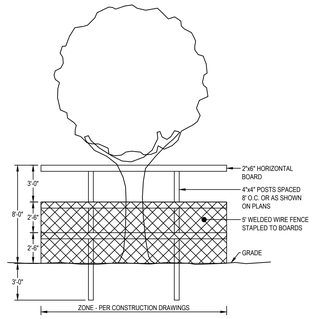
SCALE: 1" = 40'

LEGEND

- DECIDUOUS TREE
- EVERGREEN TREE
- WETLAND BOUNDARY
- BRUSH LINE
- WETLAND AREA
- NON-PROTECTED TREE TO BE REMOVED
- PROTECTED TREE TO BE REMOVED
- PROTECTED TREE FENCING

NOTES:

1. ENSURE FENCING IS INSTALLED TO PREVENT REMOVAL OF TREES OUTSIDE THE CONSTRUCTION ZONE. FENCING SHALL E□TEND 10□□E□OND THE DRIP LINE OF THE TREE CANOP□□
2. TREES □ERE MEASURED AT DIAMETER □REAST HEIGHT (D□□H)
3. PROTECTED TREES □OTH IN AND □ITHIN 10□OF CONSTRUCTION ZONE (8" OR GREATER D□□H) □39 TREES
4. PROTECTED TREES PROPOSED TO □E REMOVED □ITHIN CONSTRUCTION ZONE (8" OR GREATER D□□H) □ 24
5. □HERE PRACTICAL E□ISTING TREES THAT ARE IN GOOD HEALTH AND A□OVE 3" IN CALIPER ALONG THE FRONTAGE SHALL □E PRESERVED



ALL TREE PROTECTION SHALL □E INSTALLED □□ THE CONTRACTOR AND APPROVED □□ THE O□NER PRIOR TO COMMENCEMENT OF DEMOLITION AND NE□ CONSTRUCTION

TREE PROTECTION FENCING DETAIL

N.T.S.

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HAYES AND U.S. 31 COMMERCIAL PUD

Tree Survey Plan

Hayes and U.S. 31
PART OF SECTION 33, T8N, R16W,
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

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PROJECT NO: 13200084

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SHEET: 3 OF 6

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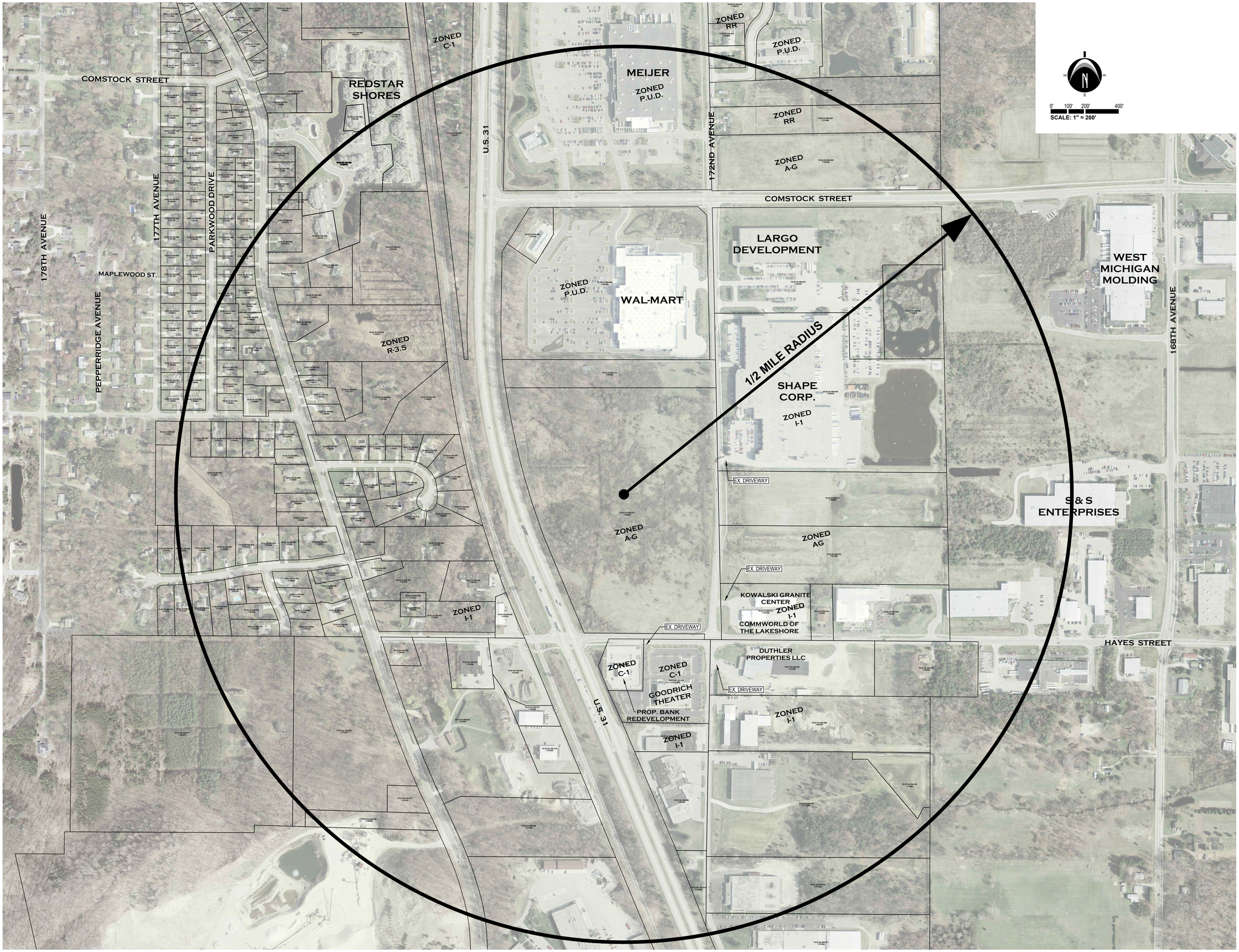

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HAYES AND U.S. 31 COMMERCIAL PUD

1/2 Mile Radius Map

Hayes and U.S. 31
PART OF SECTION 33, T8N, R16W,
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

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NO. 41900
LICENSED PROFESSIONAL ENGINEER

PROJECT NO: 13200084

SHEET NO: C-204

SHEET: 4 OF 6

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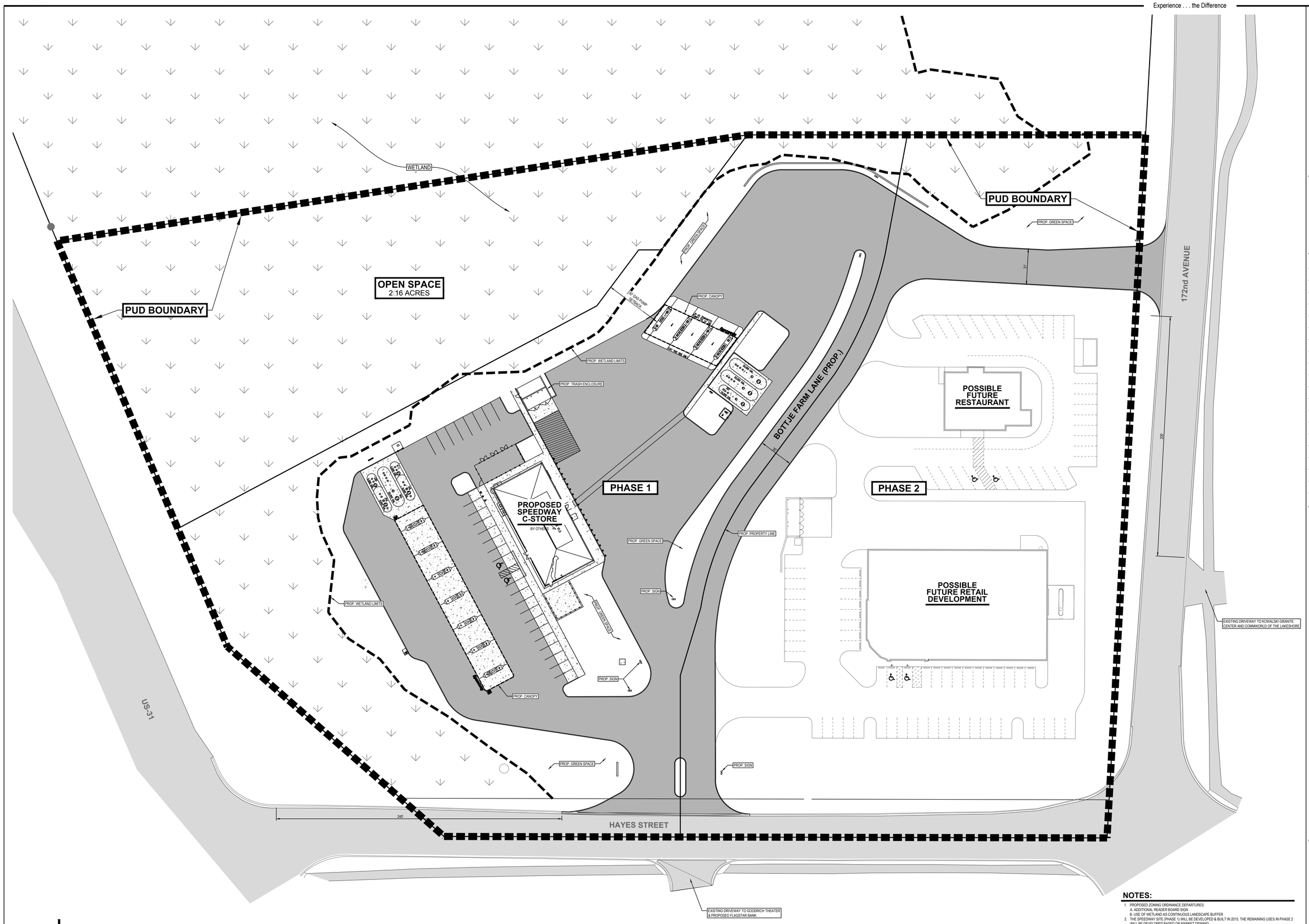

NOTES:

1. PROPOSED ZONING ORDINANCE DEPARTURES:
   A. ADDITIONAL READER BOARD SIGN
   B. USE OF WETLAND AS CONTINUOUS LANDSCAPE BUFFER
2. THE SPEEDWAY SITE (PHASE 1) WILL BE DEVELOPED & BUILT IN 2015. THE REMAINING USES IN PHASE 2 WILL BE DEVELOPED BASED ON MARKET DEMAND.
3. THE PROPOSED ACCESS ROAD BETWEEN 172nd & HAYES WILL BE PRIVATE & WILL BE PROVIDED WITH A 40' WIDE INGREE/EGRESS EASEMENT WITH A SHARED MAINTENANCE AGREEMENT BETWEEN OWNERS OF PHASE 1 AND PHASE 2.
4. TOTAL LAND AREA OF PUD = 10.78 ACRES
5. OPEN SPACE = 2.16 ACRES
6. GROSS FLOOR AREA OF PHASE 1 = 4,608 SQ.FT.
7. USABLE FLOOR AREA OF PHASE 1 = 3,600 SQ.FT.
8. CONVENIENCE STORE (PHASE 1)
   A. ALCOHOLIC BEVERAGES = NO
   B. FOOD PREPARED ON SITE = YES
   C. PROPOSED HOURS OF OPERATION = 24/7
9. APPROXIMATELY 10,000 CU. YD. OF SAND FILL WILL BE BROUGHT INTO THE SITE TO RAISE THE SITE GRADE. (APPROX. 5,000 CU.YD. ON EACH PHASE 1 AND PHASE 2)
10. STORMWATER FROM THE ENTIRE PUD WILL BE COLLECTED IN AN ENCLOSED PIPE SYSTEM & DISCHARGED TO VINCENT DRAIN EXTENSION AFTER PASSING THROUGH A STORMWATER QUALITY UNIT.

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HAYES AND U.S. 31 COMMERCIAL PUD

Preliminary P.U.D. Site Layout Plan Option 1

Hayes and U.S. 31
PART OF SECTION 33, T8N, R16W
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

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SHEET NO: C-205

SHEET: 5 OF 6

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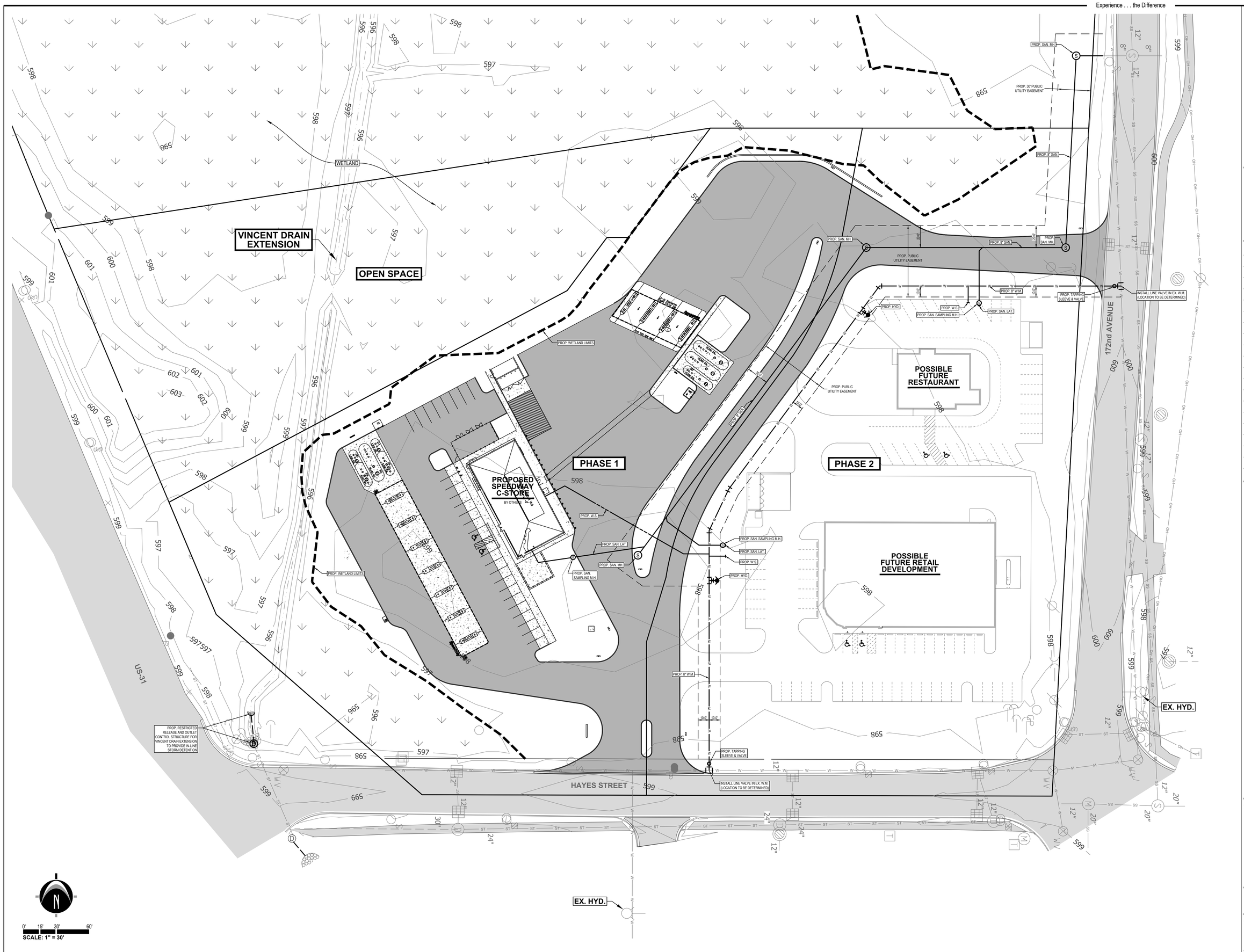

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HAYES AND U.S. 31 COMMERCIAL PUD

Utility Locations Plan

Hayes and U.S. 31
PART OF SECTION 33, T3N, R16W,
GRAND HAVEN TOWNSHIP, OTTAWA COUNTY, MICHIGAN

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PROJECT NO: 13200084

SHEET NO: C-400

SHEET: 6 OF 6

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FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

MEMO

VIA EMAIL

To:	**Mr. Kevin Coughlin** **exp US Services, Inc.**
From:	**Michael J. Labadie, PE** **Steven J. Russo, E.I.T.** **Fleis & VandenBrink**
Date:	**June 26, 2015**
Re:	**Proposed Speedway Gas Station** **Grand Haven Township, Michigan** **Traffic Impact Assessment**

Introduction

This memorandum presents the results of a Traffic Impact Assessment (TIA) for the proposed Speedway fueling station in Grand Haven Township, Michigan. The project site is located on the northwest corner of the Hayes Street & 172nd Avenue intersection and is currently vacant. The proposed development plans include a new Speedway fueling station to include 14 gasoline fueling positions, 3 diesel fueling positions, and a 4,608 square feet (SF) convenience store. Site access is proposed via one driveway to Hayes Street aligned with the Goodrich Grand Haven Theater Drive and one driveway to 172nd Avenue. Hayes Street and 172nd Avenue are under the jurisdiction of the Ottawa County Road Commission (OCRC).

Grand Haven Township has required a TIA to evaluate traffic operations with the proposed project. This TIA has been completed to identify the impacts (if any) of this project on the following study intersections:

- US-31 & Hayes Street,
- Hayes Street & 172nd Avenue,
- Comstock Street & 172nd Avenue,
- The proposed site access points.

The scope of this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, discussions with the OCRC, understanding of the development program, accepted traffic engineering practice, and methodologies published by the Institute of Transportation Engineers (ITE). The study analyses were completed using Synchro and SimTraffic, Version 9 traffic analysis software.

Data Collection

Existing weekday traffic volume data were collected by F&V subconsultant Traffic Data Collection, Inc. (TDC) on February 10 and March 24, 2015. Vehicular turning movement counts were collected at the study intersections during the AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) peak periods. Additionally, hourly 24-hour approach volumes were collected at the intersection of Hayes Street & 172nd Avenue and utilized for a signal warrant evaluation. Lastly, F&V also collected an inventory of existing lane use, traffic controls and obtained existing traffic signal timing information from the Michigan Department of Transportation (MDOT) and (OCRC). The applicable data referenced in this memorandum are attached.

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Farmington Hills, MI 48334
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Existing Conditions

The existing AM and PM peak hour traffic volumes were identified based on the data collected. Existing peak hour vehicle delays and Levels of Service (LOS) were calculated at the study intersections based on the existing lane use and traffic control shown on the attached Figure 1, the existing peak hour traffic volumes shown on the attached Figure 2, and the methodologies presented in the *Highway Capacity Manual, 2010* (HCM). Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. Additionally, SimTraffic network simulations were reviewed to evaluate network operations and vehicle queues. The results of the existing conditions analysis are attached and summarized in Table 1.

In order to accurately replicate field conditions of the US-31 Michigan Boulevard configuration, US-31 was modeled as two parallel, one-way links connected by Hayes Street. This results in the intersection of US-31 & Hayes Street being represented by two individual signalized intersections (one for each direction of travel along US-31) which must then be clustered, or grouped, together as they functionally operate using the same controller. The clustering of intersections is not currently supported by the HCM 2010, therefore for analysis purposes the HCM 2000 was utilized for the intersection of US-31 & Hayes Street.

Table 1

Existing Intersection Operations

			AM Peak		PM Peak	
Intersection	Control	Approach	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1. US-31	Signalized	EB	31.5	C	29.3	C
& Hayes Street		WB	23.9	C	25.3	C
		NB	10.4	B	12.1	B
		SB	14.6	B	10.7	B
		East Overall	**13.0**	**B**	**9.1**	**A**
		West Overall	**11.5**	**B**	**14.0**	**B**
2. Comstock Street	Signalized	EB	14.5	B	16.2	B
& 172nd Avenue		WB	16.1	B	15.3	B
		NB	12.5	B	13.8	B
		SB	12.4	B	13.7	B
		Overall	**14.5**	**B**	**14.9**	**B**
3. Hayes Street	STOP	EB	10.9	B	9.6	A
& 172nd Avenue	(All-Way)	WB	10.4	B	11.3	B
		NB	9.7	A	9.5	A
		SB	9.8	A	10.2	B
		Overal	**10.4**	**B**	**10.4**	**B**
4. Hayes Street	STOP	EB	Free		Free	
& Goodrich Theaters	(Minor)	WB LT	7.9	A	7.4	A
Drive		NB	11.4	B	10.1	B

The results of the existing conditions analysis indicate that all study intersection approaches and movements currently operate acceptably at a LOS C or better during both peak periods. Additionally, review of network simulations indicates acceptable traffic operations and vehicle queues which are acceptably processed.

Signal Warrant Evaluation

At the request of OCRC, a signal warrant evaluation was completed at the intersection of Hayes Street & 172nd Avenue. This signal warrant evaluation was completed based on the standards and guidelines published in the *2011 Michigan Manual on Uniform Traffic Control Devices* (MMUTCD). Review of the traffic signal warrants outlined in Chapter 4C of the manual indicate that Warrants 1, 2, and 7 should be evaluated for this location and Warrants 3 through 6, 8, and 9 are not applicable.

Warrant 1

According to the MMUTCD, Condition A is intended for application at locations where a large volume of intersecting traffic is the principal reason to consider installing a traffic control signal. Condition B is intended for application where Condition A is not satisfied and where the traffic volume on the major street is so heavy that traffic on a minor intersecting street suffers excessive delay or conflict in entering or crossing the major street. It is intended that Warrant 1 be treated as a single warrant, where Warrant 1 is satisfied if either Conditions A or B are met.

The MMUTCD also indicates an option to evaluate the warrant based on threshold volumes which are 70% of the standard warranting volumes if the posted speed limit on the major street exceeds 40 mph. As the speed limit on Hayes Street is 45 mph, the 70% factor may be used. In this case, Condition A is met for 3 hours and Condition B is met for 0 hours. Therefore, ***Warrant 1 is not met.***

Warrant 2

The Four-Hour signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic control signal. The need for a signal shall be considered if for each of any four hours of an average day, the approach volumes fall above the applicable curve on Figure 4C-1. For this location, the 70% volume factor may be considered (Figure 4C-2) due to the posted 45 mph speed limit on Hayes Street.

Analysis of the standards of this warrant with application of the 70% factor indicates that the intersection approach volumes do not fall above the applicable curve for any hours of the day. Therefore, ***Warrant 2 is not met***.

Warrant 7

The Crash Experience signal warrant conditions are intended for application where the severity and frequency of crashes are the principal reason to consider installing a traffic control signal. F&V obtained data for reported crashes for the most recent available 3 years (2011 to 2013) from the Michigan Traffic Crash Facts (MTCF) website. Review of the crash data indicates two crashes occurred at the intersection in the three year period for an average crash rate of 0.67. Both accidents at the intersection were rear-ending collisions and resulted in Property Damage Only (PDO).

Additionally, a third accident was reported at the Goodrich Grand Haven Theater Drive just south of the intersection along 172nd Avenue. This crash was an angled accident and resulted in PDO. The reported crash experience does not meet the criteria to consider installing a traffic signal. Therefore, ***Warrant 7 is not met***. Furthermore, the crash data do not indicate a crash pattern that would be correctable by traffic signal control.

Background Conditions

As this development is planned to be complete and occupied within the next year, future traffic growth is forecast for the study area. However, it is also important to account for traffic that will be generated by any

potential background developments within the study area. F&V recently completed a TIA for a proposed Flagstar Bank development on the southeast corner of the US-31 & Hayes Street intersection. Therefore, background conditions ***without the proposed development*** were evaluated with the additional traffic generated by the proposed Flagstar Bank.

Background peak hour vehicle delays and LOS were calculated at the study intersections based on the existing lane use and traffic control shown on the attached Figure 1, the background traffic volumes shown on the attached Figure 3, and the methodologies presented in the HCM. The results of the analysis of background conditions are attached and presented in Table 2. The background conditions results indicate no significant increase in vehicle delay and no change in LOS as compared to the results summarized in Table 1.

Table 2

Background Intersection Operations

			AM Peak		PM Peak	
Intersection	Control	Approach	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1. US-31	Signalized	EB	31.8	C	29.2	C
& Hayes Street		WB	24.3	C	25.8	C
		NB	10.3	B	12.1	B
		SB	14.8	B	10.9	B
		East Overall	**13.2**	**B**	**9.2**	**A**
		West Overall	**11.7**	**B**	**14.2**	**B**
2. Comstock Street	Signalized	EB	14.5	B	16.2	B
& 172nd Avenue		WB	16.1	B	15.3	B
		NB	12.5	B	13.8	B
		SB	12.4	B	13.7	B
		Overall	**14.5**	**B**	**14.9**	**B**
3. Hayes Street	STOP	EB	10.9	B	9.6	A
& 172nd Avenue	(All-Way)	WB	10.5	B	11.4	B
		NB	9.8	A	9.5	A
		SB	9.9	A	10.2	B
		Overal	**10.5**	**B**	**10.4**	**B**
4. Hayes Street	STOP	EB	Free		Free	
& Goodrich Theaters	(Minor)	WB LT	8	A	7.5	A
Drive		NB	11.6	B	10.4	B

Site Trip Generation and Assignment

The number of AM and PM peak hour vehicle trips that would be generated by the proposed Speedway fueling station was forecast based on data published by the Institute of Transportation Engineers (ITE) in *Trip Generation, 9th Edition* and the *Trip Generation Handbook, 2nd Edition*.

As is typical of fueling stations, a portion of the site-generated trips are already present on the adjacent road network and are interrupted to visit the site. These trips are known as “pass-by” trips and account for a percentage of the total site-generated traffic. Pass-by trips result in turning movements at the site driveways,

but do not increase traffic volumes on the adjacent road network. The site trip generation forecast is shown in Table 3.

Table 3
Site Trip Generation

Land Use	ITE Code	Amount	Units	Average Daily Traffic	AM Peak Hour In	AM Peak Hour Out	AM Peak Hour Total	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Gasoline/Service Station with Convenience Market	945	17	Pumps	2,767	87	86	173	115	115	230
Pass-By	*62% AM, 56%PM*			*1,633*	*54*	*53*	*107*	*64*	*65*	*129*
New Trips				1,134	33	33	66	51	50	101

The vehicle trips that would be generated by the proposed fueling station were assigned to the study road network based on existing peak hour traffic patterns, local population density within the development area, the proposed site access plan, and the methodologies published by ITE. This methodology indicates that pass-by trips enter and exit the development in their original direction of travel, while new trips will return to their direction of origin. The assumed distribution of site traffic is summarized in Table 4 and the peak hour site-generated traffic volumes are shown on the attached Figure 4.

Table 4
Site Trip Distribution

New Trips To / From	via	AM / PM	*Pass-By From*	*To*	AM	PM
North	US-31	45%	East	West	25%	30%
North	172nd Avenue	10%	West	East	40%	15%
South	US-31	30%	North	South	15%	30%
South	172nd Avenue	5%	South	North	20%	25%
East	Hayes Street	5%			100%	100%
West	Hayes Street	5%				
		100%				

Future Conditions

The site-generated trip assignments were added to the existing traffic volumes to determine the total future peak hour traffic volumes with the proposed development and are shown on the attached Figure 3. Future peak hour vehicle delays and LOS were calculated at the study intersections based on these volumes, the existing intersection lane use and traffic control, and the methodologies presented in the HCM. Additionally, SimTraffic simulations were utilized to evaluate network operations and vehicle queues. The results of the future conditions analysis are attached and summarized in Table 4.

The results of the future conditions analysis indicate that the proposed development project would not have a significant impact on the study intersections. Future vehicle delays and LOS as shown in Table 5 would be similar to background conditions and any increases in vehicle delay would not be discernable. Additionally, review of network simulations indicates acceptable future traffic operations and significant vehicle queues are not observed.

Site access operations were also evaluated under future traffic conditions. The results of this analysis indicate that all approaches and movements at the future site driveways will operate acceptably at a LOS B or better during both peak periods.

Table 5

Future Intersection Operations

Intersection	Control	Approach	AM Peak Delay (s/veh)	AM Peak LOS	PM Peak Delay (s/veh)	PM Peak LOS
1. US-31	Signalized	EB	32.0	C	28.9	C
& Hayes Street		WB	25.8	C	29.7	C
		NB	10.3	B	12.2	B
		SB	15.3	B	11.5	B
		East Overall	**12.1**	**B**	**15.3**	**B**
		West Overall	**13.6**	**B**	**9.7**	**A**
2. Comstock Street	Signalized	EB	14.5	B	16.2	B
& 172nd Avenue		WB	16.1	B	15.3	B
		NB	12.5	B	13.9	B
		SB	12.5	B	13.8	B
		Overall	**14.5**	**B**	**15.0**	**B**
3. Hayes Street	STOP	EB	11.0	B	9.6	A
& 172nd Avenue	(All-Way)	WB	10.6	B	11.5	B
		NB	9.8	A	9.6	A
		SB	9.9	A	10.3	B
		Overal	**10.5**	**B**	**10.5**	**B**
4. Hayes Street	STOP	EB LT	7.8	A	7.9	A
& Goodrich Theaters	(Minor)	WB LT	7.9	A	7.5	A
Drive / Site Drive		NB	13.4	B	12.1	B
		SB	12.1	B	10.5	B
5. 172nd Avenue	STOP	EB	9.9	A	10.2	B
& Site Drive	(Minor)	NB LT	7.6	A	7.7	A
		SB	Free		Free	

Driveway Turn Lane Warrants

In order to determine the configuration of the proposed site driveway intersections with Hayes Street and 172nd Avenue, OCRC warrants for right and left turn lanes were evaluated. Based on OCRC standards, MDOT Traffic & Safety Notes 604A and 605A were utilized for this evaluation. At the proposed site driveway to 172nd Avenue neither a right turn lane nor taper are required, while a two-way left-turn lane (TWLTL) currently exists to facilitate ingress left turns. At the Hayes Street neither a left turn lane nor right turn lane are required.

