

**WHITE LAKE TOWNSHIP
INTER-OFFICE MEMORANDUM
COMMUNITY DEVELOPMENT DEPARTMENT**

DATE: July 8, 2022

TO: Rik Kowall, Supervisor
Township Board of Trustees

FROM: Sean O'Neil, AICP
Community Development Director

SUBJECT: The Avalon f.k.a. White Lake Hill

Preliminary site plan approval and rezoning request

Property described as parcel number 12-20-101-003 (1085 Hill Road), located on the north side of Highland Road, west of Hill Road, consisting of approximately 68.96 acres. Property described as parcel number 12-20-126-006, located north of Highland Road, east of Hill Road, consisting of approximately 41.06 acres. Applicant requests to rezone parcel number 12-20-101-003 from (AG) Agricultural and (PB) Planned Business to (PD) Planned Development or any other appropriate zoning district, and parcel number 12-20-126-006 from (R1-A) Single Family Residential to (PD) Planned Development or any other appropriate zoning district.

The rezoning request was considered by the Planning Commission at their regular meeting of April 21, 2022 at which time the **Planning Commission recommended approval of this rezoning request**. The preliminary site plan approval was considered by the Planning Commission at their regular meeting of July 7, 2022, at which time the **Planning Commission recommended approval of the preliminary site plan**. Please find enclosed the following related documents:

- ❑ Minutes of the April 21st, 2022 Planning Commission meeting.
- ❑ Draft minutes of the July 7th, 2022 Planning Commission meeting.
- ❑ Review letters prepared by the Township Engineering Consultant, Mike Leuffgen, dated May 25, 2022 and April 13, 2022.
- ❑ Review letter prepared by DLZ Traffic Consultant, Leigh Merrill, dated June 15, 2022.
- ❑ Review letters prepared by the Township Staff Planner, Justin Quagliata, dated May 25, 2022 and April 13, 2022.
- ❑ Review letter prepared by White Lake Township Fire Chief, John Holland, dated May 24, 2022.
- ❑ Site plan and floor plans submitted by the applicant
- ❑ Community impact statement submitted by the applicant.
- ❑ Traffic impact study submitted by the applicant.

Please place this matter on the next available Township Board agenda. Do not hesitate to contact me should you require additional information.

**WHITE LAKE TOWNSHIP
PLANNING COMMISSION**

Township Annex, 7527 Highland Road
White Lake, MI 48383
July 7, 2022 @ 7:00 PM

CALL TO ORDER

Commissioner Anderson called the meeting to order at 7:00 PM and led the Pledge of Allegiance. Roll was called.

ROLL CALL

Steve Anderson
Merrie Carlock
Pete Meagher
Debby Dehart
Robert Seeley
Scott Ruggles
Mark Fine

Absent: Matt Slicker
T. Joseph Seward

Also Present: Sean O'Neil, Community Development Director
Justin Quagliata, Staff Planner
Mike Leuffgen, DLZ
Lisa Kane, Recording Secretary

Visitors: Approximately 10 members of the public were present

APPROVAL OF AGENDA

Commissioner Seeley moved to approve the agenda of the July 7, 2022 Planning Commission Meeting.

Commissioner Fine supported and the MOTION CARRIED with a voice vote: 7 yes votes.

APPROVAL OF MINUTES

- a. Regular meeting minutes of June 16, 2022
- b. Commissioner Anderson requested amendments to the minutes, showing the motions carrying for tabling cases Elizabeth Lake Retail and White Lake Hill LLC.

Commissioner Ruggles moved to approve the amended Minutes of June 16, 2022.

Commissioner Fine supported and the MOTION CARRIED with a voice vote: 7 yes votes.

CALL TO THE PUBLIC (FOR ITEMS NOT ON THE AGENDA)

John Hunt of 871 Oxhill Dr is concerned about the cement that will surround his property when the Black Rock restaurant is built.