Conclusions

The conclusions of this Traffic Impact Assessment are as follows:

1. Currently, all study intersection approaches and movements operate acceptably at a LOS D or better during both peak periods.
2. Background conditions ***without the proposed Speedway*** were evaluated based on additional traffic generated by the proposed Flagstar Bank on the southeast corner of the US-31 & Hayes Street intersection.
3. Background conditions ***without the proposed Speedway*** will be similar to existing conditions.
4. Future traffic operations with the proposed Speedway will be similar to background conditions and minor changes to vehicle delay and LOS will not be discernable.
5. All future driveway approaches will operate acceptably.
6. Based on MDOT standards (as referenced by OCRC) neither a left turn lane nor right turn lane are required at the proposed site driveways.

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

Attachments: Traffic Volume Data
Figures 1-5
MMUTCD Warrants
Synchro / SimTraffic Results
Driveway Warrants

SJR:mjl

Traffic Data Collection, TDC

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

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_2Z4 & 3DQ

File Name : TMC_1 US-31 & Hayes
Site Code : TMC_1
Start Date : 2/10/2015
Page No : 1

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

	US Hwy. 31 Southbound					Hayes Street Westbound					US Hwy. 31 Northbound					Hayes Street Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	9	290	0	0	299	17	7	0	0	24	23	208	0	0	231	3	7	0	0	10	564
07:15 AM	5	383	0	0	388	37	5	0	0	42	19	239	0	0	258	11	10	0	0	21	709
07:30 AM	7	365	0	0	372	44	10	0	0	54	34	257	0	0	291	9	26	0	0	35	752
07:45 AM	7	245	0	0	252	15	3	0	0	18	60	249	0	0	309	6	22	0	0	28	607
Total	28	1283	0	0	1311	113	25	0	0	138	136	953	0	0	1089	29	65	0	0	94	2632
08:00 AM	9	206	0	0	215	16	6	0	0	22	33	173	0	0	206	5	12	0	0	17	460
08:15 AM	4	196	0	0	200	15	16	0	0	31	28	185	0	0	213	2	17	0	0	19	463
08:30 AM	10	175	0	0	185	17	11	0	0	28	15	190	0	0	205	3	13	0	0	16	434
08:45 AM	6	152	0	0	158	18	11	1	0	30	16	185	0	0	201	4	7	0	0	11	400
Total	29	729	0	0	758	66	44	1	0	111	92	733	0	0	825	14	49	0	0	63	1757
**** BREAK ****																					
04:00 PM	16	255	0	0	271	47	22	0	0	69	15	237	0	0	252	3	7	0	0	10	602
04:15 PM	11	199	0	0	210	30	23	0	0	53	17	257	0	0	274	0	2	0	0	2	539
04:30 PM	16	208	0	0	224	30	14	0	0	44	14	250	0	0	264	1	3	0	0	4	536
04:45 PM	10	241	0	0	251	16	16	0	0	32	18	263	0	0	281	1	2	0	0	3	567
Total	53	903	0	0	956	123	75	0	0	198	64	1007	0	0	1071	5	14	0	0	19	2244
05:00 PM	21	270	0	0	291	42	22	0	0	64	13	291	0	0	304	7	6	0	0	13	672
05:15 PM	15	308	0	0	323	34	18	1	0	53	15	323	0	0	338	10	10	0	0	20	734
05:30 PM	12	242	0	0	254	10	15	0	0	25	19	352	0	0	371	10	13	0	0	23	673
05:45 PM	16	204	0	0	220	12	12	0	0	24	10	309	0	0	319	6	8	0	0	14	577
Total	64	1024	0	0	1088	98	67	1	0	166	57	1275	0	0	1332	33	37	0	0	70	2656
Grand Total	174	3939	0	0	4113	400	211	2	0	613	349	3968	0	0	4317	81	165	0	0	246	9289
Apprch %	4.2	95.8	0	0		65.3	34.4	0.3	0		8.1	91.9	0	0		32.9	67.1	0	0		
Total %	1.9	42.4	0	0	44.3	4.3	2.3	0	0	6.6	3.8	42.7	0	0	46.5	0.9	1.8	0	0	2.6	
Pass Cars	167	3674	0	0	3841	357	210	1	0	568	302	3807	0	0	4109	77	160	0	0	237	8755
% Pass Cars	96	93.3	0	0	93.4	89.2	99.5	50	0	92.7	86.5	95.9	0	0	95.2	95.1	97	0	0	96.3	94.3
Single Units	6	85	0	0	91	9	1	1	0	11	18	65	0	0	83	4	5	0	0	9	194
% Single Units	3.4	2.2	0	0	2.2	2.2	0.5	50	0	1.8	5.2	1.6	0	0	1.9	4.9	3	0	0	3.7	2.1
Heavy Trucks	1	180	0	0	181	34	0	0	0	34	29	96	0	0	125	0	0	0	0	0	340
% Heavy Trucks	0.6	4.6	0	0	4.4	8.5	0	0	0	5.5	8.3	2.4	0	0	2.9	0	0	0	0	0	3.7
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 (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. Signalized intersection with push button ped. signals for south leg only. US Hwy 31 is a divided highway with left turns prohibited for all approch legs. VCU scout camera located at NW & SE quadrants.

Traffic Data Collection, TDC

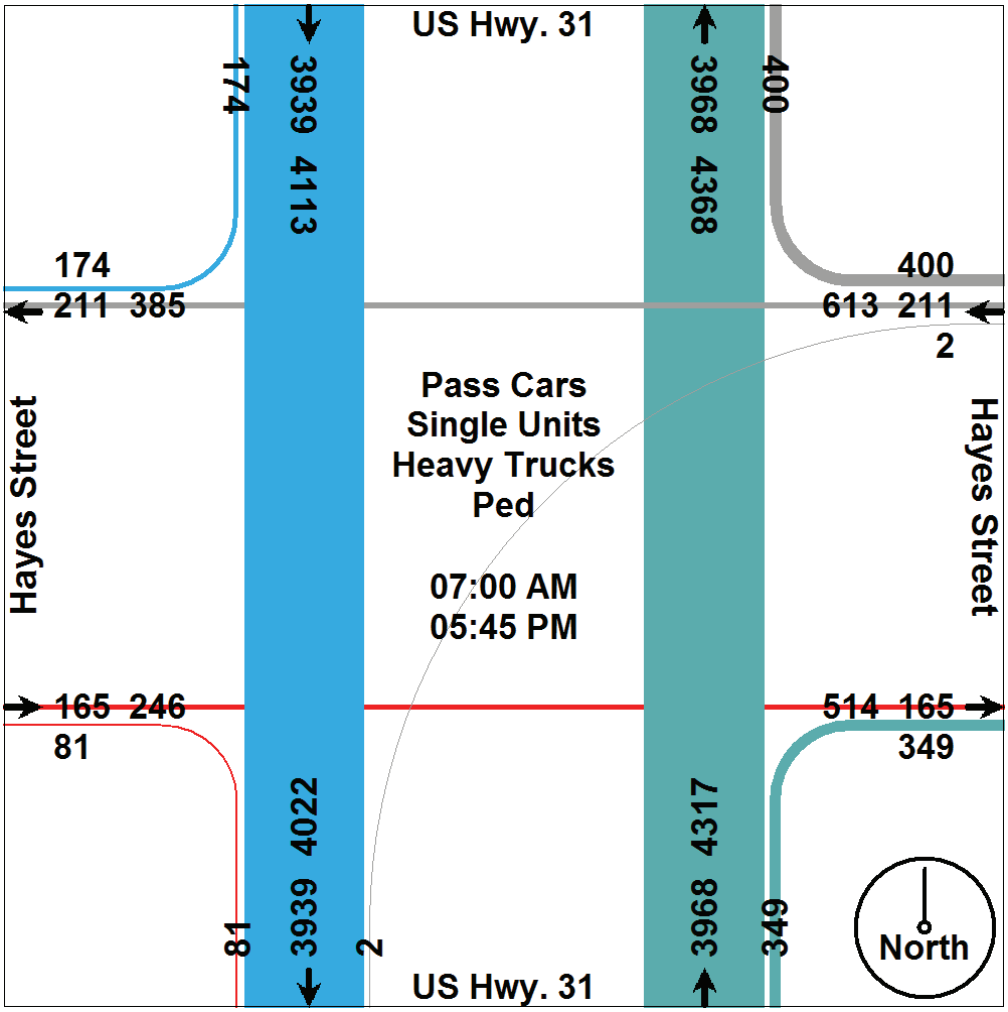
7504 Sawgrass Drive, Washington, MI 48094 Ph. (586) 786-5407

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_2Z4 & 3DQ

File Name : TMC_1 US-31 & Hayes
Site Code : TMC_1
Start Date : 2/10/2015
Page No : 2



Traffic Data Collection, TDC

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

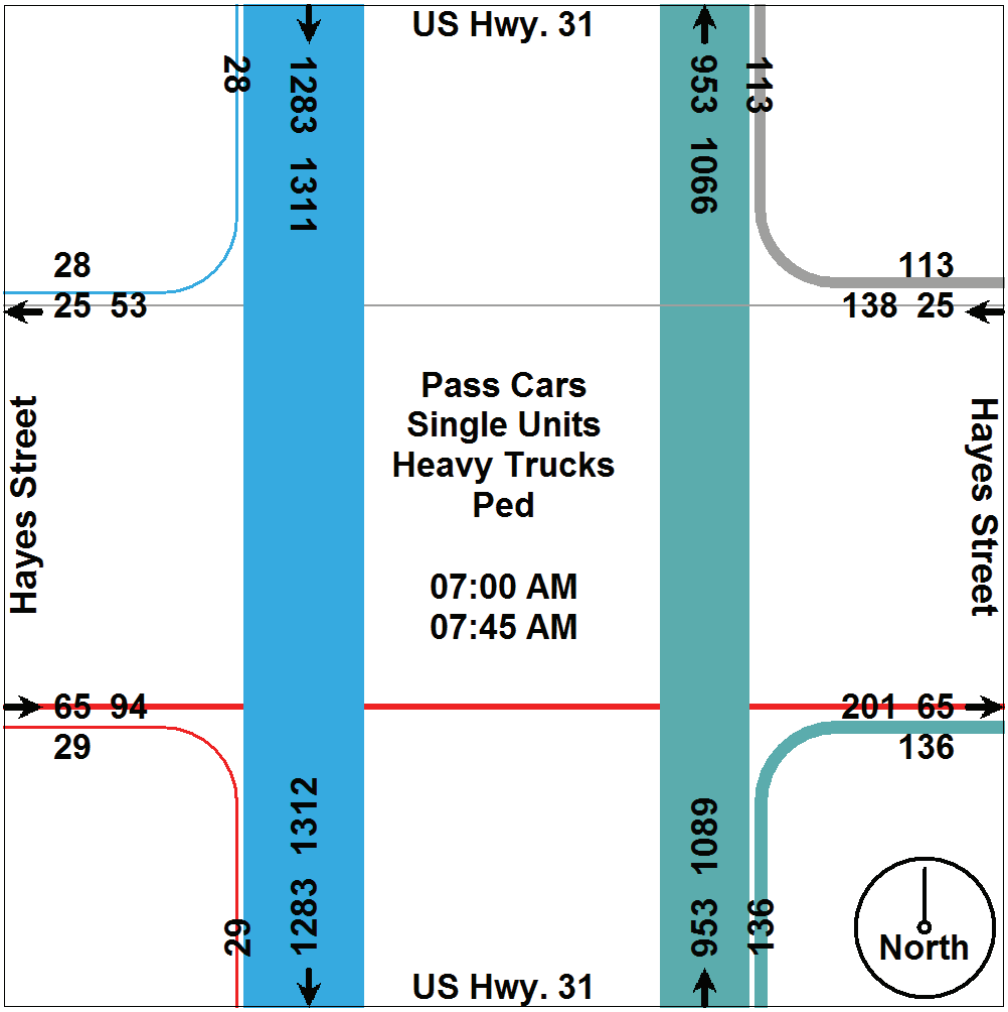
Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_2Z4 & 3DQ

File Name : TMC_1 US-31 & Hayes
Site Code : TMC_1
Start Date : 2/10/2015
Page No : 3

	US Hwy. 31 Southbound				Hayes Street Westbound				US Hwy. 31 Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	**9**	290	0	299	17	7	0	24	23	208	0	231	3	7	0	10	564
07:15 AM	5	**383**	0	**388**	37	5	0	42	19	239	0	258	**11**	10	0	21	709
07:30 AM	7	365	0	372	**44**	**10**	0	**54**	34	**257**	0	291	9	**26**	0	**35**	**752**
07:45 AM	7	245	0	252	15	3	0	18	**60**	249	0	**309**	6	22	0	28	607
Total Volume	28	1283	0	1311	113	25	0	138	136	953	0	1089	29	65	0	94	2632
% App. Total	2.1	97.9	0		81.9	18.1	0		12.5	87.5	0		30.9	69.1	0		
PHF	.778	.837	.000	.845	.642	.625	.000	.639	.567	.927	.000	.881	.659	.625	.000	.671	.875
Pass Cars	27	1217	0	1244	99	25	0	124	122	888	0	1010	27	65	0	92	2470
% Pass Cars	96.4	94.9	0	94.9	87.6	100	0	89.9	89.7	93.2	0	92.7	93.1	100	0	97.9	93.8
Single Units	1	28	0	29	2	0	0	2	7	33	0	40	2	0	0	2	73
% Single Units	3.6	2.2	0	2.2	1.8	0	0	1.4	5.1	3.5	0	3.7	6.9	0	0	2.1	2.8
Heavy Trucks	0	38	0	38	12	0	0	12	7	32	0	39	0	0	0	0	89
% Heavy Trucks	0	3.0	0	2.9	10.6	0	0	8.7	5.1	3.4	0	3.6	0	0	0	0	3.4
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 Data Collection, TDC

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

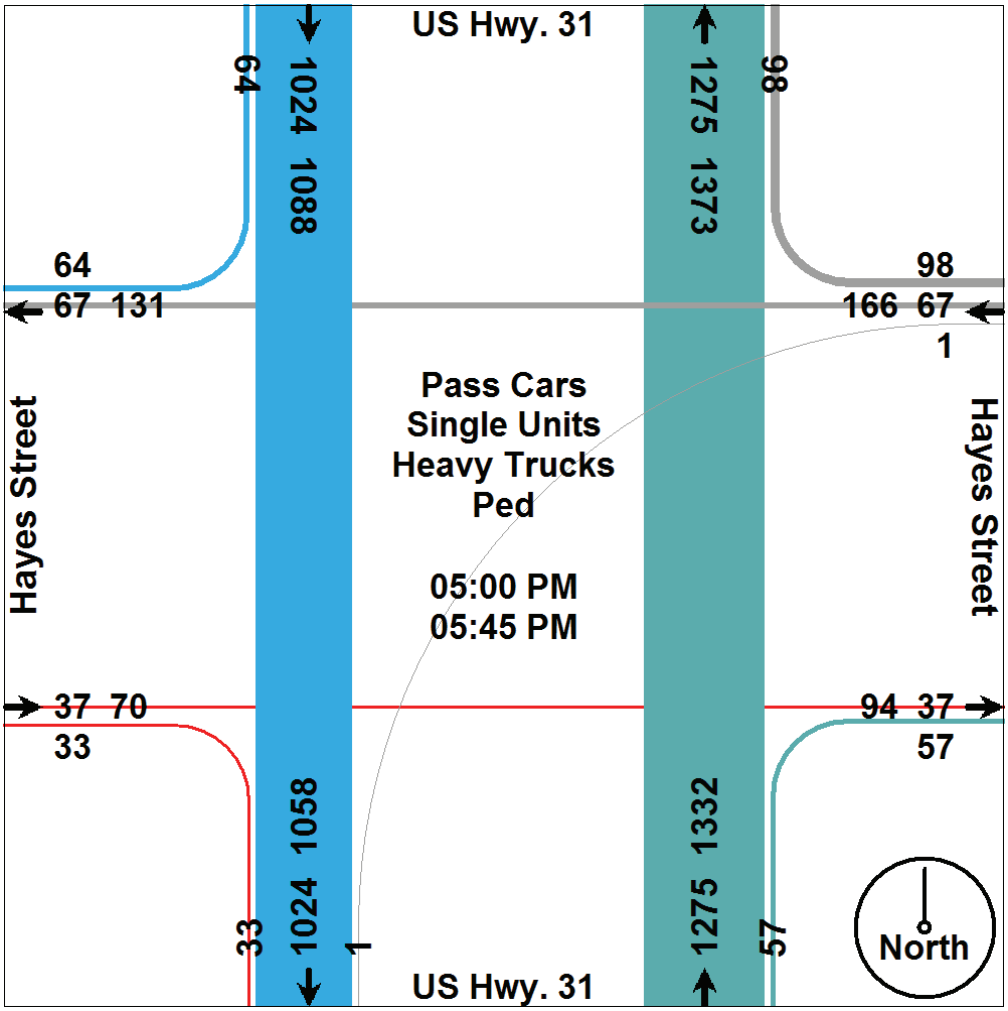
Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_2Z4 & 3DQ

File Name : TMC_1 US-31 & Hayes
Site Code : TMC_1
Start Date : 2/10/2015
Page No : 4

	US Hwy. 31 Southbound				Hayes Street Westbound				US Hwy. 31 Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	**21**	270	0	291	**42**	**22**	0	**64**	13	291	0	304	7	6	0	13	672
05:15 PM	15	**308**	0	**323**	34	18	**1**	53	15	323	0	338	**10**	10	0	20	**734**
05:30 PM	12	242	0	254	10	15	0	25	**19**	**352**	0	**371**	10	**13**	0	**23**	673
05:45 PM	16	204	0	220	12	12	0	24	10	309	0	319	6	8	0	14	577
Total Volume	64	1024	0	1088	98	67	1	166	57	1275	0	1332	33	37	0	70	2656
% App. Total	5.9	94.1	0		59	40.4	0.6		4.3	95.7	0		47.1	52.9	0		
PHF	.762	.831	.000	.842	.583	.761	.250	.648	.750	.906	.000	.898	.825	.712	.000	.761	.905
Pass Cars	63	977	0	1040	94	67	0	161	51	1256	0	1307	33	37	0	70	2578
% Pass Cars	98.4	95.4	0	95.6	95.9	100	0	97.0	89.5	98.5	0	98.1	100	100	0	100	97.1
Single Units	0	11	0	11	0	0	1	1	1	8	0	9	0	0	0	0	21
% Single Units	0	1.1	0	1.0	0	0	100	0.6	1.8	0.6	0	0.7	0	0	0	0	0.8
Heavy Trucks	1	36	0	37	4	0	0	4	5	11	0	16	0	0	0	0	57
% Heavy Trucks	1.6	3.5	0	3.4	4.1	0	0	2.4	8.8	0.9	0	1.2	0	0	0	0	2.1
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 Data Collection, TDC

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

Traffic Study Performed For:

Fleis & Vandenbrink

Project: City of Grand Haven
Location: 172nd Ave. & Comstock St.
Weather: Cloudy, 30's
Count By: Video SCU 24L

File Name : TMC_1 172nd&Comstock_3-24-15
Site Code : TMC_1
Start Date : 3/24/2015
Page No : 1

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

	172nd Ave. Southbound					Comstock Street Westbound					172nd Ave. Northbound					Comstock Street Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	6	12	6	0	24	6	34	5	0	45	0	3	7	0	10	4	34	6	0	44	123
07:15 AM	11	9	5	0	25	10	58	3	0	71	2	4	5	0	11	18	28	1	0	47	154
07:30 AM	5	16	6	0	27	9	48	2	0	59	3	14	2	0	19	20	33	2	0	55	160
07:45 AM	4	34	2	0	40	13	32	6	0	51	1	11	3	0	15	32	38	3	0	73	179
Total	26	71	19	0	116	38	172	16	0	226	6	32	17	0	55	74	133	12	0	219	616
08:00 AM	5	17	8	0	30	6	16	4	0	26	3	9	5	0	17	15	25	1	0	41	114
08:15 AM	6	17	4	0	27	19	22	1	0	42	1	14	0	0	15	11	14	1	0	26	110
08:30 AM	12	13	6	0	31	10	35	2	1	48	1	15	5	1	22	9	21	1	0	31	132
08:45 AM	8	9	4	0	21	6	20	1	0	27	2	10	5	0	17	13	28	4	0	45	110
Total	31	56	22	0	109	41	93	8	1	143	7	48	15	1	71	48	88	7	0	143	466
**** BREAK ****																					
04:00 PM	16	43	22	0	81	15	38	2	0	55	6	33	11	0	50	13	58	14	0	85	271
04:15 PM	14	27	17	1	59	13	29	2	0	44	5	32	11	0	48	13	60	20	0	93	244
04:30 PM	10	27	11	0	48	14	29	3	0	46	11	23	20	0	54	16	69	25	0	110	258
04:45 PM	12	22	19	0	53	13	40	1	0	54	3	18	15	0	36	14	68	13	0	95	238
Total	52	119	69	1	241	55	136	8	0	199	25	106	57	0	188	56	255	72	0	383	1011
05:00 PM	15	26	13	0	54	6	35	2	0	43	7	39	21	0	67	9	62	10	0	81	245
05:15 PM	9	28	18	0	55	10	36	1	0	47	6	30	14	0	50	8	88	16	0	112	264
05:30 PM	12	17	13	0	42	8	46	1	1	56	3	20	11	0	34	12	64	15	0	91	223
05:45 PM	17	20	13	0	50	5	34	2	0	41	1	13	8	0	22	13	60	15	1	89	202
Total	53	91	57	0	201	29	151	6	1	187	17	102	54	0	173	42	274	56	1	373	934
**** BREAK ****																					
Grand Total	162	337	167	1	667	163	552	38	2	755	55	288	143	1	487	220	750	147	1	1118	3027
Apprch %	24.3	50.5	25	0.1		21.6	73.1	5	0.3		11.3	59.1	29.4	0.2		19.7	67.1	13.1	0.1		
Total %	5.4	11.1	5.5	0	22	5.4	18.2	1.3	0.1	24.9	1.8	9.5	4.7	0	16.1	7.3	24.8	4.9	0	36.9	
Pass Cars	156	332	162	0	650	156	527	35	0	718	51	283	133	0	467	207	722	144	0	1073	2908
% Pass Cars	96.3	98.5	97	0	97.5	95.7	95.5	92.1	0	95.1	92.7	98.3	93	0	95.9	94.1	96.3	98	0	96	96.1
Single Units	4	4	5	0	13	7	12	2	0	21	3	5	2	0	10	5	10	2	0	17	61
% Single Units	2.5	1.2	3	0	1.9	4.3	2.2	5.3	0	2.8	5.5	1.7	1.4	0	2.1	2.3	1.3	1.4	0	1.5	2
Heavy Trucks	2	1	0	0	3	0	13	1	0	14	1	0	8	0	9	8	18	1	0	27	53
% Heavy Trucks	1.2	0.3	0	0	0.4	0	2.4	2.6	0	1.9	1.8	0	5.6	0	1.8	3.6	2.4	0.7	0	2.4	1.8
Ped	0	0	0	1	1	0	0	0	2	2	0	0	0	1	1	0	0	0	1	1	5
% Ped	0	0	0	100	0.1	0	0	0	100	0.3	0	0	0	100	0.2	0	0	0	100	0.1	0.2

Comments: Traffic study conducted during atypical weekday (Tuesday) from 7:00-9:00 AM moring & 4:00-6:00 PM afternoon peak hours while school was in session. Signalized intersection with ped. signals for east & south legs, no push buttons.

Traffic Data Collection, TDC

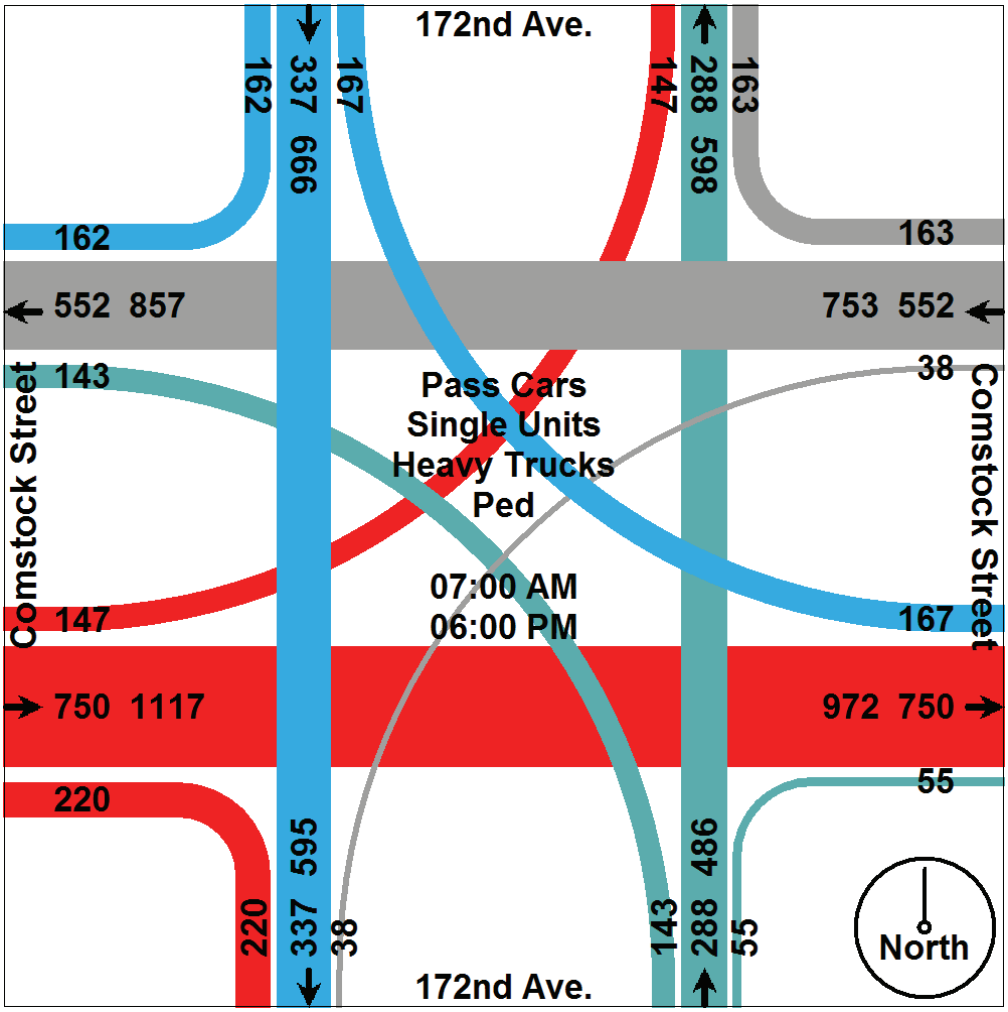
7504 Sawgrass Drive, Washington, MI 48094 Ph. (586) 786-5407

Traffic Study Performed For:

Fleis & Vandenbrink

Project: City of Grand Haven
Location: 172nd Ave. & Comstock St.
Weather: Cloudy, 30's
Count By: Video SCU 24L

File Name : TMC_1 172nd&Comstock_3-24-15
Site Code : TMC_1
Start Date : 3/24/2015
Page No : 2



Traffic Data Collection, TDC

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

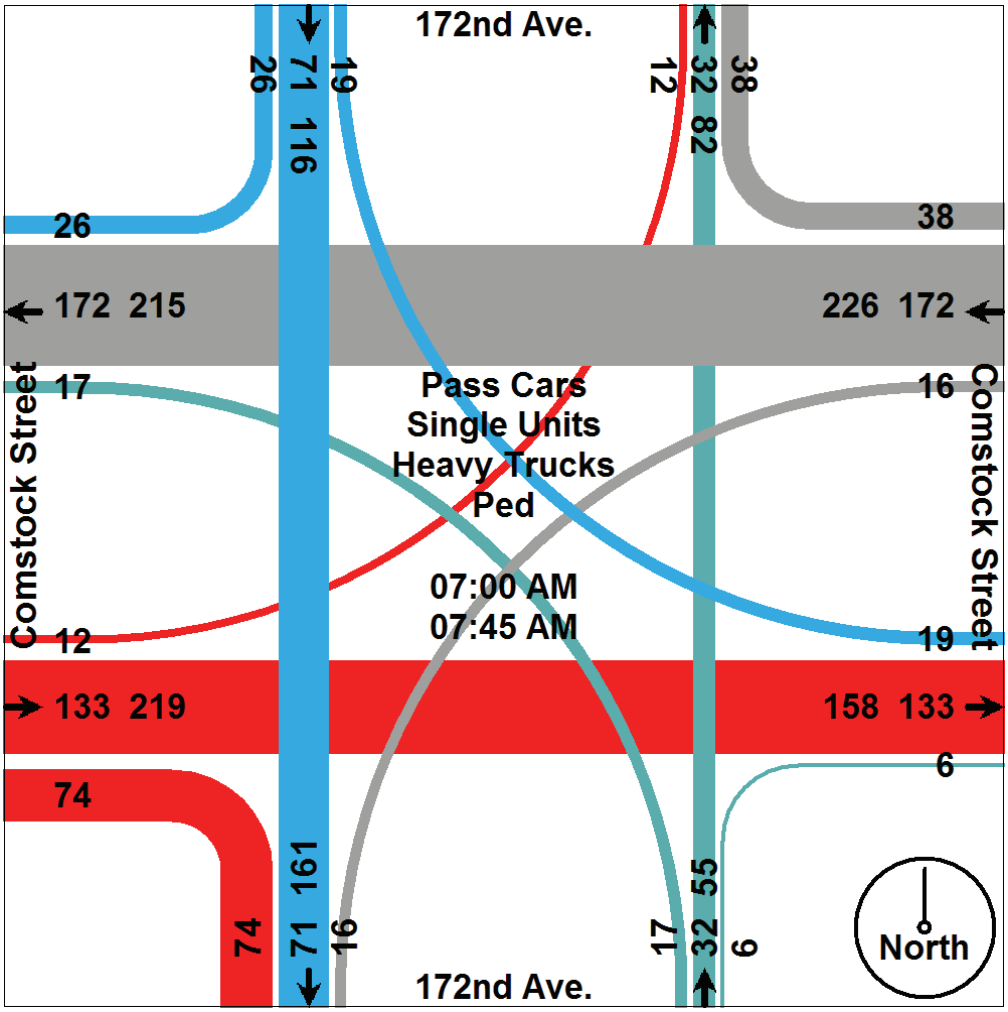
Traffic Study Performed For:

Fleis & Vandenbrink

Project: City of Grand Haven
Location: 172nd Ave. & Comstock St.
Weather: Cloudy, 30's
Count By: Video SCU 24L

File Name : TMC_1 172nd&Comstock_3-24-15
Site Code : TMC_1
Start Date : 3/24/2015
Page No : 3

	172nd Ave. Southbound				Comstock Street Westbound				172nd Ave. Northbound				Comstock Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00 AM																	
07:00 AM	6	12	**6**	24	6	34	5	45	0	3	**7**	10	4	34	**6**	44	123
07:15 AM	**11**	9	5	25	10	**58**	3	**71**	2	4	5	11	18	28	1	47	154
07:30 AM	5	16	6	27	9	48	2	59	**3**	**14**	2	**19**	20	33	2	55	160
07:45 AM	4	**34**	2	**40**	**13**	32	**6**	51	1	11	3	15	**32**	**38**	3	**73**	**179**
Total Volume	26	71	19	116	38	172	16	226	6	32	17	55	74	133	12	219	616
% App. Total	22.4	61.2	16.4		16.8	76.1	7.1		10.9	58.2	30.9		33.8	60.7	5.5		
PHF	.591	.522	.792	.725	.731	.741	.667	.796	.500	.571	.607	.724	.578	.875	.500	.750	.860
Pass Cars	26	71	18	115	37	160	15	212	3	32	14	49	70	125	11	206	582
% Pass Cars	100	100	94.7	99.1	97.4	93.0	93.8	93.8	50.0	100	82.4	89.1	94.6	94.0	91.7	94.1	94.5
Single Units	0	0	1	1	1	6	0	7	2	0	1	3	2	3	0	5	16
% Single Units	0	0	5.3	0.9	2.6	3.5	0	3.1	33.3	0	5.9	5.5	2.7	2.3	0	2.3	2.6
Heavy Trucks	0	0	0	0	0	6	1	7	1	0	2	3	2	5	1	8	18
% Heavy Trucks	0	0	0	0	0	3.5	6.3	3.1	16.7	0	11.8	5.5	2.7	3.8	8.3	3.7	2.9
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

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

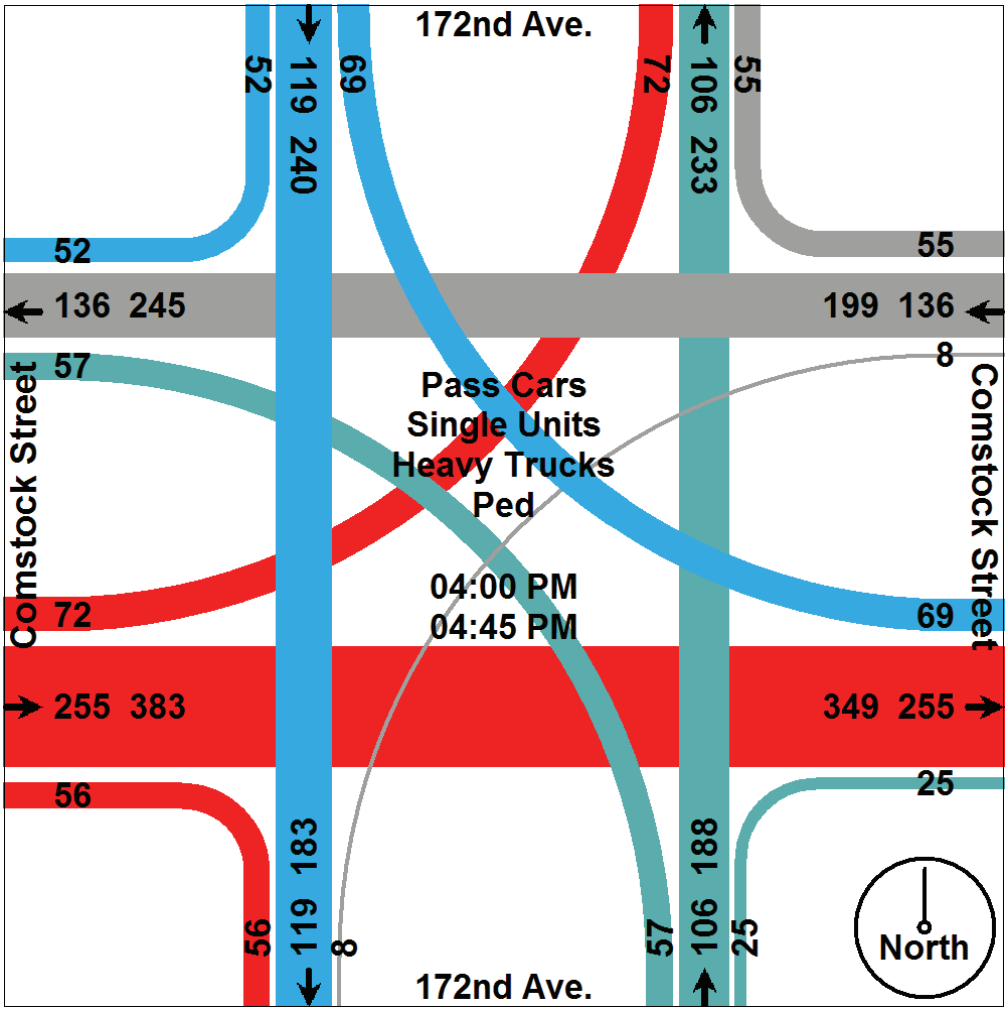
Traffic Study Performed For:

Fleis & Vandenbrink

Project: City of Grand Haven
Location: 172nd Ave. & Comstock St.
Weather: Cloudy, 30's
Count By: Video SCU 24L

File Name : TMC_1 172nd&Comstock_3-24-15
Site Code : TMC_1
Start Date : 3/24/2015
Page No : 4

	172nd Ave. Southbound				Comstock Street Westbound				172nd Ave. Northbound				Comstock Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	**16**	**43**	**22**	**81**	**15**	38	2	**55**	6	**33**	11	50	13	58	14	85	**271**
04:15 PM	14	27	17	58	13	29	2	44	5	32	11	48	13	60	20	93	243
04:30 PM	10	27	11	48	14	29	**3**	46	**11**	23	**20**	**54**	**16**	**69**	**25**	**110**	258
04:45 PM	12	22	19	53	13	**40**	1	54	3	18	15	36	14	68	13	95	238
Total Volume	52	119	69	240	55	136	8	199	25	106	57	188	56	255	72	383	1010
% App. Total	21.7	49.6	28.8		27.6	68.3	4		13.3	56.4	30.3		14.6	66.6	18.8		
PHF	.813	.692	.784	.741	.917	.850	.667	.905	.568	.803	.713	.870	.875	.924	.720	.870	.932
Pass Cars	49	117	67	233	54	131	6	191	24	105	54	183	53	249	70	372	979
% Pass Cars	94.2	98.3	97.1	97.1	98.2	96.3	75.0	96.0	96.0	99.1	94.7	97.3	94.6	97.6	97.2	97.1	96.9
Single Units	3	1	2	6	1	1	2	4	1	1	0	2	0	3	2	5	17
% Single Units	5.8	0.8	2.9	2.5	1.8	0.7	25.0	2.0	4.0	0.9	0	1.1	0	1.2	2.8	1.3	1.7
Heavy Trucks	0	1	0	1	0	4	0	4	0	0	3	3	3	3	0	6	14
% Heavy Trucks	0	0.8	0	0.4	0	2.9	0	2.0	0	0	5.3	1.6	5.4	1.2	0	1.6	1.4
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 Data Collection, TDC

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

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_24L

File Name : TMC_2 Hayes & West Site Dw
Site Code : TMC_2
Start Date : 2/10/2015
Page No : 1

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

	Southbound					Hayes Street Westbound					Westerly Site Driveway Northbound					Hayes Street Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	1	27	0	0	28	53
07:15 AM	0	0	0	0	0	0	45	0	0	45	0	0	0	0	0	1	30	0	0	31	76
07:30 AM	0	0	0	0	0	0	53	0	0	53	0	0	0	0	0	0	59	0	0	59	112
07:45 AM	0	0	0	0	0	0	17	0	0	17	0	0	0	0	0	0	81	0	0	81	98
Total	0	0	0	0	0	0	140	0	0	140	0	0	0	0	0	2	197	0	0	199	339
08:00 AM	0	0	0	0	0	0	23	0	0	23	0	0	1	0	1	0	44	0	0	44	68
08:15 AM	0	0	0	0	0	0	28	1	0	29	0	0	0	0	0	1	48	0	0	49	78
08:30 AM	0	0	0	0	0	0	27	0	0	27	0	0	1	0	1	0	27	0	0	27	55
08:45 AM	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	1	23	0	0	24	53
Total	0	0	0	0	0	0	107	1	0	108	0	0	2	0	2	2	142	0	0	144	254
**** BREAK ****																					
04:00 PM	0	0	0	0	0	0	73	0	0	73	0	0	0	0	0	1	24	0	0	25	98
04:15 PM	0	0	0	0	0	0	53	0	0	53	0	0	1	1	2	2	22	0	0	24	79
04:30 PM	0	0	0	0	0	0	43	1	0	44	0	0	0	0	0	0	30	0	0	30	74
04:45 PM	0	0	0	0	0	0	36	0	0	36	0	0	1	0	1	0	24	0	0	24	61
Total	0	0	0	0	0	0	205	1	0	206	0	0	2	1	3	3	100	0	0	103	312
05:00 PM	0	0	0	0	0	0	60	2	0	62	1	0	1	0	2	2	17	0	0	19	83
05:15 PM	0	0	0	0	0	0	45	0	0	45	0	0	2	0	2	0	23	0	0	23	70
05:30 PM	0	0	0	0	0	0	29	1	0	30	1	0	1	0	2	0	32	0	0	32	64
05:45 PM	0	0	0	0	0	0	29	0	0	29	0	0	0	0	0	1	17	0	0	18	47
Total	0	0	0	0	0	0	163	3	0	166	2	0	4	0	6	3	89	0	0	92	264
Grand Total	0	0	0	0	0	0	615	5	0	620	2	0	8	1	11	10	528	0	0	538	1169
Apprch %	0	0	0	0		0	99.2	0.8	0		18.2	0	72.7	9.1		1.9	98.1	0	0		
Total %	0	0	0	0	0	0	52.6	0.4	0	53	0.2	0	0.7	0.1	0.9	0.9	45.2	0	0	46	
Pass Cars	0	0	0	0	0	0	566	5	0	571	2	0	8	0	10	9	484	0	0	493	1074
% Pass Cars	0	0	0	0	0	0	92	100	0	92.1	100	0	100	0	90.9	90	91.7	0	0	91.6	91.9
Single Units	0	0	0	0	0	0	13	0	0	13	0	0	0	0	0	0	15	0	0	15	28
% Single Units	0	0	0	0	0	0	2.1	0	0	2.1	0	0	0	0	0	0	2.8	0	0	2.8	2.4
Heavy Trucks	0	0	0	0	0	0	36	0	0	36	0	0	0	0	0	1	29	0	0	30	66
% Heavy Trucks	0	0	0	0	0	0	5.9	0	0	5.8	0	0	0	0	0	10	5.5	0	0	5.6	5.6
Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1
% Ped	0	0	0	0	0	0	0	0	0	0	0	0	0	100	9.1	0	0	0	0	0	0.1

Comments: Traffic study conducted during atypical weekday (Tuesday from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. Non-signalized intersection. Video SCU scout camera located within SW quadrant.

Traffic Data Collection, TDC

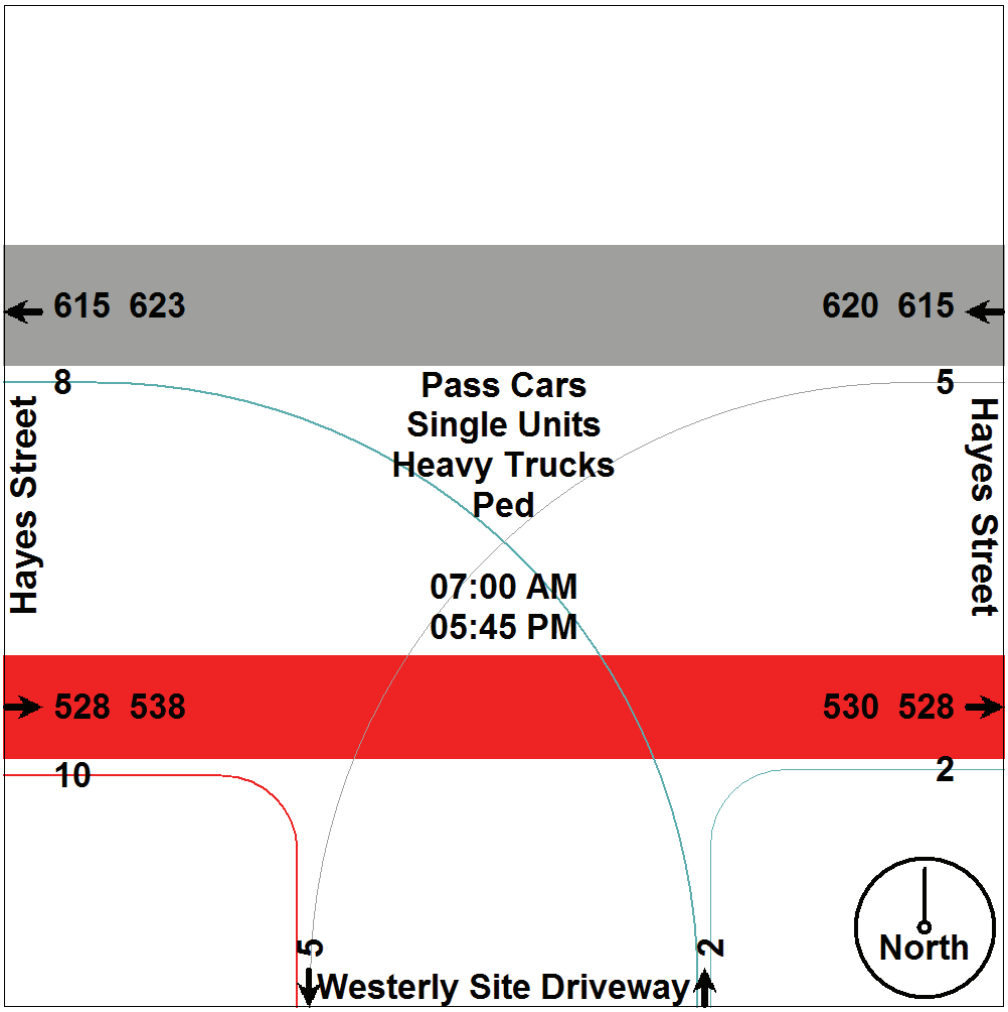
7504 Sawgrass Drive, Washington, MI 48094 Ph. (586) 786-5407

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_24L

File Name : TMC_2 Hayes & West Site Dw
Site Code : TMC_2
Start Date : 2/10/2015
Page No : 2



Traffic Data Collection, TDC

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

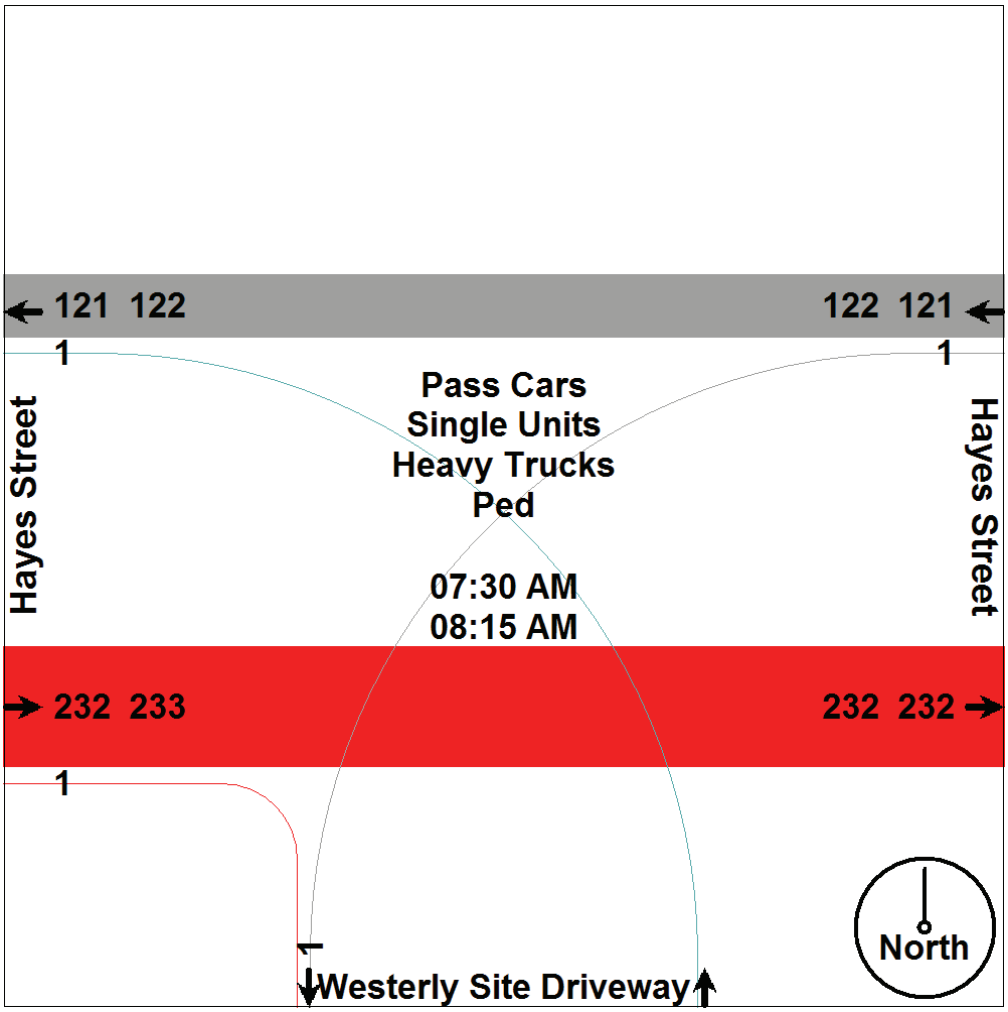
Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_24L

File Name : TMC_2 Hayes & West Site Dw
Site Code : TMC_2
Start Date : 2/10/2015
Page No : 3

	Southbound				Hayes Street Westbound				Westerly Site Driveway Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	0	0	0	0	**53**	0	**53**	0	0	0	0	0	59	0	59	**112**
07:45 AM	0	0	0	0	0	17	0	17	0	0	0	0	0	**81**	0	**81**	98
08:00 AM	0	0	0	0	0	23	0	23	0	0	**1**	**1**	0	44	0	44	68
08:15 AM	0	0	0	0	0	28	**1**	29	0	0	0	0	**1**	48	0	49	78
Total Volume	0	0	0	0	0	121	1	122	0	0	1	1	1	232	0	233	356
% App. Total	0	0	0		0	99.2	0.8		0	0	100		0.4	99.6	0		
PHF	.000	.000	.000	.000	.000	.571	.250	.575	.000	.000	.250	.250	.250	.716	.000	.719	.795
Pass Cars	0	0	0	0	0	110	1	111	0	0	1	1	0	221	0	221	333
% Pass Cars	0	0	0	0	0	90.9	100	91.0	0	0	100	100	0	95.3	0	94.8	93.5
Single Units	0	0	0	0	0	3	0	3	0	0	0	0	0	5	0	5	8
% Single Units	0	0	0	0	0	2.5	0	2.5	0	0	0	0	0	2.2	0	2.1	2.2
Heavy Trucks	0	0	0	0	0	8	0	8	0	0	0	0	1	6	0	7	15
% Heavy Trucks	0	0	0	0	0	6.6	0	6.6	0	0	0	0	100	2.6	0	3.0	4.2
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 Data Collection, TDC

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

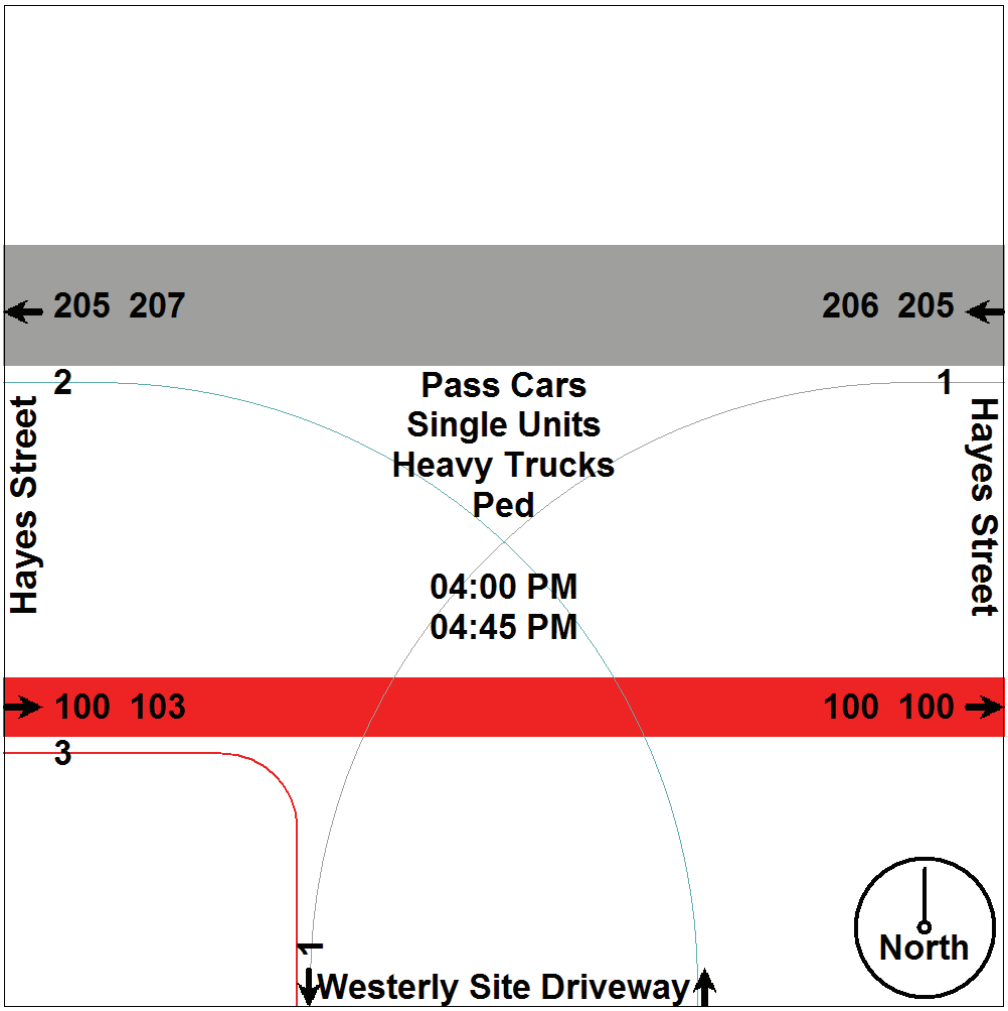
Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_24L

File Name : TMC_2 Hayes & West Site Dw
Site Code : TMC_2
Start Date : 2/10/2015
Page No : 4

	Southbound				Hayes Street Westbound				Westerly Site Driveway Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	0	0	0	0	0	73	0	73	0	0	0	0	1	24	0	25	98
04:15 PM	0	0	0	0	0	53	0	53	0	0	1	1	2	22	0	24	78
04:30 PM	0	0	0	0	0	43	1	44	0	0	0	0	0	30	0	30	74
04:45 PM	0	0	0	0	0	36	0	36	0	0	1	1	0	24	0	24	61
Total Volume	0	0	0	0	0	205	1	206	0	0	2	2	3	100	0	103	311
% App. Total	0	0	0		0	99.5	0.5		0	0	100		2.9	97.1	0		
PHF	.000	.000	.000	.000	.000	.702	.250	.705	.000	.000	.500	.500	.375	.833	.000	.858	.793
Pass Cars	0	0	0	0	0	196	1	197	0	0	2	2	3	88	0	91	290
% Pass Cars	0	0	0	0	0	95.6	100	95.6	0	0	100	100	100	88.0	0	88.3	93.2
Single Units	0	0	0	0	0	2	0	2	0	0	0	0	0	3	0	3	5
% Single Units	0	0	0	0	0	1.0	0	1.0	0	0	0	0	0	3.0	0	2.9	1.6
Heavy Trucks	0	0	0	0	0	7	0	7	0	0	0	0	0	9	0	9	16
% Heavy Trucks	0	0	0	0	0	3.4	0	3.4	0	0	0	0	0	9.0	0	8.7	5.1
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 Data Collection, TDC

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

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_1US

File Name : TMC_3 Hayes & 172nd
Site Code : TMC_3
Start Date : 2/10/2015
Page No : 1

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

	172nd Ave. Southbound					Hayes Street Westbound					172nd Ave. Northbound					Hayes Street Eastbound					
Start Time	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Rgt	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	8	4	7	0	19	3	13	1	0	17	3	4	8	0	15	6	18	5	0	29	80
07:15 AM	3	6	6	0	15	5	26	2	0	33	3	8	16	0	27	3	14	12	0	29	104
07:30 AM	5	9	8	0	22	10	32	1	0	43	0	3	12	0	15	10	33	16	0	59	139
07:45 AM	5	16	16	0	37	11	9	0	0	20	0	4	3	0	7	14	49	17	0	80	144
Total	21	35	37	0	93	29	80	4	0	113	6	19	39	0	64	33	114	50	0	197	467
08:00 AM	4	13	5	0	22	7	16	0	0	23	2	2	4	0	8	8	23	12	0	43	96
08:15 AM	9	8	10	0	27	8	16	3	0	27	1	6	4	0	11	8	27	13	0	48	113
08:30 AM	8	9	6	0	23	4	14	1	0	19	0	5	7	0	12	1	17	10	0	28	82
08:45 AM	6	10	16	0	32	16	16	0	0	32	0	8	4	0	12	2	14	7	0	23	99
Total	27	40	37	0	104	35	62	4	0	101	3	21	19	0	43	19	81	42	0	142	390
**** BREAK ****																					
04:00 PM	26	21	9	0	56	22	46	2	0	70	1	14	8	0	23	3	11	11	0	25	174
04:15 PM	15	24	8	0	47	11	20	1	0	32	1	9	13	1	24	3	11	6	0	20	123
04:30 PM	16	17	7	0	40	11	13	2	0	26	2	6	13	0	21	5	7	19	0	31	118
04:45 PM	19	10	8	0	37	12	16	1	0	29	1	14	3	0	18	4	11	10	0	25	109
Total	76	72	32	0	180	56	95	6	0	157	5	43	37	1	86	15	40	46	0	101	524
05:00 PM	15	20	8	0	43	21	38	1	0	60	1	17	9	0	27	5	4	9	0	18	148
05:15 PM	17	30	9	0	56	7	23	1	0	31	1	11	6	0	18	2	11	10	0	23	128
05:30 PM	11	16	2	1	30	7	13	2	0	22	0	15	6	0	21	4	12	18	0	34	107
05:45 PM	10	15	4	0	29	4	13	0	0	17	1	7	5	0	13	4	4	8	0	16	75
Total	53	81	23	1	158	39	87	4	0	130	3	50	26	0	79	15	31	45	0	91	458
06:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Grand Total	177	228	129	1	535	159	324	18	0	501	17	133	121	1	272	82	266	184	0	532	1840
Apprch %	33.1	42.6	24.1	0.2		31.7	64.7	3.6	0		6.2	48.9	44.5	0.4		15.4	50	34.6	0		
Total %	9.6	12.4	7	0.1	29.1	8.6	17.6	1	0	27.2	0.9	7.2	6.6	0.1	14.8	4.5	14.5	10	0	28.9	
Pass Cars	173	224	114	0	511	149	284	13	0	446	11	130	116	0	257	78	220	174	0	472	1686
% Pass Cars	97.7	98.2	88.4	0	95.5	93.7	87.7	72.2	0	89	64.7	97.7	95.9	0	94.5	95.1	82.7	94.6	0	88.7	91.6
Single Units	2	4	3	0	9	4	9	3	0	16	2	3	2	0	7	3	24	2	0	29	61
% Single Units	1.1	1.8	2.3	0	1.7	2.5	2.8	16.7	0	3.2	11.8	2.3	1.7	0	2.6	3.7	9	1.1	0	5.5	3.3
Heavy Trucks	2	0	12	0	14	6	31	2	0	39	4	0	3	0	7	1	22	8	0	31	91
% Heavy Trucks	1.1	0	9.3	0	2.6	3.8	9.6	11.1	0	7.8	23.5	0	2.5	0	2.6	1.2	8.3	4.3	0	5.8	4.9
Ped	0	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
% Ped	0	0	0	100	0.2	0	0	0	0	0	0	0	0	100	0.4	0	0	0	0	0	0.1

Comments: Traffic study conducted during atypical weekday (Tuesday) from 7:00-9:00 AM morning & 4:00-6:00 PM afternoon peak hours & while school was in session. All way stop controlled intersection. Video SCU camera located within NE quadrant.

Traffic Data Collection, TDC

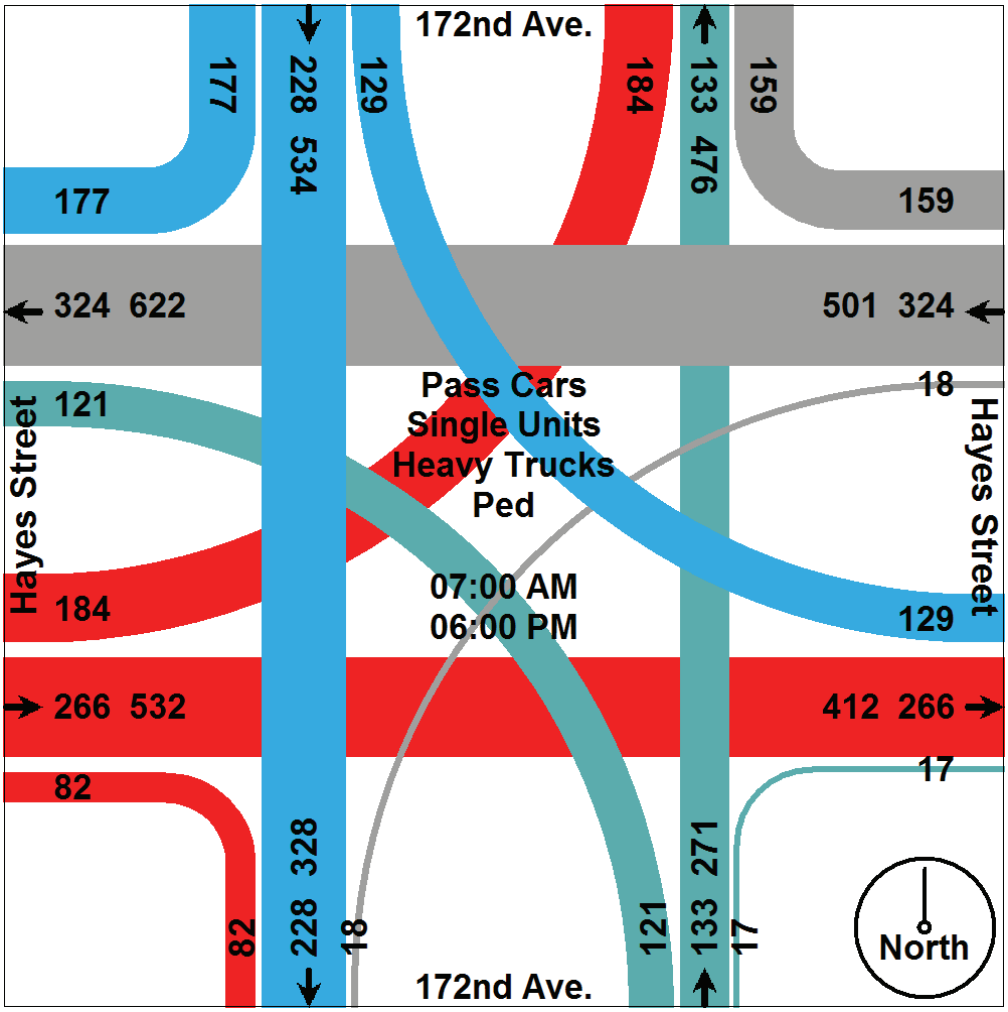
7504 Sawgrass Drive, Washington, MI 48094 Ph. (586) 786-5407

Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_1US

File Name : TMC_3 Hayes & 172nd
Site Code : TMC_3
Start Date : 2/10/2015
Page No : 2



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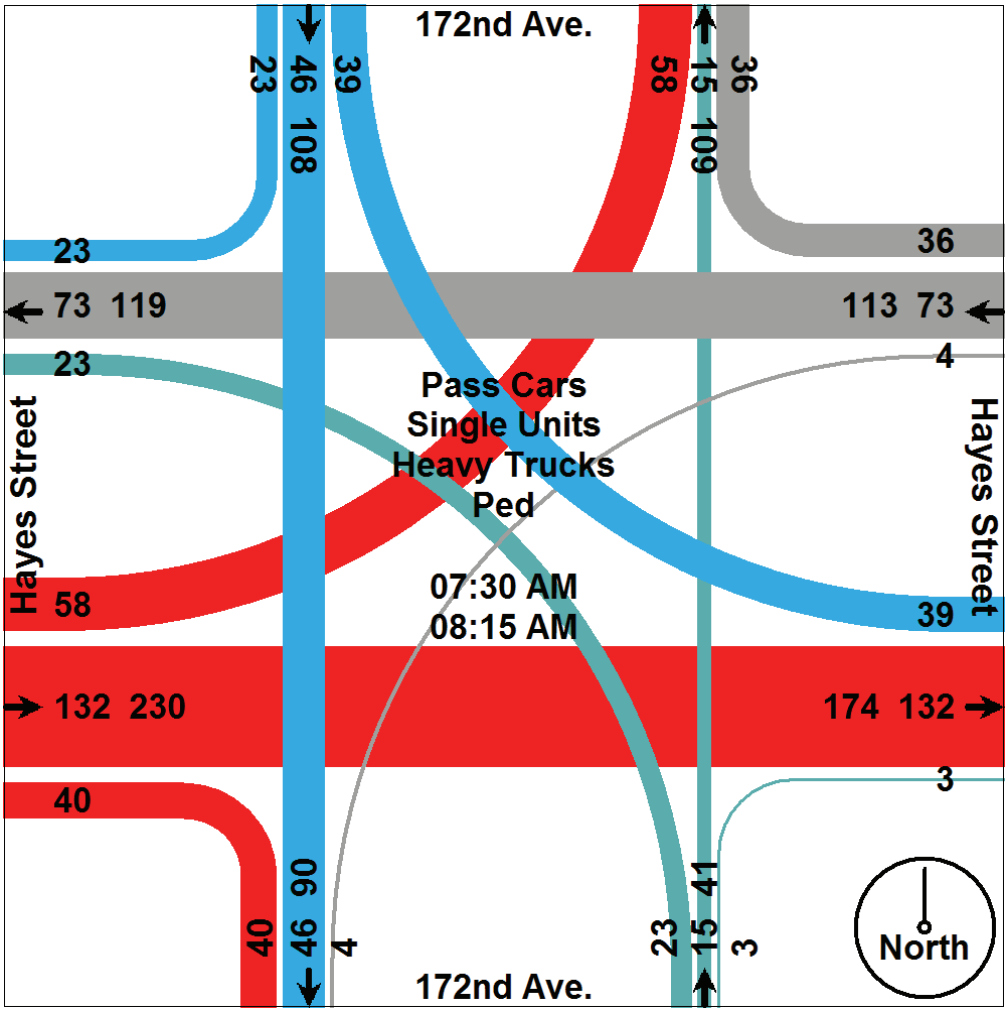
Site Code : TMC_3
Start Date : 2/10/2015
Page No : 3

	172nd Ave. Southbound				Hayes Street Westbound				172nd Ave. Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 12:30 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	5	9	8	22	10	**32**	1	**43**	0	3	**12**	**15**	10	33	16	59	139
07:45 AM	5	**16**	**16**	**37**	**11**	9	0	20	0	4	3	7	**14**	**49**	**17**	**80**	**144**
08:00 AM	4	13	5	22	7	16	0	23	**2**	2	4	8	8	23	12	43	96
08:15 AM	**9**	8	10	27	8	16	**3**	27	1	**6**	4	11	8	27	13	48	113
Total Volume	23	46	39	108	36	73	4	113	3	15	23	41	40	132	58	230	492
% App. Total	21.3	42.6	36.1		31.9	64.6	3.5		7.3	36.6	56.1		17.4	57.4	25.2		
PHF	.639	.719	.609	.730	.818	.570	.333	.657	.375	.625	.479	.683	.714	.673	.853	.719	.854
Pass Cars	20	45	35	100	33	64	3	100	1	15	23	39	39	117	54	210	449
% Pass Cars	87.0	97.8	89.7	92.6	91.7	87.7	75.0	88.5	33.3	100	100	95.1	97.5	88.6	93.1	91.3	91.3
Single Units	1	1	1	3	2	3	1	6	1	0	0	1	1	9	2	12	22
% Single Units	4.3	2.2	2.6	2.8	5.6	4.1	25.0	5.3	33.3	0	0	2.4	2.5	6.8	3.4	5.2	4.5
Heavy Trucks	2	0	3	5	1	6	0	7	1	0	0	1	0	6	2	8	21
% Heavy Trucks	8.7	0	7.7	4.6	2.8	8.2	0	6.2	33.3	0	0	2.4	0	4.5	3.4	3.5	4.3
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

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

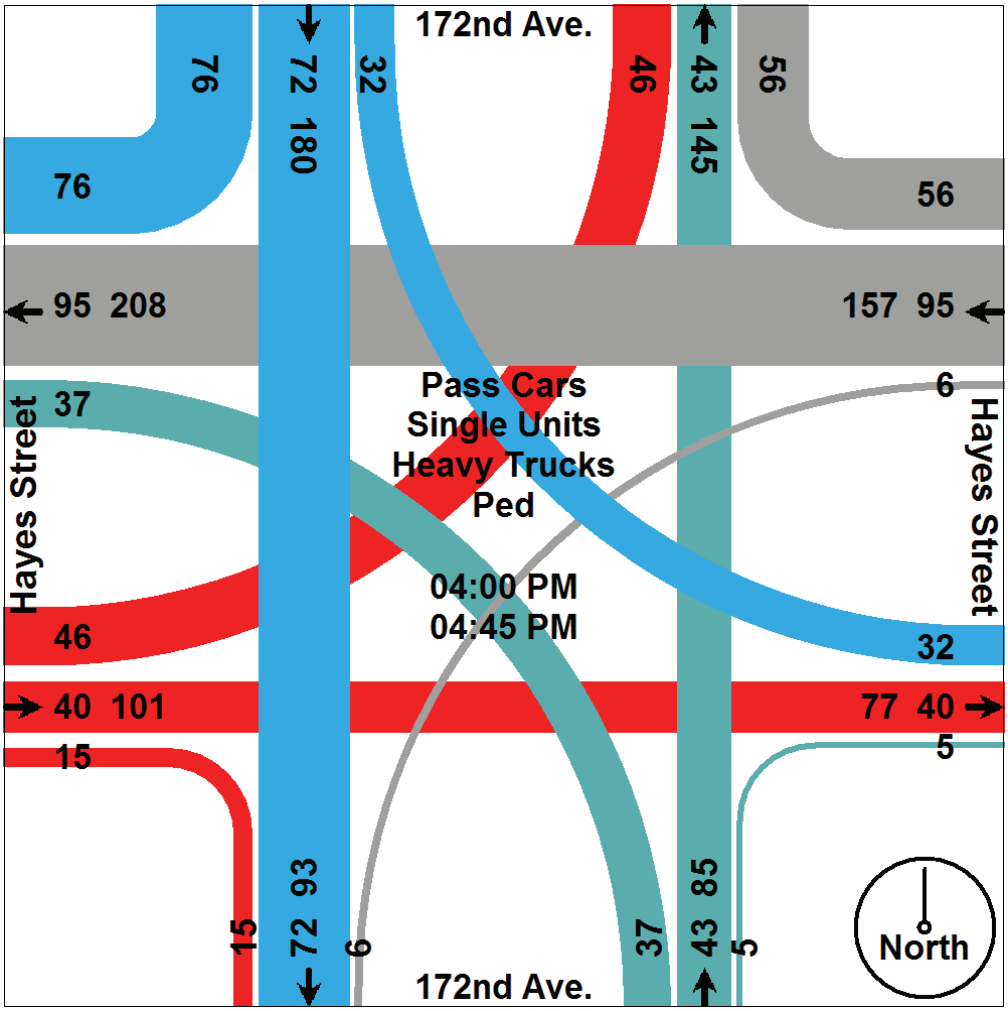
Traffic Study Performed For:

Fleis Vandenbrink

Project: Grand Haven Flagstar Study
Location: US-31 & Hayes Street
Weather: Sunny, Clear, Tmep., 20's
Count By: Miovision Video SCU_1US

File Name : TMC_3 Hayes & 172nd
Site Code : TMC_3
Start Date : 2/10/2015
Page No : 4

	172nd Ave. Southbound				Hayes Street Westbound				172nd Ave. Northbound				Hayes Street Eastbound				
Start Time	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Rgt	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:45 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	**26**	21	**9**	**56**	**22**	**46**	**2**	**70**	1	**14**	8	**23**	3	**11**	11	25	**174**
04:15 PM	15	**24**	8	47	11	20	1	32	1	9	**13**	23	3	11	6	20	122
04:30 PM	16	17	7	40	11	13	2	26	**2**	6	13	21	**5**	7	**19**	**31**	118
04:45 PM	19	10	8	37	12	16	1	29	1	14	3	18	4	11	10	25	109
Total Volume	76	72	32	180	56	95	6	157	5	43	37	85	15	40	46	101	523
% App. Total	42.2	40	17.8		35.7	60.5	3.8		5.9	50.6	43.5		14.9	39.6	45.5		
PHF	.731	.750	.889	.804	.636	.516	.750	.561	.625	.768	.712	.924	.750	.909	.605	.815	.751
Pass Cars	76	71	28	175	54	87	5	146	3	41	36	80	13	30	44	87	488
% Pass Cars	100	98.6	87.5	97.2	96.4	91.6	83.3	93.0	60.0	95.3	97.3	94.1	86.7	75.0	95.7	86.1	93.3
Single Units	0	1	0	1	0	2	1	3	1	2	0	3	1	7	0	8	15
% Single Units	0	1.4	0	0.6	0	2.1	16.7	1.9	20.0	4.7	0	3.5	6.7	17.5	0	7.9	2.9
Heavy Trucks	0	0	4	4	2	6	0	8	1	0	1	2	1	3	2	6	20
% Heavy Trucks	0	0	12.5	2.2	3.6	6.3	0	5.1	20.0	0	2.7	2.4	6.7	7.5	4.3	5.9	3.8
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



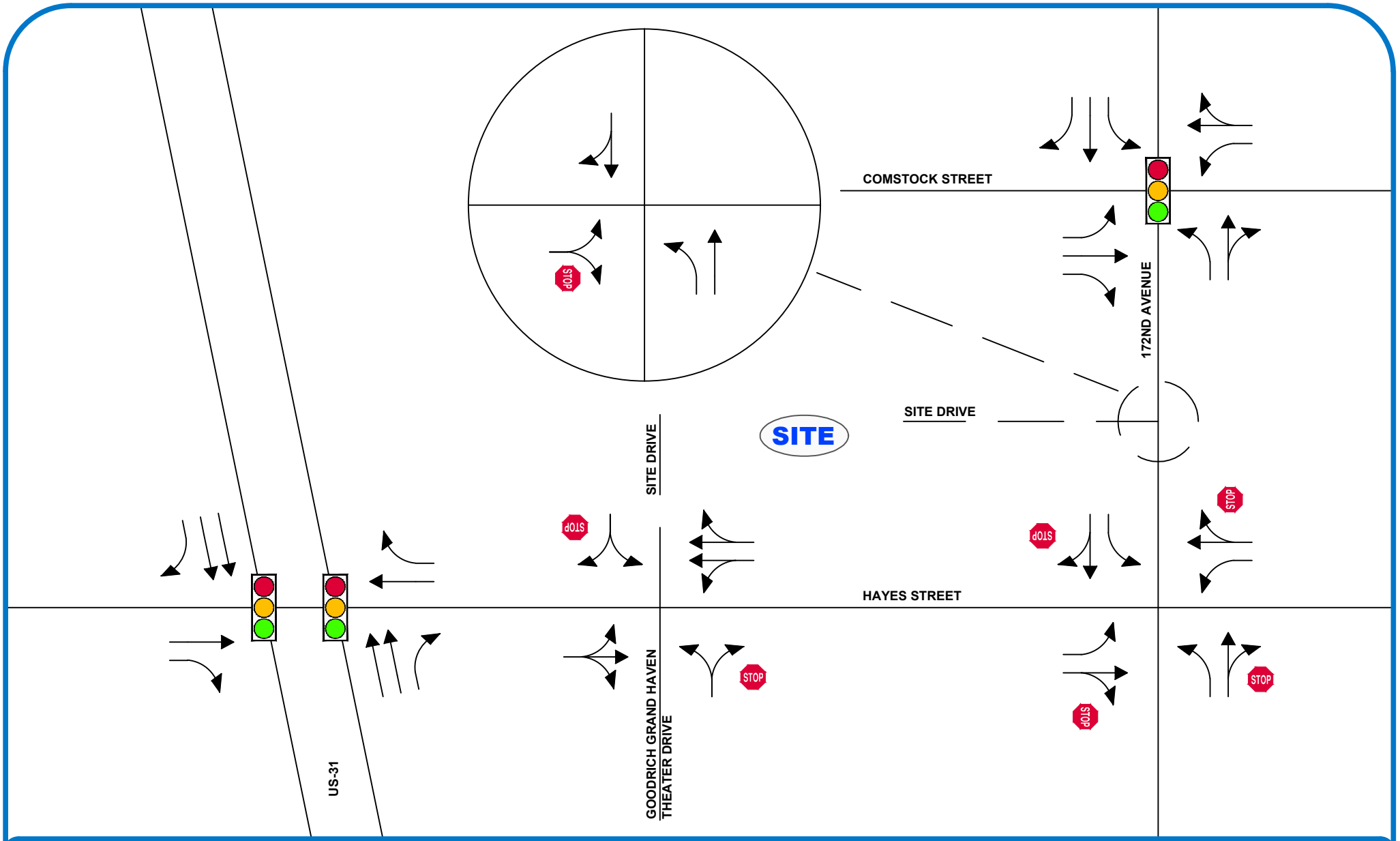


FIGURE 1
LANE USE AND TRAFFIC CONTROL

GRAND HAVEN SPEEDWAY TIA - GRAND HAVEN, MI

LEGEND

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

ROADS

LANE USE

2015

NORTH

SCALE: NOT TO SCALE

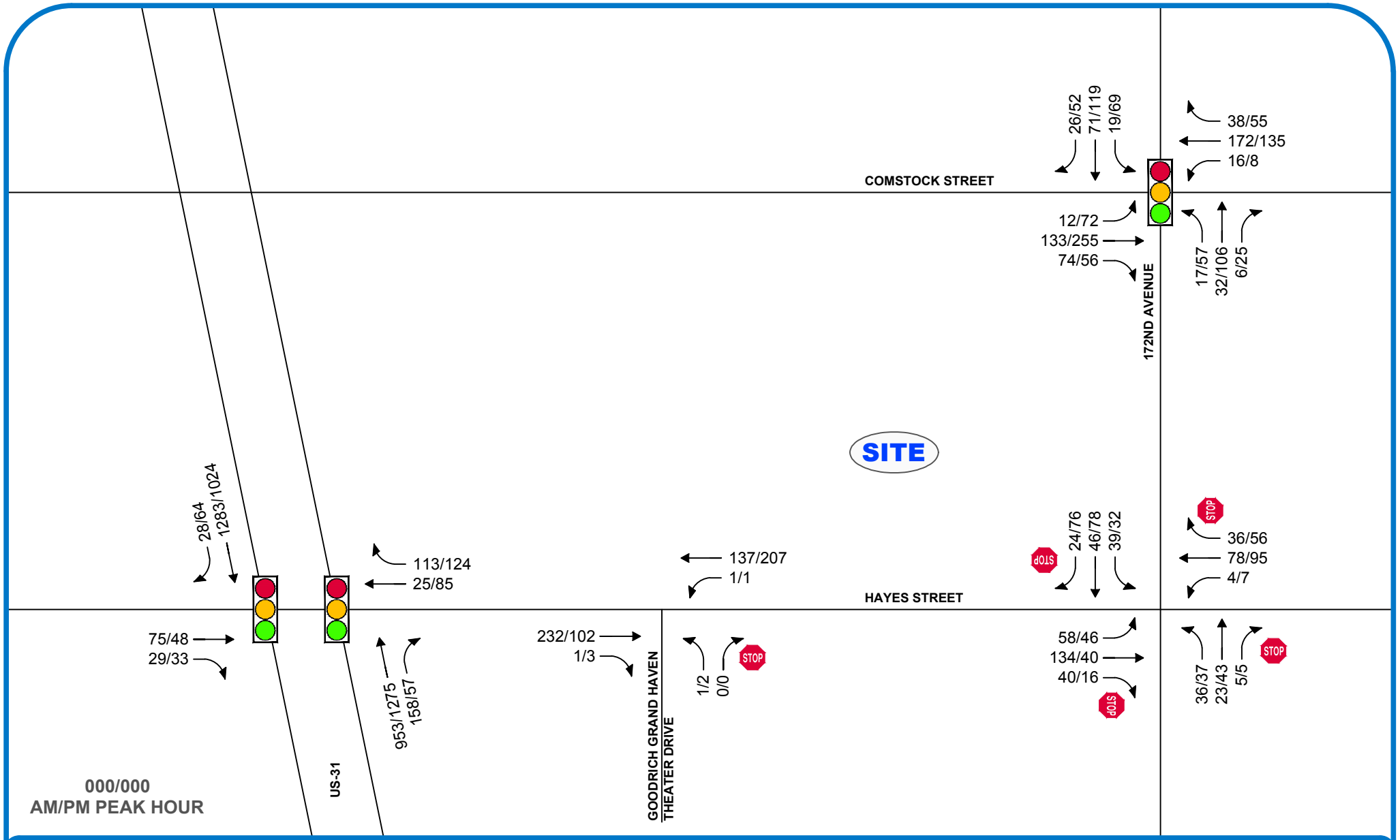


FIGURE 2
EXISTING TRAFFIC VOLUMES

GRAND HAVEN SPEEDWAY TIA - GRAND HAVEN, MI

LEGEND

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

TRAFFIC VOLUMES (AM/PM)

ROADS

2015

NORTH

SCALE: NOT TO SCALE

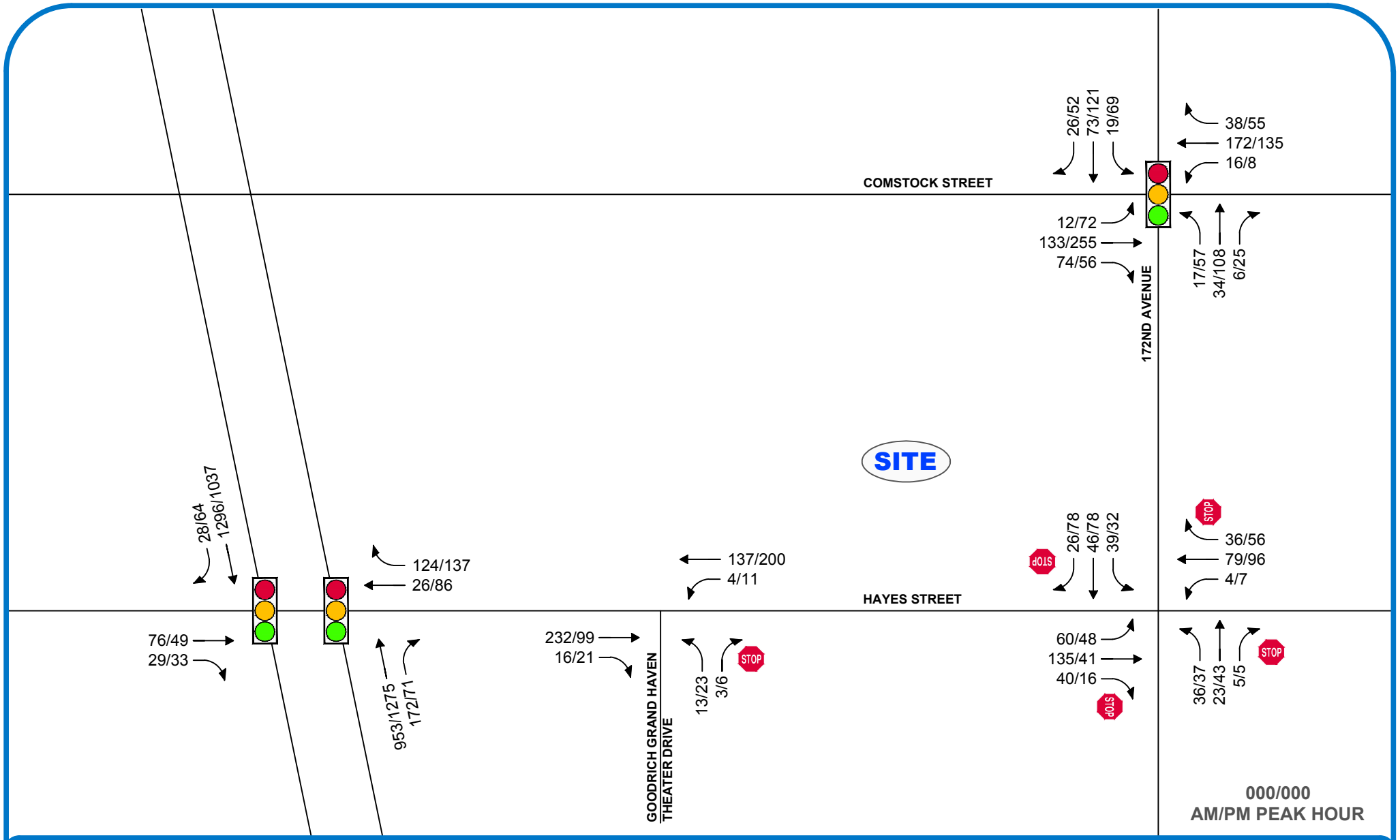


FIGURE 3
BACKGROUND TRAFFIC VOLUMES

GRAND HAVEN SPEEDWAY TIA - GRAND HAVEN, MI

LEGEND

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

TRAFFIC VOLUMES (AM/PM)

ROADS

2015

NORTH

SCALE: NOT TO SCALE

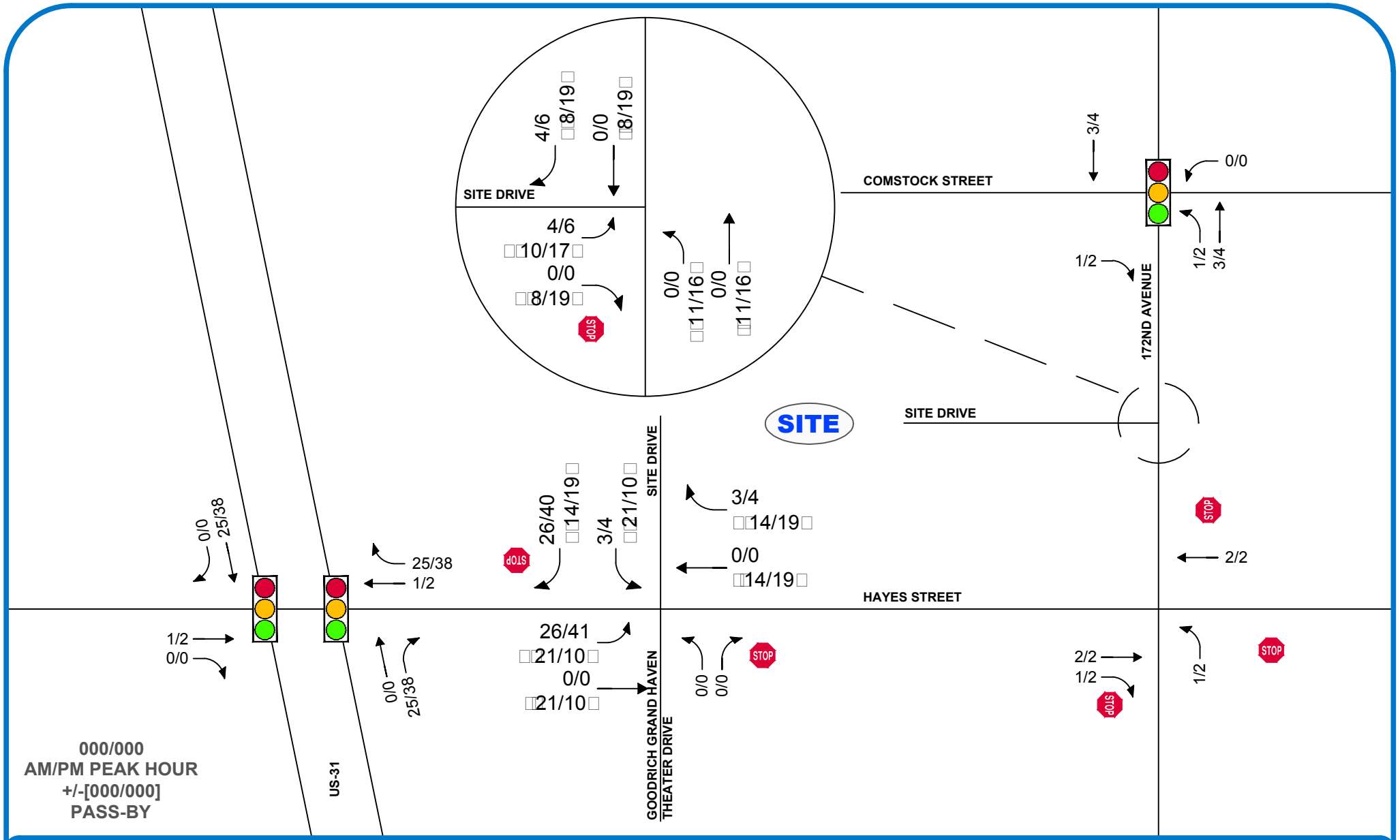


FIGURE 4
SITE-GENERATED TRAFFIC VOLUMES

GRAND HAVEN SPEEDWAY TIA - GRAND HAVEN, MI

LEGEND

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

TRAFFIC VOLUMES (AM/PM)