PUBLIC HEARING

None

CONTINUING BUSINESS

A. The Avalon fka White Lake Hill

Property described as parcel number 12-20-101-003 (1085 Hill Road), located on the north side of Highland Road, west of Hill Road, consisting of approximately 68.96 acres. Property described as parcel number 12-20-126-006, located north of Highland Road, east of Hill Road, consisting of approximately 41.06 acres. Parcel number 12-20-101-003 is currently zoned (AG) Agricultural and (PB) Planned Business, and parcel number 12-20-126-006 is currently zoned (R1-A) Single Family Residential.

Request:

1) Preliminary site plan approval

Applicant: White Lake Hill, LLC
31550 Northwestern Highway
Farmington Hills, MI 48334

Applicant present: Mark Kassab of Lautrec and Mike Bank

Commissioner Meagher motioned to untable the preliminary site plan. **Commissioner Fine** supported and the MOTION CARRIED with a voice vote. (6 – 1, with Commissioner Seeley voting no)

Director O'Neil introduced the project, stating that the rezoning was previously recommended for approval to the Township Board, however the preliminary site plan was tabled. The applicant has revised the plan, reducing the density to 6.1 per acre for the multiple-family lots and to 2.6 per acre for the single-family lots. The applicant has eliminated many waiver requests, as well as increasing the multiple-family north property setback to 120 feet.

Mr. Leuffgen presented the engineering review. The applicant has proved engineering feasibility with the current plan and the expectation is that the utility plan has not changed from what was previously presented. A donation to the sidewalk fund was indicated due to lack of sidewalk on the west side of Hill Rd. The plan is deficient for extending the sanitary sewer to the property line, it is recommended to have an escrow for the future utility/sanitary sewer connection. To ensure sufficient pressure, a second water supply to the property is necessary and should be a condition of approval. An analysis of sanitary sewer pump station is required at final site plan review.

Commissioner Anderson stated that the applicant has been flexible and agreeable to requests made of them.

Mr. Leuffgen presented the June 15, 2022 letter regarding the traffic impact study results.

Commissioner Ruggles inquired if the study indicated a traffic light be installed.

Mr. Kassab stated that they met with residents recently and considered the comments from the Planning Commission and the residents when reducing the density for the revised plan.

Mr. Levity provided clarification of the traffic study and stated that the data warrants a traffic signal with M-DOT but there has not been a decision made from M-DOT at this time.

Commissioner Meagher asked if M-DOT doesn't approve the signal, what are the ramifications.

Mr. Levity stated that M-DOT would have to offer an alternative if they do not approve a traffic signal or the applicant would have to come up with something else.

Commissioner Anderson inquired about the timeline for that process with M-DOT.

Mr. Levity they would likely install the light when the lowest amount of traffic for the warrant is met.

Mr. Kassab stated that they are prepared to abide by all M-DOT requirements.

Commissioner Seeley and **Commissioner Dehart** stated concerns about the density and size of the single-family lots.

The Board deliberated on the lot sizes and setbacks.

Commissioner Carlock inquired about disturbance to the wooded area during construction.

Mr. Kassab stated that they plan to keep that area in its natural state, installing a retaining wall 30 feet from the buildings. A wetland delineation has been completed identifying the regulated wetlands. They will coordinate with Road Commission of Oakland County for grading and paving of Hill Road. They will also contract a landscape architect to develop the landscaping plan.

Director O'Neil stated that the applicant has offered a \$100,000 contribution to the park fund that could be used for Stanley Park or other park projects.

Commissioner Ruggles inquired about the amount of wetlands on the property.

Mr. Kassab stated that there are 11 acres of wetlands on the project site.

Commissioner Meagher inquired about the front lot requirement and if it is for aesthetics and what the average cost of the single-family units would sell for.

Director O'Neil Stated that the front lot line requirement was established long ago but the trend has gone down in the area. It is believed that smaller lots are easier to maintain and people are in favor of more common areas.

Mr. Kassab stated that the single-family homes are expected to see for about \$450,000.

The Board deliberated how the sidewalk fund would be determined and if it would be based on the construction cost.

Commissioner Anderson inquired if they had considered a larger donation to the park fund.

Commissioner Seeley inquired about what waivers being requested.

Director O'Neil listed the waivers that the applicant is requesting.

John Ranking of 1849 Hill Rd has concerns of the safety of this development's pavement ending on Hill Roads "S" curve and if the curve could be eliminated.

Harvey Wilson of 1795 Hill Rd appreciates the applicant meeting with residents but feels that this development is too dense.

A letter of support of the project was entered into record.

Commissioner Meagher moved to forward a favorable recommendation, subject to the applicant addressing all of the staff and consultants' review comments and recommendations to the Township Board, the preliminary site plan for the property described as parcel number 12-20-101-003 (1085 Hill Road), located on the north side of Highland Road, west of Hill Road, consisting of approximately 68.96 acres. Property described as parcel number 12-20-126-006, located north of Highland Road, east of Hill Road, consisting of approximately 41.06 acres. Parcel number 12-20-101-003 is currently zoned (AG) Agricultural and (PB) Planned Business, and parcel number 12-20-126-006 is currently zoned (R1-A) Single Family Residential.

Commissioner Fine supported, and the MOTION CARRIED with a roll call vote (6 yes votes): (Anderson/yes, Dehart/yes, Carlock/yes, Fine/yes, Meagher/yes, Seeley/no, Ruggles/yes)

NEW BUSINESS

A. Hypershine Car Wash

Property described as parcel number 12-23-202-006 (9345 Highland Road), located on the south side of Highland Road, west of Fisk Road, consisting of approximately 4.91 acres. Currently zoned as (GB) General Business.

Request:

1) Final site plan approval

Applicant: EROP, LLC
2390 East Federal Drive
Decatur, IL 62526

Applicant Present: Erin McMachen representing EROP

Mr. Leuffgen presented the engineering review. The sanitary and storm sewer have items that need clarification. Engineering approval is recommended based on all items being addressed.

Commission Dehart inquired about the front access easement.

Mr. Quagliata gave a brief presentation of the project which received Township Board approval and was granted three variances by the Zoning Board of Appeals. The applicant has complied to all landscaping requirements and the frontage road has been widened to 24 feet to accommodate cross access.

Ms. McMachen addressed two outstanding comments, one regarding trees and the other was clarification on the screening fence.

The Board deliberated on the materials proposed for the exterior of the building.

Commissioner Carlock inquired about the reclaimed water system.

Ms. McMachen explained how the water reclamation system worked and stated no waste from within the building would enter the storm system.

Commissioner Fine asked if 55-gallon drums would be used and if they would be stored on the premises.

Mary Early of 5925 Pioneer Ct has concerns about the size of the lot for the project and inquired if there was a traffic impact study.

Mr. Quagliata M-DOT required a taper lane for this project which is indicated on the plan.

Commissioner Anderson inquired about the traffic stacking requirement.

Mr. Quagliata stated that the plan presented exceeds the requirement.

Commissioner Seeley moved to approve the final site plan subject to all staff and consultants' review comments being addressed as parcel number 12-23-202-006 (9345 Highland Road), located on the south side of Highland Road, west of Fisk Road, consisting of approximately 4.91 acres. Currently zoned as (GB) General Business.

Commissioner Meagher supported, and the MOTION CARRIED with a roll call vote (7 yes votes): (Anderson/yes, Dehart/yes, Carlock/yes, Fine/yes, Meagher/yes, Seeley/yes, Ruggles/yes)

OTHER BUSINESS

A. Concept plan for the southeast corner of Hilltop Drive & Highland Road

Sam Stafa and Arban Stafa requested feedback from the Planning Commission about a potential project that would rezone the proposed site to allow attached single-family homes. Discussion about what direction the Township is interested in as it relates to rentals and home ownership.

Bob Hoffman of Highland Township stated that he currently owned one of the parcels and asked if rezoning would be the first step in the process.

LIAISON'S REPORT

Commissioner Ruggles reported that the Township Board approved the Comfort Care project at the June 21st meeting. DPS has requested two new vehicles, the Board approved one dump truck.

Commissioner Dehart reported that the Zoning Board of Appeals heard two cases at the last meeting, Last Resort Marina on Pontiac Lake Rd was denied.

Commissioner Carlock reported that the Parks Board had a successful Family Fun Day, 125 people enjoyed the event.

DIRECTOR'S REPORT

Director O'Neil Planning Commission members will be receiving ID badges. The update of the CIP is underway and will be available in August for review by the Planning Commission and in September for a vote.