ROADS

2015

NORTH

SCALE: NOT TO SCALE

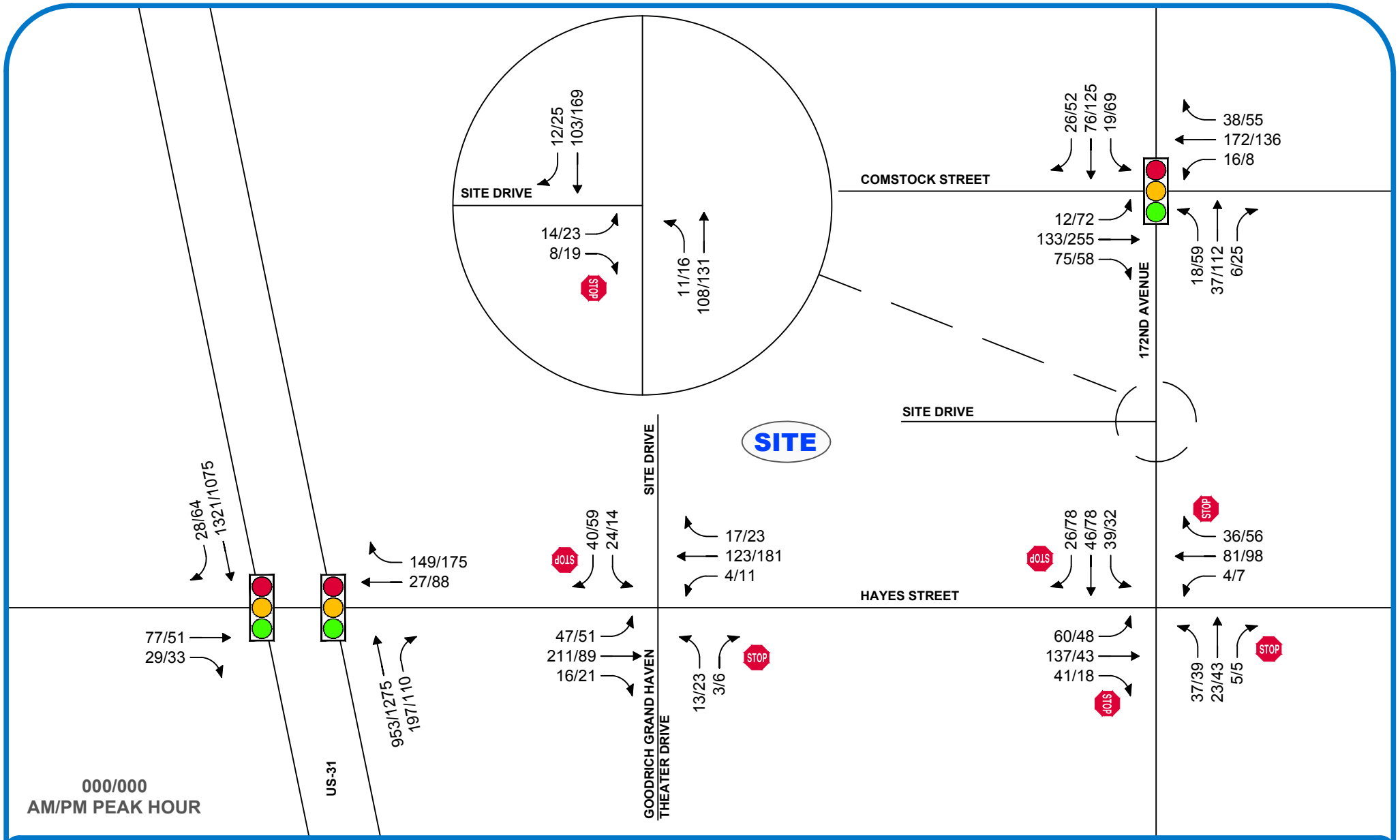


FIGURE 5
FUTURE TRAFFIC VOLUMES

GRAND HAVEN SPEEDWAY TIA - GRAND HAVEN, MI

LEGEND

SIGNALIZED INTERSECTION

UNSIGNALIZED INTERSECTION

TRAFFIC VOLUMES (AM/PM)

ROADS

2015

NORTH

SCALE: NOT TO SCALE

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 1: Eight-Hour Vehicular Volume

Intersection:	Hayes Street @ 172nd Avenue		
Date	4/2/2015	by	F&V

2	: No. of Lanes on Major St?
2	: No. of Lanes on Minor St?
45	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an Isolated community?
	: if answer 4 is Yes, then what is the of the population isolated community?
NO	: Have other remedial measures been tried?

USE 70% WARRANTS 1A AND 1B. DO NOT USE COMBINATION OF A & B

	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?	Combination Major A	Combination Minor A	Combination Major B	Combination Minor B	Warrant Condition A&B met?
Time	E-W	N-S											
00:01 - 01:00	38	7	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
01:00 - 02:00	16	7	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
02:00 - 03:00	21	5	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
03:00 - 04:00	68	11	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
04:00 - 05:00	73	21	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
05:00 - 06:00	363	110	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
06:00 - 07:00	483	100	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
07:00 - 08:00	310	93	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
08:00 - 09:00	243	104	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
09:00 - 10:00	265	99	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
10:00 - 11:00	266	111	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
11:00 - 12:00	357	162	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
12:00 - 13:00	421	182	420	140	YES	630	70	NO	N/A	N/A	N/A	N/A	N/A
13:00 - 14:00	453	211	420	140	YES	630	70	NO	N/A	N/A	N/A	N/A	N/A
14:00 - 15:00	534	175	420	140	YES	630	70	NO	N/A	N/A	N/A	N/A	N/A
15:00 - 16:00	374	150	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
16:00 - 17:00	258	180	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
17:00 - 18:00	221	158	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
18:00 - 19:00	146	101	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
19:00 - 20:00	125	93	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
20:00 - 21:00	92	72	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
21:00 - 22:00	216	106	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
22:00 - 23:00	244	47	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A
23:00 - 00:00	44	17	420	140	NO	630	70	NO	N/A	N/A	N/A	N/A	N/A

Number of Hours that met the warrant 1A =	3
Number of Hours that met the warrant 1B =	0
Number of Hours that met the warrant 1 A & B =	0

A. Is the Minimum Vehicular Volume Warrant Met? (Condition A)	NO
B. Is the Interruption of Continuous Traffic Met? (Condition B)	NO
C. Combination of Warrants A and B Criteria Met?	N/A

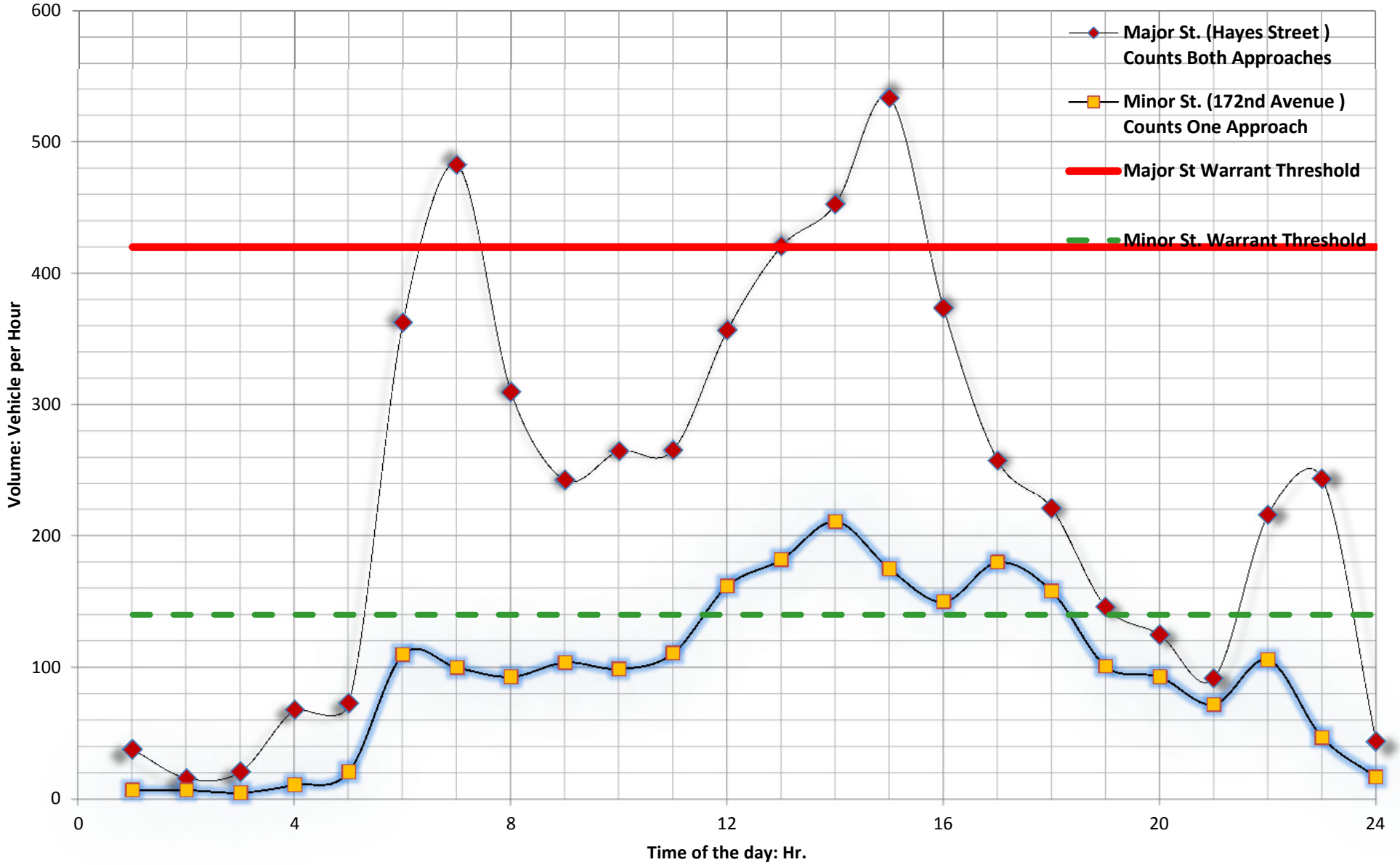


FIGURE 1: WARRANT **1A**

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? YES

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

Hayes Street @ 172nd Avenue

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 3

Does this intersection meet Warrant 1A for signal installation? NO

Data Collection Date: 3/23/2015

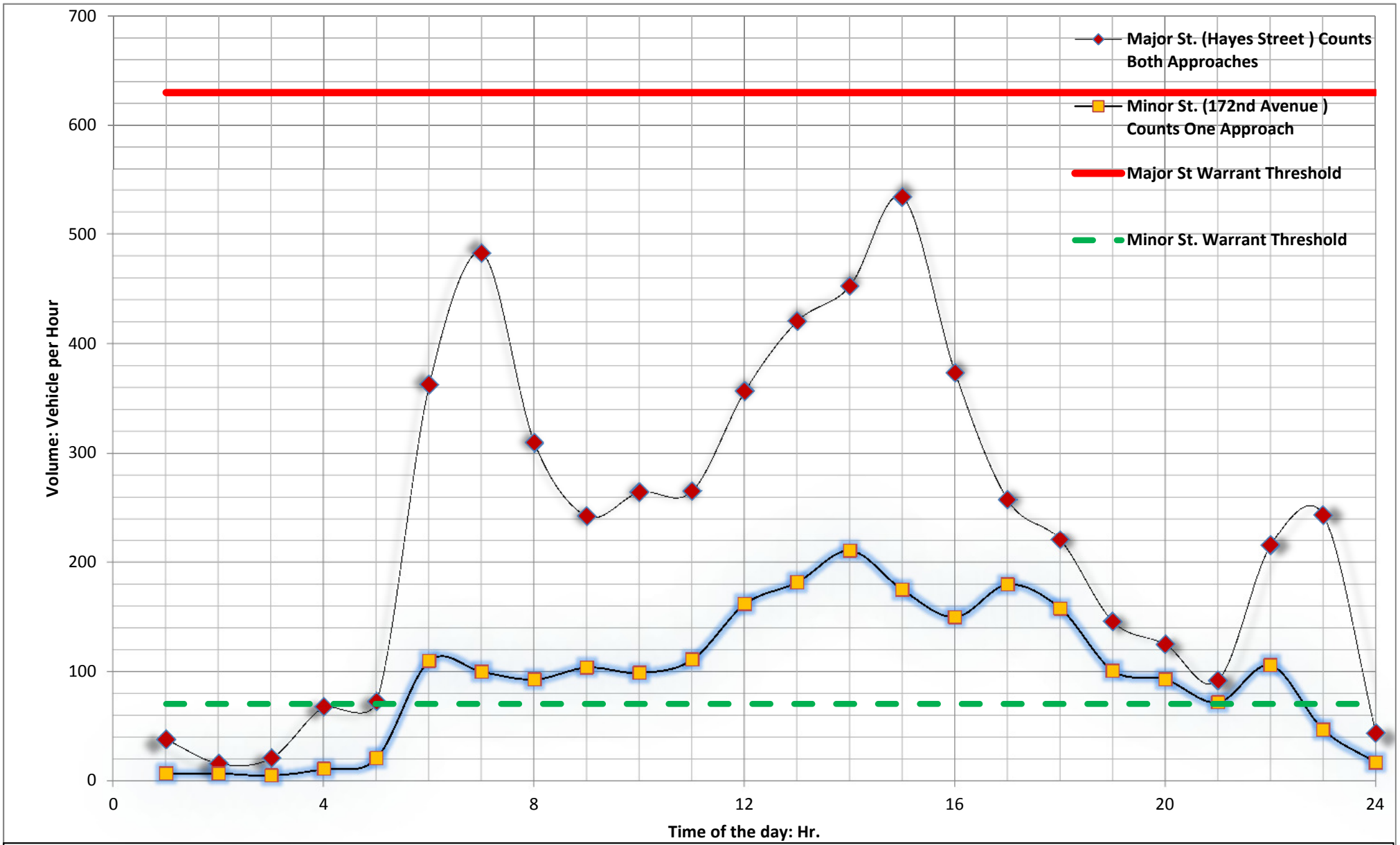


FIGURE 1: WARRANT **1B**

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 70% ...

1- DUE TO SPEED? **YES**

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? **NO**

Spot Number:

Hayes Street @ 172nd Avenue

NO. OF LANES ON MAJOR ST.? **2**

NO. OF LANES ON MINOR ST.? **2**

Number of Hours that met the Warrant: **0**

Does this intersection meet Warrant 1B for signal installation? **NO**

Data Collection Date: **3/23/2015**

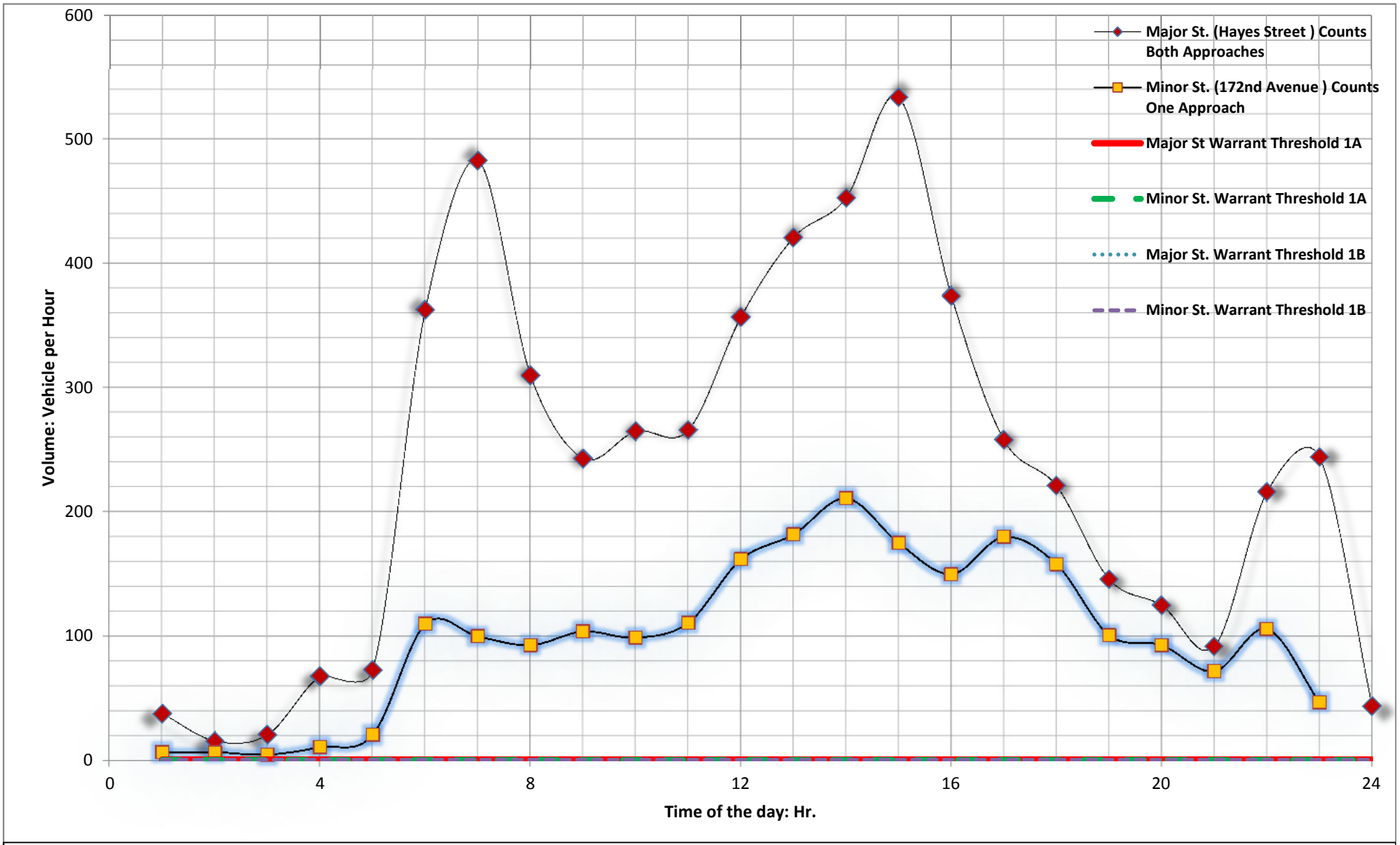


FIGURE 3: WARRANT **1A&B**

IS THERE A REDUCTION IN THE WARRANT THRESHOLDS TO 56% ...

1- DUE TO SPEED? YES

2- DUE TO ISOLATED COMMUNITY WITH POPULATION LESS THAN 10,000? NO

Spot Number:

Hayes Street @ 172nd Avenue

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 2

Number of Hours that met the Warrant: 0

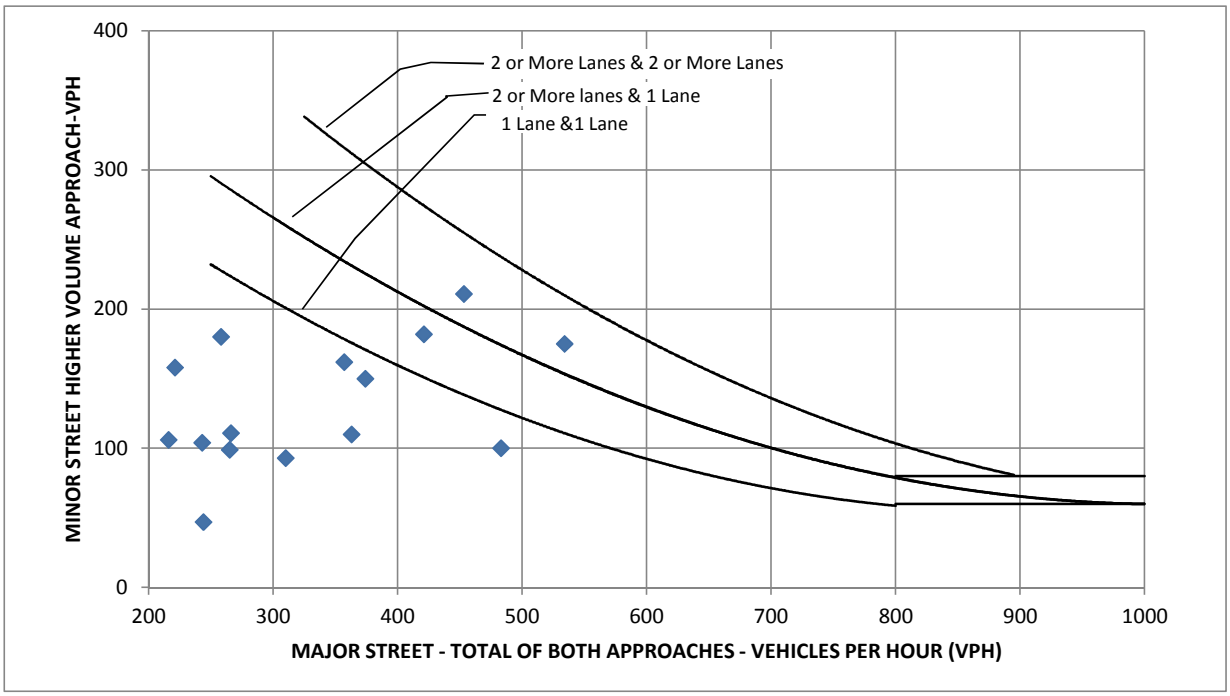
Does this intersection meet Warrant 1A&B for signal installation? N/A

Data Collection Date: 3/23/2015

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 2: Four-Hour Vehicular Volume

Spot Number:	0		
Intersection:	Hayes Street @ 172nd Avenue		
Date	4/2/2015	by	F&V

2	: No. of Lanes on Major St.
2	: No. of Lanes on Minor St.
45	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an Isolated community?
	: What is the of the population isolated community?



How Many Hours Are Met	0
Is Warrant (70%) Met?	NO

Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 7: Crash Experience

Spot Number:	0		
Intersection:	Hayes Street @ 172nd Avenue		
Date	4/2/2015	by	F&V

2	: No. of Lanes on Major St?
2	: No. of Lanes on Minor St?
0%	: Has adequate trial of remedial measure with adequate enforcement been tried?
NO	: Are there 5 or more Crashes Susceptable to Correction by Signalization in a 12 Month Period?

	Major Volume (Both Apr.)	Minor Volume (One Apr.)	Condition A Major Volume	Condition A Minor Volume	Warrant Condition A Met?	Condition B Major Volume	Condition B Minor Volume	Warrant Condition B Met?
Time	E-W	N-S						
00:01 - 01:00	38	7	336	112	NO	504	56	NO
01:00 - 02:00	16	7	336	112	NO	504	56	NO
02:00 - 03:00	21	5	336	112	NO	504	56	NO
03:00 - 04:00	68	11	336	112	NO	504	56	NO
04:00 - 05:00	73	21	336	112	NO	504	56	NO
05:00 - 06:00	363	110	336	112	NO	504	56	NO
06:00 - 07:00	483	100	336	112	NO	504	56	NO
07:00 - 08:00	310	93	336	112	NO	504	56	NO
08:00 - 09:00	243	104	336	112	NO	504	56	NO
09:00 - 10:00	265	99	336	112	NO	504	56	NO
10:00 - 11:00	266	111	336	112	NO	504	56	NO
11:00 - 12:00	357	162	336	112	YES	504	56	NO
12:00 - 13:00	421	182	336	112	YES	504	56	NO
13:00 - 14:00	453	211	336	112	YES	504	56	NO
14:00 - 15:00	534	175	336	112	YES	504	56	YES
15:00 - 16:00	374	150	336	112	YES	504	56	NO
16:00 - 17:00	258	180	336	112	NO	504	56	NO
17:00 - 18:00	221	158	336	112	NO	504	56	NO
18:00 - 19:00	146	101	336	112	NO	504	56	NO
19:00 - 20:00	125	93	336	112	NO	504	56	NO
20:00 - 21:00	92	72	336	112	NO	504	56	NO
21:00 - 22:00	216	106	336	112	NO	504	56	NO
22:00 - 23:00	244	47	336	112	NO	504	56	NO
23:00 - 00:00	44	17	336	112	NO	504	56	NO

Is there a reduction in the warrant thresholds to 56% =	NO
Number of Hours that met the warrant 7A =	5
Number of Hours that met the warrant 7B =	1

A. Is the Minimum Vehicular Volume Warrant Met Based on Crash Patterns? (Condition A)	NO
B. Is the Interruption of Continuous Traffic Met Based on Crash Patterns? (Condition B)	NO

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

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	75	29	0	25	0	0	0	0	0	1283	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1863	1583		1727						3438	1538
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1863	1583		1727						3438	1538
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.92	0.92	0.92	0.85	0.85	0.85
Adj. Flow (vph)	0	112	43	0	39	0	0	0	0	0	1509	33
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	0	112	9	0	39	0	0	0	0	0	1509	19
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	2%	2%	2%	5%	5%	5%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.9	14.9		17.9						39.7	39.7
Effective Green, g (s)		14.9	14.9		17.9						39.7	39.7
Actuated g/C Ratio		0.21	0.21		0.26						0.57	0.57
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		396	336		441						1949	872
v/s Ratio Prot		c0.06			0.02						c0.44	
v/s Ratio Perm			0.01									0.01
v/c Ratio		0.28	0.03		0.09						0.77	0.02
Uniform Delay, d1		23.1	21.8		19.8						11.7	6.6
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.1						3.1	0.0
Delay (s)		0.3	0.0		0.1						14.8	6.7
Level of Service		A	A		A						B	A
Approach Delay (s)		0.3			0.1			0.0			14.6	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	75	0	0	25	113	0	953	158	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1863			1727	1468		3374	1509			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1863			1727	1468		3374	1509			
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	0	112	0	0	39	177	0	1083	180	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	78	0	0	0
Lane Group Flow (vph)	0	112	0	0	39	114	0	1083	102	0	0	0
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	7%	7%	7%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.9			14.9	14.9		39.7	39.7			
Effective Green, g (s)		17.9			14.9	14.9		39.7	39.7			
Actuated g/C Ratio		0.26			0.21	0.21		0.57	0.57			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		476			367	312		1913	855			
v/s Ratio Prot		0.06			0.02			c0.32				
v/s Ratio Perm						c0.08			0.07			
v/c Ratio		0.24			0.11	0.37		0.57	0.12			
Uniform Delay, d1		20.6			22.2	23.5		9.7	7.0			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.3			0.1	0.7		1.2	0.3			
Delay (s)		0.3			22.3	24.2		10.9	7.3			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.3			23.9			10.4			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	104	0	0	53	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1863			1776		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1863			1776		
Peak-hour factor, PHF	0.67	0.67	0.75	0.75	0.92	0.92
Adj. Flow (vph)	155	0	0	71	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	155	0	0	71	0	0
Heavy Vehicles (%)	2%	2%	7%	7%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.9			70.0		
Effective Green, g (s)	9.9			70.0		
Actuated g/C Ratio	0.14			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	263			1776		
v/s Ratio Prot	c0.08			0.04		
v/s Ratio Perm						
v/c Ratio	0.59			0.04		
Uniform Delay, d1	28.1			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	3.4			0.0		
Delay (s)	31.5			0.0		
Level of Service	C			A		
Approach Delay (s)	31.5			0.0	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.15		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	133	74	16	172	38	17	32	6	19	71	26
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	1792	1792	1792	1792	1792	1900	1712	1712	1900	1881	1881	1881
Adj Flow Rate, veh/h	16	177	99	20	215	48	24	44	8	26	97	36
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.75	0.75	0.75	0.80	0.80	0.80	0.72	0.72	0.72	0.73	0.73	0.73
Percent Heavy Veh, %	6	6	6	6	6	6	11	11	11	1	1	1
Cap, veh/h	422	725	616	461	574	128	557	600	109	657	801	681
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1070	1792	1524	1057	1420	317	1150	1410	256	1360	1881	1599
Grp Volume(v), veh/h	16	177	99	20	0	263	24	0	52	26	97	36
Grp Sat Flow(s),veh/h/ln	1070	1792	1524	1057	0	1737	1150	0	1666	1360	1881	1599
Q Serve(g_s), s	0.7	4.6	2.9	0.9	0.0	7.4	0.9	0.0	1.3	0.8	2.2	0.9
Cycle Q Clear(g_c), s	8.2	4.6	2.9	5.5	0.0	7.4	3.1	0.0	1.3	2.1	2.2	0.9
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	422	725	616	461	0	702	557	0	709	657	801	681
V/C Ratio(X)	0.04	0.24	0.16	0.04	0.00	0.37	0.04	0.00	0.07	0.04	0.12	0.05
Avail Cap(c_a), veh/h	422	725	616	461	0	702	557	0	709	657	801	681
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	13.8	13.3	15.6	0.0	14.6	13.1	0.0	11.9	12.5	12.2	11.8
Incr Delay (d2), s/veh	0.2	0.8	0.6	0.2	0.0	1.5	0.1	0.0	0.2	0.1	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	2.4	1.3	0.3	0.0	3.8	0.3	0.0	0.6	0.3	1.2	0.4
LnGrp Delay(d),s/veh	17.7	14.6	13.8	15.8	0.0	16.2	13.3	0.0	12.1	12.7	12.5	12.0
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		292			283			76			159	
Approach Delay, s/veh		14.5			16.1			12.5			12.4	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		10.2		4.2		9.4		5.1
Green Ext Time (p_c), s		0.3		0.1		0.3		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	14.5
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	58	134	40	0	4	78	36	0	36	23	5	0	39	46	24
Peak Hour Factor	0.92	0.72	0.72	0.72	0.92	0.66	0.66	0.66	0.92	0.68	0.68	0.68	0.92	0.73	0.73	0.73
Heavy Vehicles, %	2	9	9	9	2	11	11	11	2	5	5	5	2	7	7	7
Mvmt Flow	0	81	186	56	0	6	118	55	0	53	34	7	0	53	63	33
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	10.9	10.4	9.7	9.8
HCM LOS	B	B	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	82%	0%	77%	0%	68%	0%	66%
Vol Right, %	0%	18%	0%	23%	0%	32%	0%	34%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	28	58	174	4	114	39	70
LT Vol	36	0	58	0	4	0	39	0
Through Vol	0	23	0	134	0	78	0	46
RT Vol	0	5	0	40	0	36	0	24
Lane Flow Rate	53	41	81	242	6	173	53	96
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.099	0.069	0.135	0.361	0.011	0.265	0.099	0.157
Departure Headway (Hd)	6.699	6.066	6.152	5.485	6.37	5.642	6.644	5.896
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	538	594	586	660	565	641	542	612
Service Time	4.404	3.771	3.852	3.185	4.07	3.342	4.347	3.599
HCM Lane V/C Ratio	0.099	0.069	0.138	0.367	0.011	0.27	0.098	0.157
HCM Control Delay	10.1	9.2	9.8	11.3	9.1	10.4	10.1	9.7
HCM Lane LOS	B	A	A	B	A	B	B	A
HCM 95th-tile Q	0.3	0.2	0.5	1.6	0	1.1	0.3	0.6

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	232	1	1	137	1	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	1	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	72	72	60	60	60	60
Heavy Vehicles, %	5	0	0	9	0	0
Mvmt Flow	322	1	2	228	2	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	324	0	441	323
Stage 1	-	-	-	-	323	-
Stage 2	-	-	-	-	118	-
Critical Hdwy	-	-	4.1	-	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1247	-	563	723
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	900	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1247	-	562	723
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	738	-
Stage 2	-	-	-	-	898	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	562	-	-	1247	-
HCM Lane V/C Ratio	0.003	-	-	0.001	-
HCM Control Delay (s)	11.4	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	48	33	0	85	0	0	0	0	0	1024	64
Future Volume (vph)	0	48	33	0	85	0	0	0	0	0	1024	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1900	1615		1845						3471	1553
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1900	1615		1845						3471	1553
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.92	0.92	0.92	0.84	0.84	0.84
Adj. Flow (vph)	0	63	43	0	131	0	0	0	0	0	1219	76
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	32
Lane Group Flow (vph)	0	63	9	0	131	0	0	0	0	0	1219	44
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.1	14.1		17.1						40.5	40.5
Effective Green, g (s)		14.1	14.1		17.1						40.5	40.5
Actuated g/C Ratio		0.20	0.20		0.24						0.58	0.58
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		382	325		450						2008	898
v/s Ratio Prot		0.03			c0.07						c0.35	
v/s Ratio Perm			0.01									0.03
v/c Ratio		0.16	0.03		0.29						0.61	0.05
Uniform Delay, d1		23.1	22.4		21.5						9.6	6.4
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.2	0.0		0.3						1.4	0.1
Delay (s)		0.2	0.0		0.4						11.0	6.5
Level of Service		A	A		A						B	A
Approach Delay (s)		0.1			0.4			0.0			10.7	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	48	0	0	85	124	0	1275	57	0	0	0
Future Volume (vph)	0	48	0	0	85	124	0	1275	57	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1900			1845	1568		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1900			1845	1568		3539	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	0	63	0	0	131	191	0	1417	63	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	42	0	0	27	0	0	0
Lane Group Flow (vph)	0	63	0	0	131	149	0	1417	36	0	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.1			14.1	14.1		40.5	40.5			
Effective Green, g (s)		17.1			14.1	14.1		40.5	40.5			
Actuated g/C Ratio		0.24			0.20	0.20		0.58	0.58			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		464			371	315		2047	915			
v/s Ratio Prot		0.03			0.07			c0.40				
v/s Ratio Perm						c0.09			0.02			
v/c Ratio		0.14			0.35	0.47		0.69	0.04			
Uniform Delay, d1		20.7			24.0	24.7		10.4	6.4			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.1			0.6	1.1		2.0	0.1			
Delay (s)		0.1			24.6	25.8		12.3	6.4			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.1			25.3			12.1			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	81	0	0	149	0	0
Future Volume (vph)	81	0	0	149	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1900			1845		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1900			1845		
Peak-hour factor, PHF	0.76	0.76	0.74	0.74	0.92	0.92
Adj. Flow (vph)	107	0	0	201	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	107	0	0	201	0	0
Heavy Vehicles (%)	0%	0%	3%	3%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.1			70.0		
Effective Green, g (s)	9.1			70.0		
Actuated g/C Ratio	0.13			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	247			1845		
v/s Ratio Prot	c0.06			0.11		
v/s Ratio Perm						
v/c Ratio	0.43			0.11		
Uniform Delay, d1	28.1			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.2			0.1		
Delay (s)	29.3			0.1		
Level of Service	C			A		
Approach Delay (s)	29.3			0.1	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	255	56	8	136	55	57	106	25	69	119	52
Future Volume (veh/h)	72	255	56	8	136	55	57	106	25	69	119	52
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	1845	1845	1845	1827	1827	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	83	293	64	9	149	60	66	122	29	93	161	70
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.87	0.87	0.87	0.74	0.74	0.74
Percent Heavy Veh, %	3	3	3	4	4	4	3	3	3	3	3	3
Cap, veh/h	476	746	633	395	501	202	523	614	146	557	785	668
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1156	1845	1566	1000	1239	499	1134	1442	343	1219	1845	1568
Grp Volume(v), veh/h	83	293	64	9	0	209	66	0	151	93	161	70
Grp Sat Flow(s),veh/h/ln	1156	1845	1566	1000	0	1738	1134	0	1784	1219	1845	1568
Q Serve(g_s), s	3.7	7.9	1.8	0.5	0.0	5.7	2.7	0.0	3.7	3.6	3.8	1.9
Cycle Q Clear(g_c), s	9.4	7.9	1.8	8.3	0.0	5.7	6.6	0.0	3.7	7.3	3.8	1.9
Prop In Lane	1.00		1.00	1.00		0.29	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	476	746	633	395	0	703	523	0	760	557	785	668
V/C Ratio(X)	0.17	0.39	0.10	0.02	0.00	0.30	0.13	0.00	0.20	0.17	0.21	0.10
Avail Cap(c_a), veh/h	476	746	633	395	0	703	523	0	760	557	785	668
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	14.8	12.9	17.7	0.0	14.1	14.7	0.0	12.6	14.9	12.6	12.1
Incr Delay (d2), s/veh	0.8	1.6	0.3	0.1	0.0	1.1	0.5	0.0	0.6	0.6	0.6	0.3
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	1.3	4.3	0.8	0.1	0.0	2.9	0.9	0.0	1.9	1.3	2.1	0.9
LnGrp Delay(d),s/veh	18.1	16.3	13.3	17.8	0.0	15.2	15.2	0.0	13.2	15.6	13.2	12.4
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		440			218			217			324	
Approach Delay, s/veh		16.2			15.3			13.8			13.7	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		11.4		9.3		10.3		8.6
Green Ext Time (p_c), s		0.3		0.2		0.3		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.9
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	46	40	16	0	7	95	56	0	37	43	5	0	32	78	76
Future Vol, veh/h	0	46	40	16	0	7	95	56	0	37	43	5	0	32	78	76
Peak Hour Factor	0.92	0.82	0.82	0.82	0.92	0.60	0.60	0.60	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Heavy Vehicles, %	2	14	14	14	2	7	7	7	2	6	6	6	2	3	3	3
Mvmt Flow	0	56	49	20	0	12	158	93	0	40	47	5	0	40	98	95
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	9.6	11.3	9.5	10.2
HCM LOS	A	B	A	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	90%	0%	71%	0%	63%	0%	51%
Vol Right, %	0%	10%	0%	29%	0%	37%	0%	49%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	48	46	56	7	151	32	154
LT Vol	37	0	46	0	7	0	32	0
Through Vol	0	43	0	40	0	95	0	78
RT Vol	0	5	0	16	0	56	0	76
Lane Flow Rate	40	52	56	68	12	252	40	192
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.073	0.086	0.102	0.11	0.02	0.376	0.069	0.286
Departure Headway (Hd)	6.542	5.963	6.521	5.814	6.142	5.376	6.308	5.455
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	550	604	553	620	577	662	571	662
Service Time	4.25	3.67	4.225	3.518	3.938	3.172	4.008	3.155
HCM Lane V/C Ratio	0.073	0.086	0.101	0.11	0.021	0.381	0.07	0.29
HCM Control Delay	9.8	9.2	10	9.2	9.1	11.4	9.5	10.3
HCM Lane LOS	A	A	A	A	A	B	A	B
HCM 95th-tile Q	0.2	0.3	0.3	0.4	0.1	1.7	0.2	1.2

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	102	3	1	207	2	0
Future Vol, veh/h	102	3	1	207	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	1	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	71	71	60	60
Heavy Vehicles, %	12	0	0	4	0	0
Mvmt Flow	119	3	1	292	3	0

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	122	0	269	120
Stage 1	-	-	-	-	120	-
Stage 2	-	-	-	-	149	-
Critical Hdwy	-	-	4.1	-	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1478	-	714	937
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	869	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1478	-	713	937
Mov Cap-2 Maneuver	-	-	-	-	713	-
Stage 1	-	-	-	-	910	-
Stage 2	-	-	-	-	868	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	713	-	-	1478	-
HCM Lane V/C Ratio	0.005	-	-	0.001	-
HCM Control Delay (s)	10.1	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	76	29	0	26	0	0	0	0	0	1296	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1863	1583		1727						3438	1538
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1863	1583		1727						3438	1538
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.92	0.92	0.92	0.85	0.85	0.85
Adj. Flow (vph)	0	113	43	0	41	0	0	0	0	0	1525	33
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	0	113	9	0	41	0	0	0	0	0	1525	19
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	2%	2%	2%	5%	5%	5%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.9	14.9		17.9						39.7	39.7
Effective Green, g (s)		14.9	14.9		17.9						39.7	39.7
Actuated g/C Ratio		0.21	0.21		0.26						0.57	0.57
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		396	336		441						1949	872
v/s Ratio Prot		c0.06			0.02						c0.44	
v/s Ratio Perm			0.01									0.01
v/c Ratio		0.29	0.03		0.09						0.78	0.02
Uniform Delay, d1		23.1	21.8		19.9						11.8	6.6
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.1						3.2	0.0
Delay (s)		0.3	0.0		0.1						15.0	6.7
Level of Service		A	A		A						B	A
Approach Delay (s)		0.3			0.1			0.0			14.8	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	76	0	0	26	124	0	953	172	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1863			1727	1468		3374	1509			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1863			1727	1468		3374	1509			
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	0	113	0	0	41	194	0	1083	195	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	84	0	0	0
Lane Group Flow (vph)	0	113	0	0	41	131	0	1083	111	0	0	0
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	7%	7%	7%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.9			14.9	14.9		39.7	39.7			
Effective Green, g (s)		17.9			14.9	14.9		39.7	39.7			
Actuated g/C Ratio		0.26			0.21	0.21		0.57	0.57			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		476			367	312		1913	855			
v/s Ratio Prot		0.06			0.02			c0.32				
v/s Ratio Perm						c0.09			0.07			
v/c Ratio		0.24			0.11	0.42		0.57	0.13			
Uniform Delay, d1		20.6			22.2	23.8		9.7	7.1			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.3			0.1	0.9		1.2	0.3			
Delay (s)		0.3			22.3	24.7		10.9	7.4			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.3			24.3			10.3			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	105	0	0	54	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1863			1776		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1863			1776		
Peak-hour factor, PHF	0.67	0.67	0.75	0.75	0.92	0.92
Adj. Flow (vph)	157	0	0	72	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	157	0	0	72	0	0
Heavy Vehicles (%)	2%	2%	7%	7%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.9			70.0		
Effective Green, g (s)	9.9			70.0		
Actuated g/C Ratio	0.14			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	263			1776		
v/s Ratio Prot	c0.08			0.04		
v/s Ratio Perm						
v/c Ratio	0.60			0.04		
Uniform Delay, d1	28.2			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	3.6			0.0		
Delay (s)	31.8			0.0		
Level of Service	C			A		
Approach Delay (s)	31.8			0.0	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	133	74	16	172	38	17	34	6	19	73	26
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	1792	1792	1792	1792	1792	1900	1712	1712	1900	1881	1881	1881
Adj Flow Rate, veh/h	16	177	99	20	215	48	24	47	8	26	100	36
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.75	0.75	0.75	0.80	0.80	0.80	0.72	0.72	0.72	0.73	0.73	0.73
Percent Heavy Veh, %	6	6	6	6	6	6	11	11	11	1	1	1
Cap, veh/h	422	725	616	461	574	128	554	607	103	654	801	681
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1070	1792	1524	1057	1420	317	1147	1426	243	1357	1881	1599
Grp Volume(v), veh/h	16	177	99	20	0	263	24	0	55	26	100	36
Grp Sat Flow(s),veh/h/ln	1070	1792	1524	1057	0	1737	1147	0	1669	1357	1881	1599
Q Serve(g_s), s	0.7	4.6	2.9	0.9	0.0	7.4	0.9	0.0	1.4	0.8	2.3	0.9
Cycle Q Clear(g_c), s	8.2	4.6	2.9	5.5	0.0	7.4	3.2	0.0	1.4	2.2	2.3	0.9
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.15	1.00		1.00
Lane Grp Cap(c), veh/h	422	725	616	461	0	702	554	0	710	654	801	681
V/C Ratio(X)	0.04	0.24	0.16	0.04	0.00	0.37	0.04	0.00	0.08	0.04	0.12	0.05
Avail Cap(c_a), veh/h	422	725	616	461	0	702	554	0	710	654	801	681
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	13.8	13.3	15.6	0.0	14.6	13.2	0.0	11.9	12.6	12.2	11.8
Incr Delay (d2), s/veh	0.2	0.8	0.6	0.2	0.0	1.5	0.1	0.0	0.2	0.1	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	2.4	1.3	0.3	0.0	3.8	0.3	0.0	0.7	0.3	1.2	0.4
LnGrp Delay(d),s/veh	17.7	14.6	13.8	15.8	0.0	16.2	13.3	0.0	12.1	12.7	12.5	12.0
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		292			283			79			162	
Approach Delay, s/veh		14.5			16.1			12.5			12.4	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		10.2		4.3		9.4		5.2
Green Ext Time (p_c), s		0.3		0.1		0.3		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	14.5
HCM 2010 LOS	B

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Vol, veh/h	0	60	135	40	0	4	79	36	0	36	23	5	0	39	46	26
Peak Hour Factor	0.92	0.72	0.72	0.72	0.92	0.66	0.66	0.66	0.92	0.68	0.68	0.68	0.92	0.73	0.73	0.73
Heavy Vehicles, %	2	9	9	9	2	11	11	11	2	5	5	5	2	7	7	7
Mvmt Flow	0	83	188	56	0	6	120	55	0	53	34	7	0	53	63	36
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	10.9	10.5	9.8	9.9
HCM LOS	B	B	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	82%	0%	77%	0%	69%	0%	64%
Vol Right, %	0%	18%	0%	23%	0%	31%	0%	36%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	36	28	60	175	4	115	39	72
LT Vol	36	0	60	0	4	0	39	0
Through Vol	0	23	0	135	0	79	0	46
RT Vol	0	5	0	40	0	36	0	26
Lane Flow Rate	53	41	83	243	6	174	53	99
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.099	0.07	0.14	0.364	0.011	0.273	0.099	0.162
Departure Headway (Hd)	6.722	6.089	6.17	5.504	6.371	5.645	6.662	5.9
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	535	590	585	659	564	638	540	611
Service Time	4.436	3.803	3.87	3.204	4.089	3.362	4.374	3.613
HCM Lane V/C Ratio	0.099	0.069	0.142	0.369	0.011	0.273	0.098	0.162
HCM Control Delay	10.2	9.3	9.9	11.3	9.2	10.5	10.1	9.8
HCM Lane LOS	B	A	A	B	A	B	B	A
HCM 95th-tile Q	0.3	0.2	0.5	1.7	0	1.1	0.3	0.6

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	232	16	4	137	13	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	1	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	72	72	60	60	60	60
Heavy Vehicles, %	5	0	0	9	0	0
Mvmt Flow	322	22	7	228	22	5

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	344	0	461	333
Stage 1	-	-	-	-	333	-
Stage 2	-	-	-	-	128	-
Critical Hdwy	-	-	4.1	-	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1226	-	548	713
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	890	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1226	-	544	713
Mov Cap-2 Maneuver	-	-	-	-	544	-
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	884	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	569	-	-	1226	-
HCM Lane V/C Ratio	0.047	-	-	0.005	-
HCM Control Delay (s)	11.6	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	49	33	0	86	0	0	0	0	0	1037	64
Future Volume (vph)	0	49	33	0	86	0	0	0	0	0	1037	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1900	1615		1845						3471	1553
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1900	1615		1845						3471	1553
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.92	0.92	0.92	0.84	0.84	0.84
Adj. Flow (vph)	0	64	43	0	132	0	0	0	0	0	1235	76
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	32
Lane Group Flow (vph)	0	64	9	0	132	0	0	0	0	0	1235	44
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.2	14.2		17.2						40.4	40.4
Effective Green, g (s)		14.2	14.2		17.2						40.4	40.4
Actuated g/C Ratio		0.20	0.20		0.25						0.58	0.58
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		385	327		453						2003	896
v/s Ratio Prot		0.03			c0.07						c0.36	
v/s Ratio Perm			0.01									0.03
v/c Ratio		0.17	0.03		0.29						0.62	0.05
Uniform Delay, d1		23.0	22.4		21.4						9.7	6.4
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.2	0.0		0.3						1.4	0.1
Delay (s)		0.2	0.0		0.4						11.1	6.5
Level of Service		A	A		A						B	A
Approach Delay (s)		0.1			0.4			0.0			10.9	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	9.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	49	0	0	86	137	0	1275	71	0	0	0
Future Volume (vph)	0	49	0	0	86	137	0	1275	71	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1900			1845	1568		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1900			1845	1568		3539	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	0	64	0	0	132	211	0	1417	79	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	42	0	0	33	0	0	0
Lane Group Flow (vph)	0	64	0	0	132	169	0	1417	46	0	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.2			14.2	14.2		40.4	40.4			
Effective Green, g (s)		17.2			14.2	14.2		40.4	40.4			
Actuated g/C Ratio		0.25			0.20	0.20		0.58	0.58			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		466			374	318		2042	913			
v/s Ratio Prot		0.03			0.07			c0.40				
v/s Ratio Perm						c0.11			0.03			
v/c Ratio		0.14			0.35	0.53		0.69	0.05			
Uniform Delay, d1		20.6			24.0	24.9		10.4	6.4			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.1			0.6	1.7		2.0	0.1			
Delay (s)		0.1			24.5	26.6		12.4	6.5			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.1			25.8			12.1			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	14.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	82	0	0	150	0	0
Future Volume (vph)	82	0	0	150	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1900			1845		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1900			1845		
Peak-hour factor, PHF	0.76	0.76	0.74	0.74	0.92	0.92
Adj. Flow (vph)	108	0	0	203	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	108	0	0	203	0	0
Heavy Vehicles (%)	0%	0%	3%	3%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.2			70.0		
Effective Green, g (s)	9.2			70.0		
Actuated g/C Ratio	0.13			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	249			1845		
v/s Ratio Prot	c0.06			0.11		
v/s Ratio Perm						
v/c Ratio	0.43			0.11		
Uniform Delay, d1	28.0			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.2			0.1		
Delay (s)	29.2			0.1		
Level of Service	C			A		
Approach Delay (s)	29.2			0.1	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.18		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	255	56	8	136	55	57	108	25	69	121	52
Future Volume (veh/h)	72	255	56	8	136	55	57	108	25	69	121	52
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	1845	1845	1845	1827	1827	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	83	293	64	9	149	60	66	124	29	93	164	70
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.87	0.87	0.87	0.74	0.74	0.74
Percent Heavy Veh, %	3	3	3	4	4	4	3	3	3	3	3	3
Cap, veh/h	476	746	633	395	501	202	521	616	144	555	785	668
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1156	1845	1566	1000	1239	499	1131	1447	338	1217	1845	1568
Grp Volume(v), veh/h	83	293	64	9	0	209	66	0	153	93	164	70
Grp Sat Flow(s),veh/h/ln	1156	1845	1566	1000	0	1738	1131	0	1785	1217	1845	1568
Q Serve(g_s), s	3.7	7.9	1.8	0.5	0.0	5.7	2.7	0.0	3.8	3.6	3.9	1.9
Cycle Q Clear(g_c), s	9.4	7.9	1.8	8.3	0.0	5.7	6.7	0.0	3.8	7.4	3.9	1.9
Prop In Lane	1.00		1.00	1.00		0.29	1.00		0.19	1.00		1.00
Lane Grp Cap(c), veh/h	476	746	633	395	0	703	521	0	760	555	785	668
V/C Ratio(X)	0.17	0.39	0.10	0.02	0.00	0.30	0.13	0.00	0.20	0.17	0.21	0.10
Avail Cap(c_a), veh/h	476	746	633	395	0	703	521	0	760	555	785	668
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	14.8	12.9	17.7	0.0	14.1	14.8	0.0	12.6	15.0	12.7	12.1
Incr Delay (d2), s/veh	0.8	1.6	0.3	0.1	0.0	1.1	0.5	0.0	0.6	0.7	0.6	0.3
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	1.3	4.3	0.8	0.1	0.0	2.9	0.9	0.0	2.0	1.3	2.1	0.9
LnGrp Delay(d),s/veh	18.1	16.3	13.3	17.8	0.0	15.2	15.3	0.0	13.2	15.6	13.3	12.4
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		440			218			219			327	
Approach Delay, s/veh		16.2			15.3			13.8			13.7	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		11.4		9.4		10.3		8.7
Green Ext Time (p_c), s		0.3		0.2		0.3		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	14.9
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	10.4
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	48	41	16	0	7	96	56	0	37	43	5	0	32	78	78
Future Vol, veh/h	0	48	41	16	0	7	96	56	0	37	43	5	0	32	78	78
Peak Hour Factor	0.92	0.82	0.82	0.82	0.92	0.60	0.60	0.60	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Heavy Vehicles, %	2	14	14	14	2	7	7	7	2	6	6	6	2	3	3	3
Mvmt Flow	0	59	50	20	0	12	160	93	0	40	47	5	0	40	98	98
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	9.6	11.4	9.5	10.2
HCM LOS	A	B	A	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	90%	0%	72%	0%	63%	0%	50%
Vol Right, %	0%	10%	0%	28%	0%	37%	0%	50%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	48	48	57	7	152	32	156
LT Vol	37	0	48	0	7	0	32	0
Through Vol	0	43	0	41	0	96	0	78
RT Vol	0	5	0	16	0	56	0	78
Lane Flow Rate	40	52	59	70	12	253	40	195
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.073	0.087	0.106	0.113	0.02	0.379	0.069	0.291
Departure Headway (Hd)	6.564	5.984	6.534	5.83	6.256	5.491	6.327	5.469
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	548	602	551	618	576	659	570	661
Service Time	4.273	3.693	4.24	3.536	3.956	3.191	4.027	3.169
HCM Lane V/C Ratio	0.073	0.086	0.107	0.113	0.021	0.384	0.07	0.295
HCM Control Delay	9.8	9.3	10	9.3	9.1	11.5	9.5	10.4
HCM Lane LOS	A	A	A	A	A	B	A	B
HCM 95th-tile Q	0.2	0.3	0.4	0.4	0.1	1.8	0.2	1.2

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	99	21	11	200	23	6
Future Vol, veh/h	99	21	11	200	23	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	1	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	86	86	71	71	60	60
Heavy Vehicles, %	12	0	0	4	0	0
Mvmt Flow	115	24	15	282	38	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	140	0	299	127
Stage 1	-	-	-	-	127	-
Stage 2	-	-	-	-	172	-
Critical Hdwy	-	-	4.1	-	6.6	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1456	-	685	929
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	847	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1456	-	677	929
Mov Cap-2 Maneuver	-	-	-	-	677	-
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	837	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	717	-	-	1456	-
HCM Lane V/C Ratio	0.067	-	-	0.011	-
HCM Control Delay (s)	10.4	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	77	29	0	27	0	0	0	0	0	1321	28
Future Volume (vph)	0	77	29	0	27	0	0	0	0	0	1321	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1863	1583		1727						3438	1538
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1863	1583		1727						3438	1538
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.92	0.92	0.92	0.85	0.85	0.85
Adj. Flow (vph)	0	115	43	0	42	0	0	0	0	0	1554	33
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	14
Lane Group Flow (vph)	0	115	9	0	42	0	0	0	0	0	1554	19
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	2%	2%	2%	5%	5%	5%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.9	14.9		17.9						39.7	39.7
Effective Green, g (s)		14.9	14.9		17.9						39.7	39.7
Actuated g/C Ratio		0.21	0.21		0.26						0.57	0.57
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		396	336		441						1949	872
v/s Ratio Prot		c0.06			0.02						c0.45	
v/s Ratio Perm			0.01									0.01
v/c Ratio		0.29	0.03		0.10						0.80	0.02
Uniform Delay, d1		23.1	21.8		19.9						12.0	6.6
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.3	0.0		0.1						3.5	0.0
Delay (s)		0.3	0.0		0.1						15.5	6.7
Level of Service		A	A		A						B	A
Approach Delay (s)		0.3			0.1			0.0			15.3	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	13.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	77	0	0	27	149	0	953	197	0	0	0
Future Volume (vph)	0	77	0	0	27	149	0	953	197	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1863			1727	1468		3374	1509			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1863			1727	1468		3374	1509			
Peak-hour factor, PHF	0.67	0.67	0.67	0.64	0.64	0.64	0.88	0.88	0.88	0.92	0.92	0.92
Adj. Flow (vph)	0	115	0	0	42	233	0	1083	224	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	63	0	0	97	0	0	0
Lane Group Flow (vph)	0	115	0	0	42	170	0	1083	127	0	0	0
Heavy Vehicles (%)	2%	2%	2%	10%	10%	10%	7%	7%	7%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.9			14.9	14.9		39.7	39.7			
Effective Green, g (s)		17.9			14.9	14.9		39.7	39.7			
Actuated g/C Ratio		0.26			0.21	0.21		0.57	0.57			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		476			367	312		1913	855			
v/s Ratio Prot		0.06			0.02			c0.32				
v/s Ratio Perm						c0.12			0.08			
v/c Ratio		0.24			0.11	0.54		0.57	0.15			
Uniform Delay, d1		20.7			22.2	24.5		9.7	7.2			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.3			0.1	1.9		1.2	0.4			
Delay (s)		0.3			22.4	26.5		10.9	7.5			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.3			25.8			10.3			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	106	0	0	55	0	0
Future Volume (vph)	106	0	0	55	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1863			1776		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1863			1776		
Peak-hour factor, PHF	0.67	0.67	0.75	0.75	0.92	0.92
Adj. Flow (vph)	158	0	0	73	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	158	0	0	73	0	0
Heavy Vehicles (%)	2%	2%	7%	7%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.9			70.0		
Effective Green, g (s)	9.9			70.0		
Actuated g/C Ratio	0.14			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	263			1776		
v/s Ratio Prot	c0.08			0.04		
v/s Ratio Perm						
v/c Ratio	0.60			0.04		
Uniform Delay, d1	28.2			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	3.8			0.0		
Delay (s)	32.0			0.0		
Level of Service	C			A		
Approach Delay (s)	32.0			0.0	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	21.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.16		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	12	133	75	16	172	38	18	37	6	19	76	26
Future Volume (veh/h)	12	133	75	16	172	38	18	37	6	19	76	26
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	1792	1792	1792	1792	1792	1900	1712	1712	1900	1881	1881	1881
Adj Flow Rate, veh/h	16	177	100	20	215	48	25	51	8	26	104	36
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.75	0.75	0.75	0.80	0.80	0.80	0.72	0.72	0.72	0.73	0.73	0.73
Percent Heavy Veh, %	6	6	6	6	6	6	11	11	11	1	1	1
Cap, veh/h	422	725	616	461	574	128	551	615	96	650	801	681
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1070	1792	1524	1056	1420	317	1143	1445	227	1352	1881	1599
Grp Volume(v), veh/h	16	177	100	20	0	263	25	0	59	26	104	36
Grp Sat Flow(s),veh/h/ln	1070	1792	1524	1056	0	1737	1143	0	1672	1352	1881	1599
Q Serve(g_s), s	0.7	4.6	2.9	0.9	0.0	7.4	1.0	0.0	1.5	0.8	2.4	0.9
Cycle Q Clear(g_c), s	8.2	4.6	2.9	5.5	0.0	7.4	3.3	0.0	1.5	2.3	2.4	0.9
Prop In Lane	1.00		1.00	1.00		0.18	1.00		0.14	1.00		1.00
Lane Grp Cap(c), veh/h	422	725	616	461	0	702	551	0	712	650	801	681
V/C Ratio(X)	0.04	0.24	0.16	0.04	0.00	0.37	0.05	0.00	0.08	0.04	0.13	0.05
Avail Cap(c_a), veh/h	422	725	616	461	0	702	551	0	712	650	801	681
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	13.8	13.3	15.6	0.0	14.6	13.2	0.0	12.0	12.6	12.2	11.8
Incr Delay (d2), s/veh	0.2	0.8	0.6	0.2	0.0	1.5	0.2	0.0	0.2	0.1	0.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	2.4	1.3	0.3	0.0	3.8	0.3	0.0	0.7	0.3	1.3	0.4
LnGrp Delay(d),s/veh	17.7	14.6	13.9	15.8	0.0	16.2	13.4	0.0	12.2	12.8	12.6	12.0
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		293			283			84			166	
Approach Delay, s/veh		14.5			16.1			12.5			12.5	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		10.2		4.4		9.4		5.3
Green Ext Time (p_c), s		0.3		0.1		0.3		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	14.5
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	60	137	41	0	4	81	36	0	37	23	5	0	39	46	26
Future Vol, veh/h	0	60	137	41	0	4	81	36	0	37	23	5	0	39	46	26
Peak Hour Factor	0.92	0.72	0.72	0.72	0.92	0.66	0.66	0.66	0.92	0.68	0.68	0.68	0.92	0.73	0.73	0.73
Heavy Vehicles, %	2	9	9	9	2	11	11	11	2	5	5	5	2	7	7	7
Mvmt Flow	0	83	190	57	0	6	123	55	0	54	34	7	0	53	63	36
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	11	10.6	9.8	9.9
HCM LOS	B	B	A	A