COMMUNICATIONS

NEXT MEETING DATES: August 4, 2022

ADJOURNMENT

Commissioner Fine moved to adjourn the meeting at 9:02 PM

Commissioner Meagher supported and the MOTION CARRIED with a voice vote: 7 yes votes

DRAFT

**WHITE LAKE TOWNSHIP
PLANNING COMMISSION**

Township Annex, 7527 Highland Road
White Lake, MI 48383
April 21, 2022 @ 7:00 PM

CALL TO ORDER

Chairperson Anderson called the meeting to order at 7:00 PM and led the Pledge of Allegiance. Roll was called.

ROLL CALL

Steve Anderson
Merrie Carlock
Pete Meagher
Debby Dehart
Scott Ruggles
Matt Slicker
Robert Seeley
T. Joseph Seward

Absent: Mark Fine

Also Present: Sean O'Neil, Community Development Director
Justin Quagliata, Staff Planner
Mike Leuffgen, DLZ
Kyle Gall, DLZ
Lisa Kane, Recording Secretary

Visitors: 20+ members of the public were present

APPROVAL OF AGENDA

Commissioner Meagher moved to approve the agenda of the April 21, 2022 Planning Commission Meeting.

Commissioner Carlock supported and the **MOTION CARRIED** with a voice vote: 8 yes votes.

APPROVAL OF MINUTES

- a. Regular meeting minutes of April 7, 2022

Commissioner Meagher moved to approve the Minutes of April 7, 2022

Commissioner Seward supported and the **MOTION CARRIED** with a voice vote: 8 yes votes.

CALL TO THE PUBLIC (FOR ITEMS NOT ON THE AGENDA)

None

PUBLIC HEARING

A. White Lake Hill LLC

Property described as parcel number 12-20-101-003 (1085 Hill Road), located on the north side of Highland Road, west of Hill Road, consisting of approximately 68.96 acres. Property described as parcel number 12-20-126-006, located north of Highland Road, east of Hill Road, consisting of approximately 41.06 acres.

Requests:

1) Preliminary site plan approval

2) Rezoning request: Applicant requests to rezone parcel number 12-20-101-003 from (AG) Agricultural and (PB) Planned Business to (PD) Planned Development or any other appropriate zoning district, and parcel number 12-20-126-006 from (R1-A) Single Family Residential to (PD) Planned Development or any other appropriate zoning district.

Applicant: White Lake Hill, LLC
31550 Northwestern Highway
Farmington Hills, MI 48334

Applicant Present: Mark Kassab

Director O'Neil presented the Fire Department's comments and Assessing's comments on the parcels.

Commissioner Slicker disclosed a professional relationship with the applicant and asked to recuse himself from voting.

Commissioner Meagher moved to allow Commissioner Slicker to recuse himself due to the professional relationship with the applicant. Commissioner Seward supported and the motion carried with a roll call vote (7 yes votes)
(Carlock/yes, Dehart/yes, Meagher/yes, Anderson/yes, Seeley/yes, Seward/yes, Ruggles/yes)

Commissioner Ruggles disclosed a professional relationship for consideration by the board, as his family has farmed that land in the past. It was determined that there were no conflicts of interest and Commissioner Ruggles remained present for the public hearing.

Mr. Leuffgen presented the engineering report from DLZ Engineering. Because sidewalks are not feasible on both sides of Hill Road and the applicant has offered a community benefit for sidewalk fund to compensate for that. The ordinance requires that work done within the 25-foot wetland buffer will need a plan in place to restore it to the original vegetative state. All roads, whether private or public, need to meet Road Commission of Oakland County requirements and this will be required to be indicated on the final site plan. The preliminary site plan provides a reasonable means of stormwater management. The sanitary sewer ordinance requires that sewer be extended across the full extent of the property frontage for the benefit of future use, however the grade and location of trees will make it difficult to extend all the way to the northern property line on Hill Road, therefore it may be left about 40 feet short. The recommendation is for the applicant to consider depositing funds in an escrow account for future use when there is a need for it by an adjoining property. The master plan does include sanitary sewer extending north on Hill Road. It should be considered to include a condition for a loop system for the water supply which provides a redundant source of water service to provide redundancy and reliability concern. A pump station analysis is recommended for the sewage system as the closed pump station has two pumps and a third pump may be warranted. There is a concern regarding building envelopes in relation to patios and decks extending into the sewer easements that should be limited as much as possible.