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	82%	0%	77%	0%	69%	0%	64%
Vol Right, %	0%	18%	0%	23%	0%	31%	0%	36%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	28	60	178	4	117	39	72
LT Vol	37	0	60	0	4	0	39	0
Through Vol	0	23	0	137	0	81	0	46
RT Vol	0	5	0	41	0	36	0	26
Lane Flow Rate	54	41	83	247	6	177	53	99
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.102	0.07	0.14	0.371	0.011	0.279	0.099	0.162
Departure Headway (Hd)	6.746	6.113	6.18	5.514	6.385	5.662	6.687	5.925
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	533	588	584	658	562	636	538	608
Service Time	4.459	3.826	3.88	3.214	4.101	3.378	4.4	3.638
HCM Lane V/C Ratio	0.101	0.07	0.142	0.375	0.011	0.278	0.099	0.163
HCM Control Delay	10.2	9.3	9.9	11.4	9.2	10.6	10.1	9.8
HCM Lane LOS	B	A	A	B	A	B	B	A
HCM 95th-tile Q	0.3	0.2	0.5	1.7	0	1.1	0.3	0.6

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	47	211	16	4	123	17	13	0	3	24	0	40
Future Vol, veh/h	47	211	16	4	123	17	13	0	3	24	0	40
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	1	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	72	72	60	60	92	60	92	60	92	92	92
Heavy Vehicles, %	2	5	0	0	9	2	0	2	0	2	2	2
Mvmt Flow	51	293	22	7	205	18	22	0	5	26	0	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	223	0	0	315	0	0	522	643	304	637	645	112
Stage 1	-	-	-	-	-	-	406	406	-	228	228	-
Stage 2	-	-	-	-	-	-	116	237	-	409	417	-
Critical Hdwy	4.14	-	-	4.1	-	-	7.3	6.53	6.2	7.33	6.53	6.93
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.53	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.22	-	-	2.2	-	-	3.5	4.019	3.3	3.519	4.019	3.319
Pot Cap-1 Maneuver	1343	-	-	1257	-	-	455	391	740	376	390	920
Stage 1	-	-	-	-	-	-	626	597	-	755	715	-
Stage 2	-	-	-	-	-	-	882	708	-	619	590	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1343	-	-	1257	-	-	416	371	740	359	370	920
Mov Cap-2 Maneuver	-	-	-	-	-	-	416	371	-	359	370	-
Stage 1	-	-	-	-	-	-	597	570	-	720	711	-
Stage 2	-	-	-	-	-	-	835	704	-	587	563	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.2	13.4	12.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	453	1343	-	-	1257	-	-	580
HCM Lane V/C Ratio	0.059	0.038	-	-	0.005	-	-	0.12
HCM Control Delay (s)	13.4	7.8	0	-	7.9	0	-	12.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	14	8	11	108	103	12
Future Vol, veh/h	14	8	11	108	103	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	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	72	72	73	73
Heavy Vehicles, %	2	2	2	11	5	2
Mvmt Flow	15	9	15	150	141	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	330	149	158	0	-	0
Stage 1	149	-	-	-	-	-
Stage 2	181	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	665	898	1422	-	-	-
Stage 1	879	-	-	-	-	-
Stage 2	850	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	658	898	1422	-	-	-
Mov Cap-2 Maneuver	692	-	-	-	-	-
Stage 1	879	-	-	-	-	-
Stage 2	841	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.9	0.7	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1422	-	755	-	-
HCM Lane V/C Ratio	0.011	-	0.032	-	-
HCM Control Delay (s)	7.6	-	9.9	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	51	33	0	88	0	0	0	0	0	1075	64
Future Volume (vph)	0	51	33	0	88	0	0	0	0	0	1075	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0	9.0		6.0						6.4	6.4
Lane Util. Factor		1.00	1.00		1.00						0.95	1.00
Frt		1.00	0.85		1.00						1.00	0.85
Flt Protected		1.00	1.00		1.00						1.00	1.00
Satd. Flow (prot)		1900	1615		1845						3471	1553
Flt Permitted		1.00	1.00		1.00						1.00	1.00
Satd. Flow (perm)		1900	1615		1845						3471	1553
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.92	0.92	0.92	0.84	0.84	0.84
Adj. Flow (vph)	0	67	43	0	135	0	0	0	0	0	1280	76
RTOR Reduction (vph)	0	0	34	0	0	0	0	0	0	0	0	32
Lane Group Flow (vph)	0	67	9	0	135	0	0	0	0	0	1280	44
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	4%	4%	4%
Turn Type		NA	Perm		NA						NA	Perm
Protected Phases		4			8						6	
Permitted Phases			4									6
Actuated Green, G (s)		14.5	14.5		17.5						40.1	40.1
Effective Green, g (s)		14.5	14.5		17.5						40.1	40.1
Actuated g/C Ratio		0.21	0.21		0.25						0.57	0.57
Clearance Time (s)		9.0	9.0		6.0						6.4	6.4
Vehicle Extension (s)		3.0	3.0		3.0						0.2	0.2
Lane Grp Cap (vph)		393	334		461						1988	889
v/s Ratio Prot		0.04			c0.07						c0.37	
v/s Ratio Perm			0.01									0.03
v/c Ratio		0.17	0.03		0.29						0.64	0.05
Uniform Delay, d1		22.8	22.1		21.2						10.1	6.6
Progression Factor		0.00	0.00		0.00						1.00	1.00
Incremental Delay, d2		0.2	0.0		0.3						1.6	0.1
Delay (s)		0.2	0.0		0.4						11.7	6.7
Level of Service		A	A		A						B	A
Approach Delay (s)		0.1			0.4			0.0			11.5	
Approach LOS		A			A			A			B	

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	51	0	0	88	175	0	1275	110	0	0	0
Future Volume (vph)	0	51	0	0	88	175	0	1275	110	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			9.0	9.0		6.4	6.4			
Lane Util. Factor		1.00			1.00	1.00		0.95	1.00			
Frt		1.00			1.00	0.85		1.00	0.85			
Flt Protected		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (prot)		1900			1845	1568		3539	1583			
Flt Permitted		1.00			1.00	1.00		1.00	1.00			
Satd. Flow (perm)		1900			1845	1568		3539	1583			
Peak-hour factor, PHF	0.76	0.76	0.76	0.65	0.65	0.65	0.90	0.90	0.90	0.92	0.92	0.92
Adj. Flow (vph)	0	67	0	0	135	269	0	1417	122	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	42	0	0	52	0	0	0
Lane Group Flow (vph)	0	67	0	0	135	227	0	1417	70	0	0	0
Heavy Vehicles (%)	0%	0%	0%	3%	3%	3%	2%	2%	2%	2%	2%	2%
Turn Type		NA			NA	Perm		NA	Perm			
Protected Phases		8			4			2				
Permitted Phases						4			2			
Actuated Green, G (s)		17.5			14.5	14.5		40.1	40.1			
Effective Green, g (s)		17.5			14.5	14.5		40.1	40.1			
Actuated g/C Ratio		0.25			0.21	0.21		0.57	0.57			
Clearance Time (s)		6.0			9.0	9.0		6.4	6.4			
Vehicle Extension (s)		3.0			3.0	3.0		0.2	0.2			
Lane Grp Cap (vph)		475			382	324		2027	906			
v/s Ratio Prot		0.04			0.07			c0.40				
v/s Ratio Perm						c0.14			0.04			
v/c Ratio		0.14			0.35	0.70		0.70	0.08			
Uniform Delay, d1		20.4			23.7	25.7		10.7	6.7			
Progression Factor		0.00			1.00	1.00		1.00	1.00			
Incremental Delay, d2		0.1			0.6	6.7		2.0	0.2			
Delay (s)		0.1			24.3	32.4		12.7	6.8			
Level of Service		A			C	C		B	A			
Approach Delay (s)		0.1			29.7			12.2			0.0	
Approach LOS		A			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	84	0	0	152	0	0
Future Volume (vph)	84	0	0	152	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	14.0			4.0		
Lane Util. Factor	1.00			1.00		
Frt	1.00			1.00		
Flt Protected	1.00			1.00		
Satd. Flow (prot)	1900			1845		
Flt Permitted	1.00			1.00		
Satd. Flow (perm)	1900			1845		
Peak-hour factor, PHF	0.76	0.76	0.74	0.74	0.92	0.92
Adj. Flow (vph)	111	0	0	205	0	0
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	111	0	0	205	0	0
Heavy Vehicles (%)	0%	0%	3%	3%	2%	2%
Turn Type	NA			NA		
Protected Phases	12			Free		
Permitted Phases						
Actuated Green, G (s)	9.5			70.0		
Effective Green, g (s)	9.5			70.0		
Actuated g/C Ratio	0.14			1.00		
Clearance Time (s)	14.0					
Vehicle Extension (s)	3.0					
Lane Grp Cap (vph)	257			1845		
v/s Ratio Prot	c0.06			0.11		
v/s Ratio Perm						
v/c Ratio	0.43			0.11		
Uniform Delay, d1	27.8			0.0		
Progression Factor	1.00			1.00		
Incremental Delay, d2	1.2			0.1		
Delay (s)	28.9			0.1		
Level of Service	C			A		
Approach Delay (s)	28.9			0.1	0.0	
Approach LOS	C			A	A	

Intersection Summary			
HCM 2000 Control Delay	10.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.19		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	72	255	58	8	136	55	59	112	25	69	125	52
Future Volume (veh/h)	72	255	58	8	136	55	59	112	25	69	125	52
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	1845	1845	1845	1827	1827	1900	1845	1845	1900	1845	1845	1845
Adj Flow Rate, veh/h	83	293	67	9	149	60	68	129	29	93	169	70
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	1	1	1
Peak Hour Factor	0.87	0.87	0.87	0.91	0.91	0.91	0.87	0.87	0.87	0.74	0.74	0.74
Percent Heavy Veh, %	3	3	3	4	4	4	3	3	3	3	3	3
Cap, veh/h	476	746	633	394	501	202	517	621	140	551	785	668
Arrive On Green	0.40	0.40	0.40	0.40	0.40	0.40	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	1156	1845	1566	997	1239	499	1125	1459	328	1212	1845	1568
Grp Volume(v), veh/h	83	293	67	9	0	209	68	0	158	93	169	70
Grp Sat Flow(s),veh/h/ln	1156	1845	1566	997	0	1738	1125	0	1787	1212	1845	1568
Q Serve(g_s), s	3.7	7.9	1.9	0.5	0.0	5.7	2.8	0.0	3.9	3.7	4.1	1.9
Cycle Q Clear(g_c), s	9.4	7.9	1.9	8.3	0.0	5.7	6.9	0.0	3.9	7.6	4.1	1.9
Prop In Lane	1.00		1.00	1.00		0.29	1.00		0.18	1.00		1.00
Lane Grp Cap(c), veh/h	476	746	633	394	0	703	517	0	761	551	785	668
V/C Ratio(X)	0.17	0.39	0.11	0.02	0.00	0.30	0.13	0.00	0.21	0.17	0.22	0.10
Avail Cap(c_a), veh/h	476	746	633	394	0	703	517	0	761	551	785	668
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.3	14.8	13.0	17.7	0.0	14.1	14.9	0.0	12.7	15.0	12.7	12.1
Incr Delay (d2), s/veh	0.8	1.6	0.3	0.1	0.0	1.1	0.5	0.0	0.6	0.7	0.6	0.3
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	1.3	4.3	0.9	0.1	0.0	2.9	1.0	0.0	2.1	1.3	2.2	0.9
LnGrp Delay(d),s/veh	18.1	16.3	13.3	17.8	0.0	15.2	15.4	0.0	13.3	15.7	13.3	12.4
LnGrp LOS	B	B	B	B		B	B		B	B	B	B
Approach Vol, veh/h		443			218			226			332	
Approach Delay, s/veh		16.2			15.3			13.9			13.8	
Approach LOS		B			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		34.0		36.0		34.0		36.0
Change Period (Y+Rc), s		* 5.7		6.2		* 5.7		6.2
Max Green Setting (Gmax), s		* 28		29.8		* 28		29.8
Max Q Clear Time (g_c+I1), s		11.4		9.6		10.3		8.9
Green Ext Time (p_c), s		0.3		0.2		0.3		0.2

Intersection Summary	
HCM 2010 Ctrl Delay	15.0
HCM 2010 LOS	B

Notes

Intersection	
Intersection Delay, s/veh	10.5
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR	SBU	SBL	SBT	SBR
Traffic Vol, veh/h	0	48	43	18	0	7	98	56	0	39	43	5	0	32	78	78
Future Vol, veh/h	0	48	43	18	0	7	98	56	0	39	43	5	0	32	78	78
Peak Hour Factor	0.92	0.82	0.82	0.82	0.92	0.60	0.60	0.60	0.92	0.92	0.92	0.92	0.92	0.80	0.80	0.80
Heavy Vehicles, %	2	14	14	14	2	7	7	7	2	6	6	6	2	3	3	3
Mvmt Flow	0	59	52	22	0	12	163	93	0	42	47	5	0	40	98	98
Number of Lanes	0	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	2	2
HCM Control Delay	9.6	11.5	9.6	10.3
HCM LOS	A	B	A	B

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	90%	0%	70%	0%	64%	0%	50%
Vol Right, %	0%	10%	0%	30%	0%	36%	0%	50%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	39	48	48	61	7	154	32	156
LT Vol	39	0	48	0	7	0	32	0
Through Vol	0	43	0	43	0	98	0	78
RT Vol	0	5	0	18	0	56	0	78
Lane Flow Rate	42	52	59	74	12	257	40	195
Geometry Grp	7	7	7	7	7	7	7	7
Degree of Util (X)	0.078	0.087	0.107	0.121	0.02	0.386	0.069	0.292
Departure Headway (Hd)	6.595	6.015	6.55	5.836	6.275	5.513	6.36	5.501
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	546	598	550	617	574	657	567	657
Service Time	4.304	3.724	4.258	3.543	3.975	3.213	4.06	3.201
HCM Lane V/C Ratio	0.077	0.087	0.107	0.12	0.021	0.391	0.071	0.297
HCM Control Delay	9.9	9.3	10	9.3	9.1	11.6	9.5	10.5
HCM Lane LOS	A	A	A	A	A	B	A	B
HCM 95th-tile Q	0.3	0.3	0.4	0.4	0.1	1.8	0.2	1.2

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	51	89	21	11	181	23	23	0	6	14	0	59
Future Vol, veh/h	51	89	21	11	181	23	23	0	6	14	0	59
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	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	1	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	86	86	71	71	92	60	92	60	92	92	92
Heavy Vehicles, %	2	12	0	0	4	2	0	2	0	2	2	2
Mvmt Flow	55	103	24	15	255	25	38	0	10	15	0	64

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	280	0	0	128	0	0	385	538	116	530	537	140
Stage 1	-	-	-	-	-	-	227	227	-	298	298	-
Stage 2	-	-	-	-	-	-	158	311	-	232	239	-
Critical Hdwy	4.14	-	-	4.1	-	-	7.3	6.53	6.2	7.33	6.53	6.93
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.53	-	6.53	5.53	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.5	5.53	-	6.13	5.53	-
Follow-up Hdwy	2.22	-	-	2.2	-	-	3.5	4.019	3.3	3.519	4.019	3.319
Pot Cap-1 Maneuver	1280	-	-	1470	-	-	565	449	942	446	450	883
Stage 1	-	-	-	-	-	-	780	716	-	687	666	-
Stage 2	-	-	-	-	-	-	834	658	-	770	707	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1280	-	-	1470	-	-	501	423	942	422	424	883
Mov Cap-2 Maneuver	-	-	-	-	-	-	501	423	-	422	424	-
Stage 1	-	-	-	-	-	-	744	683	-	655	658	-
Stage 2	-	-	-	-	-	-	764	650	-	727	674	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	0.4	12.1	10.5
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	555	1280	-	-	1470	-	-	730
HCM Lane V/C Ratio	0.087	0.043	-	-	0.011	-	-	0.109
HCM Control Delay (s)	12.1	7.9	0	-	7.5	0	-	10.5
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0	-	-	0.4

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	23	19	16	131	169	25
Future Vol, veh/h	23	19	16	131	169	25
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	-	150	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	21	17	142	184	27

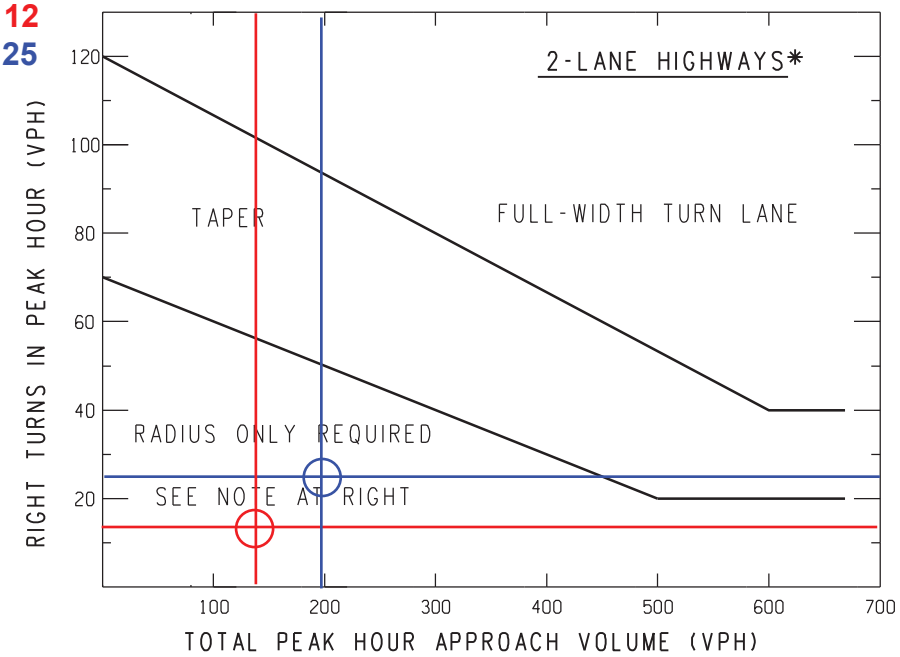
Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	374	197	211	0	-	0
Stage 1	197	-	-	-	-	-
Stage 2	177	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	627	844	1360	-	-	-
Stage 1	836	-	-	-	-	-
Stage 2	854	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	619	844	1360	-	-	-
Mov Cap-2 Maneuver	666	-	-	-	-	-
Stage 1	836	-	-	-	-	-
Stage 2	843	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.2	0.8	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1360	-	736	-	-
HCM Lane V/C Ratio	0.013	-	0.062	-	-
HCM Control Delay (s)	7.7	-	10.2	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

172ND AVENUE & SITE DRIVE RT LANE WARRANT

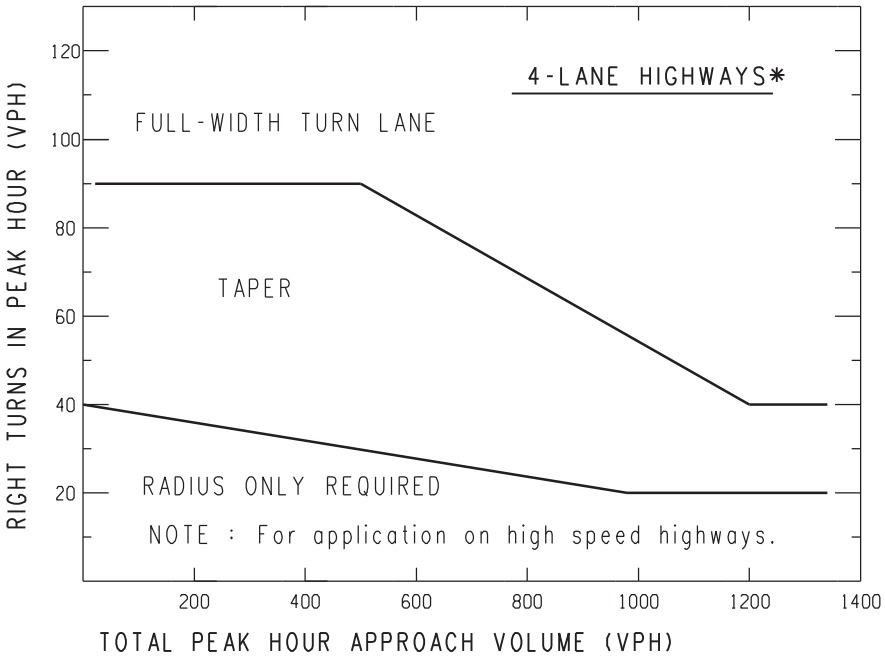
AM: 12
PM: 25



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

Adjust peak hour right turns = Peak hour right turns - 20

AM: 115
PM: 194



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

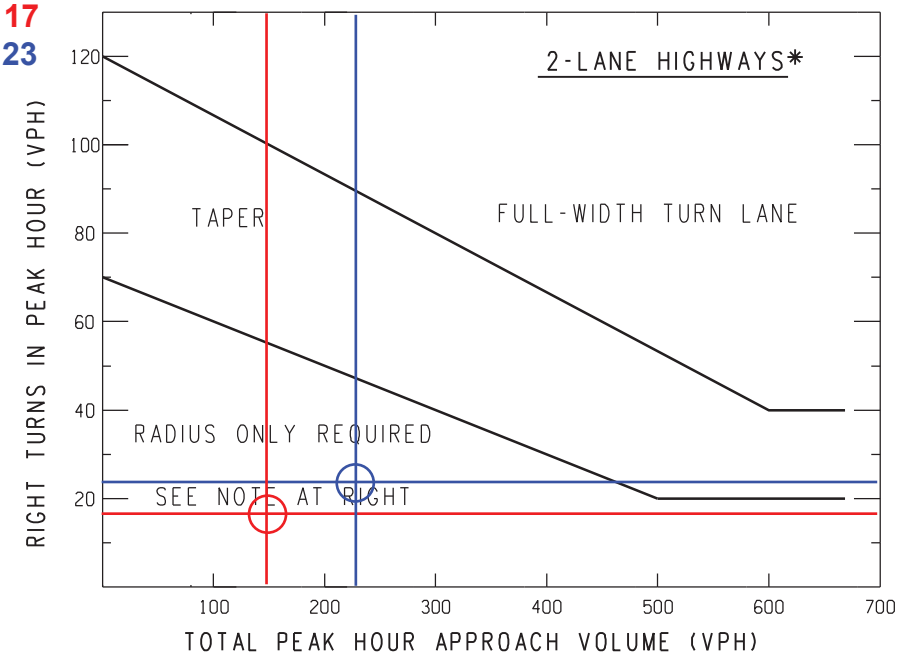
Sample Problem:
The Design Speed is 55 mph. The Peak Hour Approach Volume is 300 vph. The Number of Right Turns in the Peak Hour is 100 vph. Determine if a right turn lane is recommended.

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

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	604A	SHEET 2 OF 2
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

HAYES STREET & SITE DRIVE RT LANE WARRANT

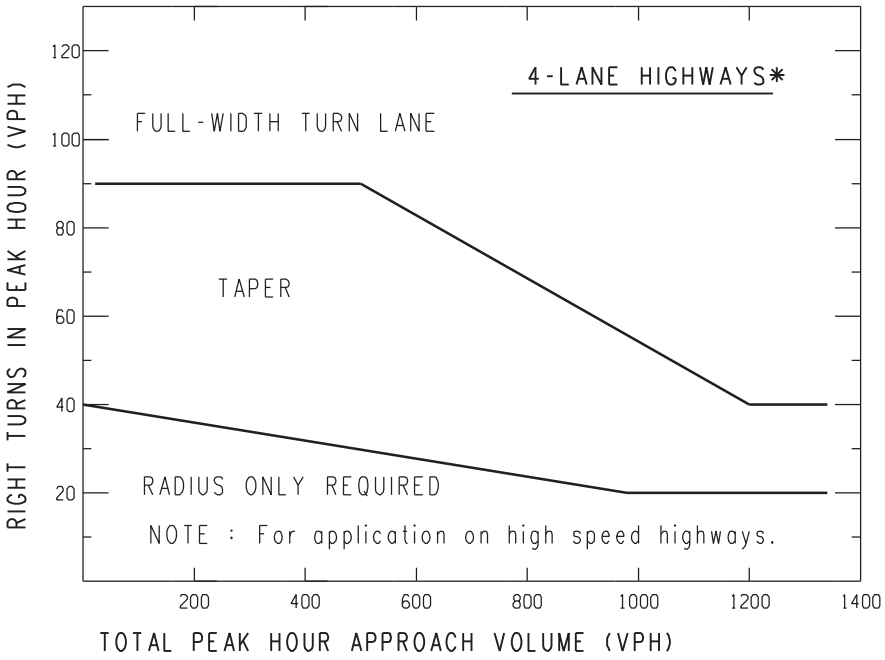
AM: 17
PM: 23



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

Adjust peak hour right turns = Peak hour right turns - 20

AM: 144
PM: 215



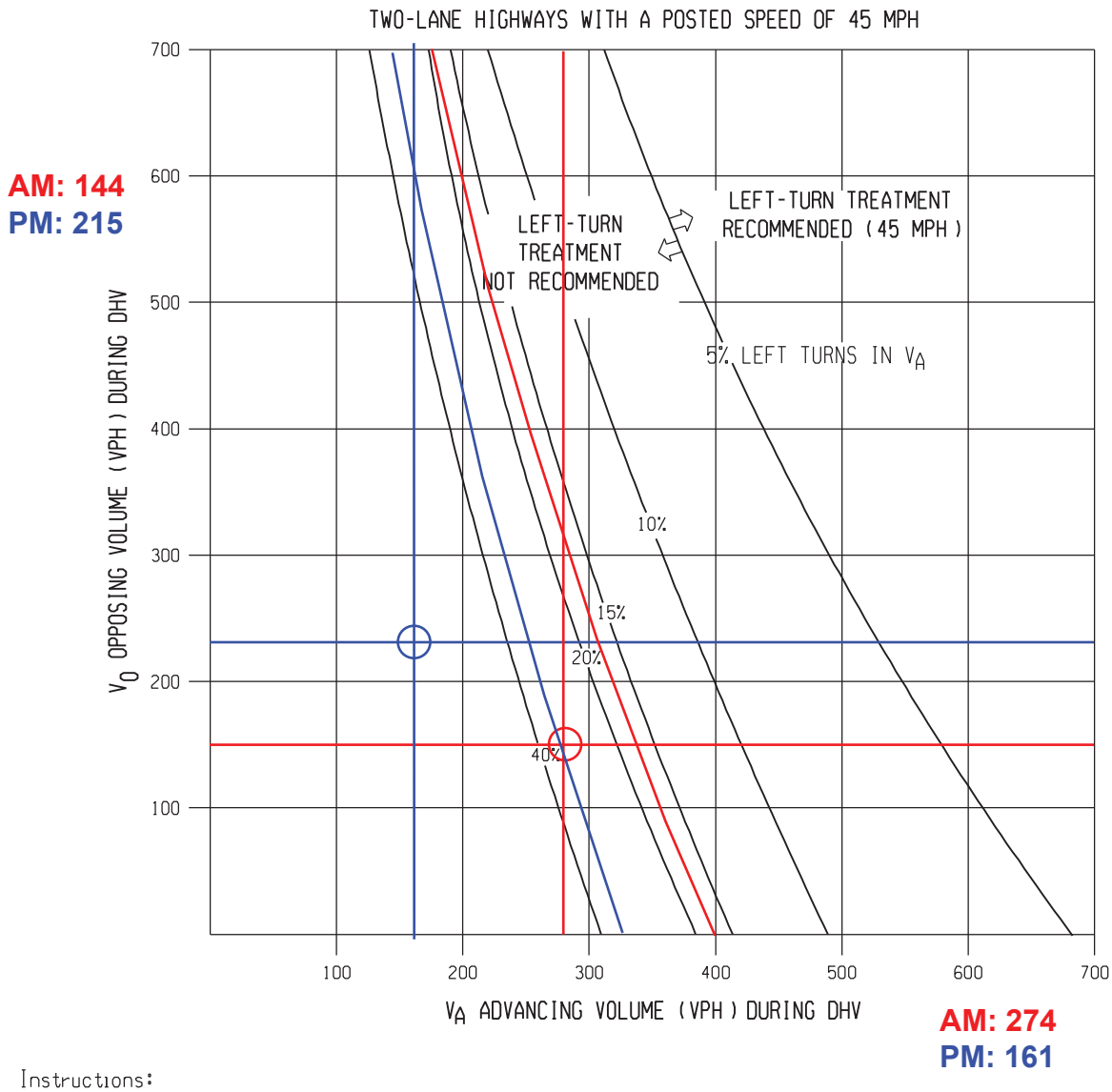
*If a center left-turn lane exists(i.e. 3 or 5 lane highway), subtract the number of left turns in approach volume from the total approach volume to get an adjusted total approach volume.

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

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

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR RIGHT-TURN LANES AND TAPERS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	604A	SHEET 2 OF 2
FILE: K:/DGN/ts notes/Note604A tsn.dgn		REV. 08/05/2004	

HAYES STREET & SITE DRIVE LT LANE WARRANT



Instructions:

1. The family of curves represent the percentage of left turns in the advancing volume (V_A). The designer should locate the curve for the actual percentage of left turns. When this is not an even increment of 5, the designer should estimate where the curve lies.

2. Read V_A and V_O into the chart and locate the intersection of the two volumes.

3. Note the location of the point in #2 relative to the line in #1. If the point is to the right of the line, then a left-turn lane is recommended. If the point is to the left of the line, then a left-turn is not recommended based on traffic volumes.

MDOT Michigan Department of Transportation TRAFFIC AND SAFETY NOTE	TRAFFIC VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS		
DRAWN BY: MTS CHECKED BY: JAT	08/05/2004 PLAN DATE:	605A	SHEET 4 OF 6
FILE: K:/DGN/ts notes/Note605A tsn.dgn		REV. 08/05/2004	

Speedway LLC
8902 Vincennes Circle, Suite E
Indianapolis, IN 46268

May 13, 2015

Stacey Fedewa
Planning & Zoning Official
Grand Haven Charter Township
13300 168th Avenue
Grand Haven, MI 49417

RE: Parking Study
Proposed Speedway Store #1830
NEC US 31 & Hayes Street
Grand Haven, MI

Dear Stacey,

Pursuant to your request for an analysis that would substantiate Speedway's request for a quantity of parking spaces that exceeds the Township's ordinances, please note the following:

VARIANCE FROM THE ALLOWED NUMBER OF PARKING SPACES

Section 15A10.10 of the Grand Haven Township Zoning Ordinance:

"10. Parking. To improve views and reduce impacts on the environment, the amount of parking constructed shall be less than what is typically required for commercial uses. Parking shall be provided at a rate of one space per 200 square feet of useable floor area, unless a parking study demonstrates the need for additional parking to the satisfaction of the Planning Commission."

Usable Floor Area is defined in Chapter 2 of the Grand Haven Township Zoning Ordinance:

"FLOOR AREA, USABLE (UFA)

1. That portion of **GROSS FLOOR AREA** used for or intended to be used for the sale of merchandise or services, or for use to serve patrons, clients, or customers; or that portion of **GROSS FLOOR AREA** used in a **DWELLING UNIT** for living purposes. Floor area which is used or intended to be used principally for the storage or processing of merchandise, for hallways, or for utilities shall be excluded from the computation of **USABLE FLOOR AREA**."

The Usable Floor Area (UFA) of a C4600 convenience store (having a gross floor area of 4,608 s.f.) such as the building proposed for the northeast corner of US 31 and Hayes Street is approximately 2,500 s.f.. Therefore, the number of parking spaces permitted by the ordinance may be calculated as follows:
2,500 s.f. UFA x (1 parking space/200 s.f. UFA) = 12.5 parking spaces.

The current site plan for the Speedway development includes 28 parking spaces (reduced from 30 spaces in earlier plans to accommodate an outdoor sales area), which exceeds the ordinance restriction by 15.5 parking spaces.

PARKING STUDY

Having an existing Michigan store that has customer volumes similar to what is expected of the proposed Grand Haven store, Speedway has available to it actual customer counts from which to predict the number of parking spaces that will be needed at the new store.

The store from which the customer counts were taken is
Store #2319
1530 E. Grand Avenue
Portland, MI

Similar to the proposed Grand Haven store #1830, store #2319 has three commercial fueling lanes. Whereas store #1830 will have seven auto fueling dispensers (fourteen auto fueling lanes), store #2319 has only six dispensers.

Customer volume at Speedway stores typically peaks on Friday afternoon. The transaction count for store #2319, taken between 2 PM and 2:30 PM on March 13, 2015, totaled 80. Using an overall consumer shopping time of roughly ten minutes, it can be estimated to be as many as 25 customers on the Speedway lot at the same time.

(80 customers x 10 minutes)/ 30 minutes time period = 25 customers

Anticipating 5 employees on duty during the same period, the number of parking spaces needed can be calculated to be 30.

25 customers + 5 employees = 30 parking spaces.

Thirty parking spaces should be considered a conservative estimate of the number of parking spaces needed to provide a safe and convenient site for our customers and employees for two reasons:

1) The estimate is based on transaction counts. The number of drivers who stopped at store #2319 during the study period solely to use the restroom is not reflected in the customer count.
2) The study was conducted on March 13, 2015. Customer volume increases significantly during the summer months.

Based on a study conducted at a similar store to the one proposed for Grand Haven, Speedway believes that it's request for 28 auto parking spaces is warranted.

Respectfully submitted,

Michael R. Bergman
Construction Specialist
Speedway LLC

RECORDING REQUESTED AND
WHEN RECORDED RETURN TO:

Gary J Bazydlo
4300 Sharon Road, Apt 313
Charlotte, NC 28211

(Space above this line for Recorder's use only)

DECLARATION OF RESTRICTIONS AND EASEMENTS

THIS DECLARATION OF RESTRICTIONS AND EASEMENTS ("**Agreement**") is made and entered into this ____ day of _____, 2015, by and between Alice Bottje, an unmarried individual, having an address of 14623 172nd Avenue, Grand Haven, Michigan 49417 ("**AB Owner**"), and SPEEDWAY LLC, having an address of c/o Real Estate Department, 539 South Main Street, Findlay, OH 45840 ("**Speedway**"). AB Owner and Speedway together with their respective successors and assigns, are hereinafter sometimes referred to each as an "**Owner**" and collectively "**Owners**".

RECITALS

A. AB Owner is the owner of that certain real property situated in the City of Grand Haven, Ottawa County, Michigan, more particularly described in **Schedule I** attached hereto and incorporated herein by this reference (the "**AB Owner Parcel**").

B. Speedway is the owner of that certain real property situated in the City of Grand Haven, Ottawa County, Michigan, more particularly described in **Schedule II** attached hereto and incorporated herein by this reference (the "**Speedway Parcel**"; the AB Owner Parcel and the Speedway Parcel are hereinafter sometimes referred to each as a "**Parcel**" and collectively "**Parcels**").

C. AB Owner and Speedway desire to agree to certain rights, privileges and easements and to impose certain restrictions and covenants upon the Parcels, on the terms and conditions hereinafter set forth.

D. The Parcels, the Owners thereof, and their successors and assigns, shall continue to be subject to (and benefited by, as the case may be) the easements, covenants, restrictions, liens and encumbrances set forth in any reciprocal easement agreement, operating agreement or declaration of record (collectively, the "**Existing Declarations**"), in addition to the restrictions

set forth in this Agreement. To the extent of any inconsistency between the provisions of this Agreement and the Existing Declarations, the more restrictive provision shall apply. The provisions of this Agreement shall be for the exclusive benefit of the Parcels and may not be enforced by the owner or occupant of any other property or enforced for the benefit of any other property.

AGREEMENT

NOW, THEREFORE, in consideration of the promises and mutual covenants herein contained and other good and valuable consideration the receipt and sufficiency of which are hereby acknowledged by the parties, AB Owner and Speedway agree as follows:

1. EASEMENTS AND LICENSE.

1.1 **Access and Parking Easement.** The Owner of the AB Owner Parcel and the Owner of the Speedway Parcel mutually grant to each other, and their respective tenants, contractors, employees, agents, customers, licensees and invitees, and the subtenants, contractors, employees, agents, customers, licensees and invitees of such tenants (collectively, the "**Permittees**"), for the mutual benefit of the AB Owner Parcel and the Speedway Parcel, a nonexclusive perpetual easement for ingress and egress by vehicular and pedestrian traffic upon, over and across the Common Area (hereinafter defined), and for cross-parking on the respective parcels, except for those areas devoted to service facilities or drive-up or drive-through customer service facilities as depicted on that certain site plan attached hereto as **Exhibit A** and incorporated by reference herein (the "**Site Plan**"). The term "**Common Area**" as used herein shall mean all those areas on the Parcels which are not then improved with a building or designated by the respective Owner as outside sales areas during the period such area is used for sales, display and/or storage purposes. Such Common Area shall include, but not be limited to, the following improvements located on the Parcels: Utility Lines (hereinafter defined), automobile parking areas, any portion of Hayes Street and of 172nd Avenue which is not a public right-of-way, sidewalks, access drives, curb cuts, fountains, landscaping, landscaping irrigation systems, and landscaped buffer strips. The "Access Road", as shown on **Exhibit B** shall not be materially diminished or impaired by any Owner without the written permission of all other Owners which may be withheld or denied in its sole discretion.

1.2 **Utility Easement.** The Owner of the AB Owner Parcel and the Owner of the Speedway Parcel mutually grant to each other, and their respective Permittees for the mutual benefit of the AB Owner Parcel and the Speedway Parcel, a perpetual non-exclusive easement under, through and across the Common Areas for the installation, operation, maintenance, repair and replacement of facilities and systems for transmission of utility services, including, but not limited to, water drainage and storage systems or structures; fire protection, irrigation and domestic water mains; sewer lines; telephone lines; electrical conduits or systems; telecommunication, computer lines, data conduits and pneumatic conduits; gas mains and other public or private utilities (any of the foregoing are referred to herein as "**Utility Lines**") so long as one or more of the aforedescribed uses does not materially interfere with the operation of each Parcel as determined by the Owner of the affected Parcel in its reasonable discretion. The Owners agree to grant to each other such additional easements under, through, and across the Common Area of each Parcel as are reasonably required by any public or private utility for the

purpose of providing Utility Lines provided such easements are not otherwise inconsistent with the provisions of this Agreement and so long as the use of the additional easements do not materially interfere with the operation of each Parcel as determined by the Owner of the affected Parcel in its reasonable discretion. Notwithstanding the foregoing, at any time and from time to time, the Owner of a Parcel shall have the right to relocate on its Parcel any Utility Lines installed pursuant to the foregoing grant of easements which is then located on the Parcel of such Owner, provided that any such relocation (i) shall be performed upon sixty (60) days' advance written notice of the proposed relocation to the non-relocating Owners of each other Parcel served by the Utility Line (the "**Non-Relocating Owners**"), (ii) shall not unreasonably interfere with or diminish utility service to the Parcel served by Utility Line as determined by the Non-Relocating Owners in their reasonable discretion, (iii) shall not reduce or unreasonably impair the usefulness or function of the Utility Line, (iv) shall be performed without cost or expense to the Non-Relocating Owners and their respective Permittees, and (v) shall provide for the affected real property and improvements on the Parcels to be restored to substantiallly their original condition as existed prior to the relocation of the subject Utility Line. The Owner performing such relocation shall provide as-built for all such relocated Utility Lines to the plans to the Non-Relocating Owners within thirty (30) days after the date of completion of such relocation.

1.3 **Sign License**. Not Applicable.

1.4 **No Restriction on Construction of Improvements**. Provided that each Parcel "self-parks" for code compliance purposes, and further provided the Owners' access to and use of the that the Access Road is not materially impaired, then nothing contained in any of Sections 1.1, 1.2 and/or 1.3 of this Agreement shall limit, restrict or prohibit the construction by the Owner of a Parcel of any government-approved buildings or other improvements on its Parcel including, without limitation, construction of any such buildings or improvements on any portion of such Parcel that would constitute Common Area if such construction had not occurred.

1.5 **Access Road Easement**. The Owner needing to perform maintenance, repair, snow removal or replacement of all or any part of the Access Road on another Parcel shall have reasonable access to that other Parcel for purposes of performing the necessary work. To this end, Speedway Owner will provide for three curb cuts, at locations reasonably agreed to by the parties, along the Access Road to the AB Owner Parcel (and subject to approval of the same by all governmental entities with appropriate jurisdiction). Owner performing work shall carry commercially reasonable insurance on the work they are performing and access they are engaging in, and shall repair any damage done to the Parcel during or related to said work. Speedway Owner shall be the party performing said work as set forth in Section 2.1 below, subject to the self-help remedies also set forth in Section 2.1.

2. MAINTENANCE AND REPAIR.

2.1 **Common Area**. (A) Except as provided below with respect to the Access Road, each Party shall perform the following maintenance obligations, at its sole cost and expense, on the Common Area on its Parcel in a safe condition and good state of repair: (i) periodically remove papers, debris, filth, refuse, ice and snow, but in any event to the extent necessary to

keep the Common Area in a first-class, clean and orderly condition and (ii) maintain, clean and replace sidewalks, including those adjacent and contiguous to buildings located on the Parcels and the sidewalks shall be swept at appropriate intervals during such time as shall not interfere with the conduct of business or use of the Common Area, and shall be cleared of ice or snow. Once, and not until, AB Owner constructs a building and has said building occupied for operation by an end-user, AB Owner shall pay to Speedway Owner an annual fee of One Thousand Five Hundred Dollars ($1,500) annually, payable in the month of January of each year (the "Access Road Maintenance Fee"), and AB Owner shall be charged that Access Road Maintenance Fee for Speedway Owner maintaining, repairing, cleaning, snow removing and replacing the Access Road in reasonably good and safe condition on all Parcels. In the event Speedway Owner fails to properly maintain, repair, clean, snow remove or replace the Access Road in a reasonably good and safe condition, any other Owner may provide Speedway Owner with thirty (30) days written notice of said failure, and if said failure is not cured during the notice period (or if said cure would require additional time, at least commenced within thirty (30) days, with written explanation to the notifying Owner of how long the cure is expected to take), then the notifying Owner will have the right to cure the offending condition and charge Speedway Owner with the reasonable third-party cost of said cure, which reimbursement shall be made by AB Owner within twenty (20) days of receipt of demand for payment along with a paid invoice for the cure work. The Access Road Maintenance Fee shall increase by five percent (5%) on each fifth (5th) anniversary of the Effective Date of this Agreement.

(B) In addition to the Access Road Maintenance Fee, AB Owner shall pay to Speedway Owner a one-time fee of Six Thousand Six Hundred Sixty-Six and 66/100ths Dollars ($6,666.66) for each of the three (3) curb cuts set forth in Section 1.5 above that AB Owner actively attaches to and utilizes up to a total for all three (3) curb cuts of Twenty Thousand Dollars ($20,000) if all three are ultimately utilized. Payment shall be made within thirty (30) days of the date when utilization of a curb cut begins. Utilization of each curb cut shall begin when a curb cut is paved to the curb cut on the AB Owner Parcel side and use of all or any part of the AB Owner Parcel is or can be accessed through that particular paved curb cut by employees, invitees, suppliers, vendors and other third-parties.

2.2 **Utility Lines**. The Utility Lines shall be maintained in a safe, clean and good state of repair and condition. The Owner of the affected Parcel shall perform such work in compliance with all applicable governmental requirements, as quickly as possible and after normal business hours whenever possible. Except in the case of a maintenance emergency where such work may be initiated after reasonable notice, the Owner of the affected Parcel shall provide the Owners of the non-affected Parcel with at least fifteen (15) days prior notice before commencement of any maintenance work.

2.3 **Speedway Pylon Sign**. The Owner of the Speedway Parcel shall maintain the Speedway Pylon Sign in a safe, clean and good state of repair and condition (the "**Speedway Pylon Sign Maintenance Costs**"). The Speedway Pylon Sign Maintenance Costs shall be paid by the Owner of the Speedway Parcel.

3. RESTRICTIONS.

3.1 **Gas Station Restriction.** So long as a gas station store is located and operating on the Speedway Parcel, any portion of the AB Owner Parcel shall not be leased, rented, occupied, or suffered or permitted to be used or occupied for the purpose of conducting therein, or for use as, a gas station.

3.2 **Special Use Restrictions.** No part of the Parcels shall be used for: (a) any use which is a public or private nuisance; (b) any use which produces noise or sound that is objectionable due to intermittence, high frequency, shrillness or loudness; (c) any use which produces obnoxious odors; (d) any use which produces noxious, toxic, caustic or corrosive fumes; (e) any use which produces dust, dirt or fly ash in excessive quantities; (f) any use which produces fire, explosion or other damaging or dangerous hazard (including the storage, display or sale of explosives or fireworks); (g) a warehouse; (h) any assembling, manufacturing, industrial, distilling, refining, smelting, agriculture or mining operation; (i) a dry cleaning plant; (j) living quarters, sleeping apartment or lodging rooms; (k) a massage, tattoo, or piercing parlor (a massage spa typically found in neighborhood or community centers shall not be considered a parlor), (l) any establishment with a business, the principal purpose of which is selling, renting or displaying of pornographic or "adult" materials, including, without limitation, magazines, books, movies, videos, and photographs; (m) a mortuary, funeral home or crematorium; (n) adult dancing entertainment; (o) a carnival, amusement park or circus; (p) a facility for the sale of new or used motor vehicles, trailers or mobile homes, or (q) restaurant unless same is capable of self-parking to code without parking variance.

4. MAINTENANCE OF HAYES STREET AND 172ND AVENUE. Commencing on the date of this Agreement, each Owner, at such Owner's sole cost and expense, shall keep and maintain that portion of Hayes Street and 172nd Avenue located on such Owner's Parcel at all times in good condition and repair.

5. NO RIGHTS IN PUBLIC/THIRD PARTY BENEFICIARIES. Nothing contained in this Agreement shall be construed as creating any rights in the general public or as dedicating for public use any portion of the Parcels. This Agreement is not intended to create, nor shall it in any way be interpreted or construed to create, any third party beneficiary rights in any person not a party hereto.

6. REMEDIES. In the event of a breach of any of the terms or provisions of this Agreement, and subject to the terms herein, the non-defaulting party shall be entitled to exercise any and all available remedies at law or in equity for full and adequate relief from such breach, which remedies shall be cumulative. Notwithstanding anything to the contrary contained in this Agreement, in no event shall any default or breach under this Agreement entitle any party to seek or to enforce the cancellation, rescission, or termination in whole or in part of this Agreement or of any of the easements or use restrictions herein granted. In the event of any violation or threatened violation by any person of any of the provisions of this Agreement, any or all of the parties shall have the right to enjoin such violation or threatened violation in a court of competent jurisdiction. The right of injunction shall be in addition to all other remedies set forth in this Agreement or provided by law or equity.

7. **TERM.** The covenants, conditions, and restrictions contained in this Agreement shall be effective commencing on the date of recordation of this Agreement in the office of the county recorder where the Parcels are located and shall remain in full force and effect for a period of sixty-five (65) years from and after said date of recordation (the "**Primary Term**"), and the easements granted in this Agreement shall continue in perpetuity, unless this Agreement is modified, amended, cancelled, or terminated by the written consent of all then record Owners of the Speedway Parcel and the AB Owner Parcel in accordance with Section 8.3 of this Agreement. Notwithstanding the foregoing, upon the expiration of the Primary Term, the term of this Agreement shall automatically renew for successive periods of ten (10) years each (each such period being referred to as an "**Extension Period**" unless, at least ninety (90) days prior to the date of expiration of the Primary Term or Extension Period then in effect, any party delivers to the other parties written notice of termination, in which event, the Agreement shall automatically expire at the end of the Primary Term or Extension Period then in effect.

8. MISCELLANEOUS.

8.1 **Notices.** Any notice to be given by any party under this Agreement shall be given in writing and delivered in person, or by reputable nationwide overnight courier (e.g., Federal Express), or forwarded by certified or registered mail, postage prepaid, return receipt requested, at the address indicated below, unless the party giving such notice has been notified, in writing, of a change of address:

AB Owner Parcel Owner:

with a copy to:

Speedway Parcel Owner:

c/o Real Estate Department, Room 1604
539 South Main Street
Findlay, OH 45840

Any such notice shall be deemed effective on the date on which such notice is delivered, if notice is given by personal delivery or overnight courier, or if notice is sent through the United States mail, on the date of actual delivery as shown by the addressee's receipt or upon the expiration of three (3) days following the date of mailing, whichever first occurs.

8.2 **Attorneys' Fees.** In the event a party institutes any legal action or proceeding for the enforcement of any right or obligation contained in this Agreement, the prevailing party shall be entitled to recover from the unsuccessful party its costs and reasonable attorneys' fees incurred in the preparation and prosecution of such action or proceeding. For the purposes of this Section

8.2, the "prevailing party" shall include, but not be limited to, a party who obtains legal counsel or brings an action against the other by reason of the other's breach or default and obtains substantially the relief sought by judgment.

8.3 **Amendment.** The parties agree that this Agreement may be terminated, modified, or amended only by the written consent of all record Owners of the AB Owner Parcel and the Speedway Parcel. Any such termination, modification, or amendment of this Agreement shall be evidenced by a document that has been fully executed and acknowledged by all such Owners and recorded in the official records of the county recorder of the county in which the Parcels are located.

8.4 **Consents.** Wherever in this Agreement the consent or approval of a party is required, unless otherwise expressly provided in this Agreement, such consent or approval shall not be unreasonably withheld or delayed. Any request for consent or approval shall: (a) be in writing; (b) specify the Section hereof which requires that such notice be given or that such consent or approval be obtained; and (c) be accompanied by such background data as is reasonably necessary to make an informed decision thereon.

8.5 **No Waiver.** No waiver of any default of any obligation by any party to this Agreement shall be implied from any omission by the other party to take any action with respect to such default.

8.6 **No Agency.** Nothing in this Agreement shall be deemed or construed by any third party or by any third person to create the relationship of principal and agent or of limited or general partners or of joint venturers or of any other association between the Owner of the AB Owner Parcel and the Owner of the Speedway Parcel.

8.7 **Covenants to Run with Land.** It is intended that each of the easements, covenants, conditions, restrictions, rights, and obligations set forth in this Agreement shall run with the land and create equitable servitudes in favor of the real property benefited thereby, shall bind every person having any fee, leasehold, or other interest therein and shall inure to the benefit of the respective parties and their successors, assigns, heirs, and personal representatives. However, no easement, covenant, condition, restriction, or other right or benefit accruing under this Agreement in favor of any Parcel shall be assignable, transferable, or otherwise delegable to or for the benefit of neighboring real property that is not a Parcel hereunder (for example, the Owner of the Speedway Parcel shall have no right to assign the easement for vehicular access over the Common Areas of the AB Owner Parcel arising under this Agreement in favor of other real property in the vicinity of the Parcels).

8.8 **Grantee's Acceptance.** The grantee of any Parcel or any portion thereof, by acceptance of a deed conveying title thereto or the execution of a contract for the purchase thereof, whether from an original party or from a subsequent Owner of such Parcel, shall accept such deed or contract upon and subject to each and all of the easements, covenants, conditions, restrictions, and obligations contained herein. By such acceptance, any such grantee shall for himself and his successors, assigns, heirs, and personal representatives, covenant, consent, and agree to and with all other parties, to keep, observe, comply with, and perform the obligations

and agreements set forth herein with respect to the property so acquired by such grantee, whereupon the grantor of such property shall be released from such obligations and agreements thereafter arising in respect of such property.

8.9 **Severability.** Each provision of this Agreement and the application thereof to the AB Owner Parcel and the Speedway Parcel are hereby declared to be independent of and severable from the remainder of this Agreement. If any provision contained in this Agreement shall be held to be invalid or to be unenforceable or not to run with the land, such holding, shall not affect the validity or enforceability of the remainder of this Agreement. In the event the validity or enforceability of any provision of this Agreement is held to be dependent upon the existence of a specific legal description, the parties agree to promptly cause such legal description to be prepared.

8.10 **Time of Essence.** Time is of the essence of this Agreement.

8.11 **Entire Agreement.** This Agreement contains the complete understanding and agreement of the parties with respect to all matters referred to in this Agreement, and all prior representations, negotiations, and understandings are superseded by this Agreement.

8.12 **Estoppel Certificate.** Each party, upon the written request of another party, shall execute, acknowledge, and deliver, without charge and within fifteen (15) days following such request, an estoppel certificate certifying that this Agreement is in full force and effect, that no party is in default under this Agreement (or stating such default(s), if any, are claimed), and setting forth such other information as may reasonably be requested and is true and correct.

8.13 **Subordinate Declarations.** Nothing contained in this Agreement shall be deemed to prohibit the recording by a party of additional easements, covenants, conditions, or restrictions applicable to such party's Parcel only, so long as the same are subordinate to this Agreement and not in conflict with this Agreement.

8.14 **Governing Law and Jurisdiction.** The laws of the State in which the Parcels are located shall govern the interpretation, validity, performance, and enforcement of this Agreement. The parties irrevocably consent to jurisdiction and venue in the State in which the Parcels are located and agree not to attempt to remove or transfer any action properly commenced in the State in which the Parcels are located.

8.15 **Recitals.** The recitals, and in particular those relating to conflicting provisions, are incorporated herein by reference and constitute binding terms of the Agreement.

[remainder of page intentionally left blank; signature page follows]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

OWNER OF THE AB OWNER PARCEL:

By: _____

Name: _____

Title: _____

OWNER OF THE SPEEDWAY PARCEL:

By: _____

Name: Jeffrey J. Wild

Title: Director, Real Estate

APPROVED AS TO FORM

STATE OF _____
COUNTY OF _____

I, _____, a Notary Public of the County and State aforesaid, do hereby certify that, _____, the _____ of _____, personally known to me or who produced _____ as identification, personally appeared before me this day and acknowledged the due execution of the foregoing instrument. Witness my hand and official stamp or seal, this ____ day of _____, 2015.

_____
Notary Public

(NOTARIAL SEAL)

My Commission Expires:

STATE OF OHIO
COUNTY OF CLARK

I, Dawn M. Woods, a Notary Public of the County and State aforesaid, do hereby certify that, Jeffrey J. Wild, the Director, Real Estate of Speedway LLC, personally known to me or who produced N/A as identification, personally appeared before me this day and acknowledged the due execution of the foregoing instrument. Witness my hand and official stamp or seal, this 11th day of February, 2015.

Dawn M. Woods
Notary Public

(NOTARIAL SEAL)

DAWN M. WOODS
NOTARY PUBLIC · STATE OF OHIO
RECORDED IN MONTGOMERY COUNTY
MY COMMISSION EXPIRES NOV. 1, 2017

My Commission Expires: November 1, 2017

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

OWNER OF THE AB OWNER PARCEL:

By: Alice Bottje

Name: Alice Bottje

Title: Successor Trustee

OWNER OF THE SPEEDWAY PARCEL:

By: _____

Name: _____

Title: _____

STATE OF Michigan
COUNTY OF Ottawa

I, Cara L. Galbavi, a Notary Public of the County and State aforesaid, do hereby certify that, Alice Bottje, the Successor Trustee of Mary E. Bottje Living Trust, personally known to me ~~or who produced~~ _____ ~~as identification~~, personally appeared before me this day and acknowledged the due execution of the foregoing instrument. Witness my hand and official stamp or seal, this 2 day of April, 2015.

Cara L. Galbavi
Notary Public

(NOTARIAL SEAL)

CARA L. GALBAVI
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF OTTAWA
My Commission Expires March 13, 2021
Acting in the County of Ottawa

My Commission Expires: 03/13/2021

STATE OF _____
COUNTY OF _____

I, _____, a Notary Public of the County and State aforesaid, do hereby certify that, _____, the _____ of Speedway LLC, personally known to me or who produced _____ as identification, personally appeared before me this day and acknowledged the due execution of the foregoing instrument. Witness my hand and official stamp or seal, this ____ day of _____, 2015.

_____
Notary Public

(NOTARIAL SEAL)

My Commission Expires:

Schedule I
Legal Description of the AB Owner Parcel

Schedule II

Legal Description of the Speedway Parcel

Exhibit A

Site Plan

(see attached)

Exhibit B

Depiction of Access Road

(see attached)