Commissioner Seeley inquired about the single point of road access and if there is a number of units that would indicate the need of a second road access.

Mr. Quagliata stated that the Fire Department indicated that the preliminary site plan met the intent of the fire code.

Commissioner Ruggles inquired about the loop water system and if the water main on Highland Road would meet the needs of the development.

Mr. Leuffgen explained that where this project would tie in to the water main is in a different pressure district than the water tower. There is not a water main on Hill Road but they are proposing installing one.

Commissioner Anderson inquired about the number of units, the need for the looping water system and if the residents nearby would benefit from the looping water system.

Mr. Leuffgen stated that the residents on Highland Road have direct access to the water main on Highland Road and would not require access to the looped water system.

Discussion occurred of the benefits of looped water system and whether it stabilizes water pressure.

Mr. Quagliata presented the project as 493 total units which consists of 87 detached single-family site condos and 406 multiple-family rental apartment units. The single-family homes will be governed by a declaration of covenant and the apartment rentals will remain owned and managed by the developer. The property on the west side of Hill Road has split zoning, which would be remedied by the rezoning. Rezoning to Planned Development is necessary to develop these properties as indicated on the preliminary site plan. The clubhouse is in the hub of the apartments providing amenities such as a patio and pool and the single-family dwellings will not have access to the clubhouse. The applicant has proposed a public benefit of \$100,000 Parks and Rec fund. Between the two parcels 22 wetlands are identified and are regulated by EGLE, the applicant has stated that any natural area that requires grading for walk-out basements will be returned to its natural, undisturbed state with only native plantings. The multi-family apartments on Hill Road will have a boulevard style entrance. The traffic impact statement recommends a signal be installed east of Hill Road with a right turn taper installed, which is consistent with generally accepted engineering standards. MDOT has jurisdiction of Highland Road and will need to approve any traffic light or changes to the roadway. The Planning Commission can consider waivers in exchange for amenities requested. The applicant would request a waiver for some recreation space. Parallel plans could be considered for parcels without Planned Development district approval, in which the applicant would request a waiver for density. The Planning Commission should consider if the proposed setbacks and lot coverage are appropriate for this project. They will request a 5-foot waiver for some lots' setbacks. There would be no deck or patio in any setback, however a waiver for some patios or decks in the storm water easement may be requested. The ordinance requires double striping and the applicant has indicated that they will seek a waiver for parking striping as double striping is more appropriate for commercial properties, not residential. A 930-foot waiver for the length of street due to topographies and natural features. Sidewalks will be installed on the west side of Hill Road but not on the east side of the road and the applicant has proposed a contribution to the Township Sidewalk Fund to accommodate for that. The applicant would also seek a waiver for a third sign as only two signs are allowed. The dumpster enclosure by the clubhouse would either need a concrete pad in front of it or to seek a waiver. Staff recommends approval as the rezoning and site plan are consistent and compatible with the master plan, subject to getting final site plan approval and all comments and reports in the final site plan are addressed.

Commissioner Seward is troubled by the statement that this is consistent with the master plan because this area is rural and it will increase traffic.

Mr. Quagliata stated that the master plan prescribes residential at this location at a greater density than what is proposed in this project.

Director O'Neil added that this property was rezoned about 15 years ago to Planned Business in preparation for a Super Target to be built. That project did not materialize but there was anticipation of another similar project being brought forward. This residential project will bring less traffic than a large scale commercial project would.

Mr. Quagliata stated that Hill Road will be paved to the north and that they do not expect that traffic will travel north on Hill Road as there isn't anywhere to cut through to.

Commissioner Anderson reminded the public that they would have an opportunity to speak after the applicant makes their presentation.

Commissioner Carlock inquired about the orientation of the single-family units on the southeast side of Hill Road and the road that would serve them.

Mr. Quagliata stated that the road to those units would be a private road that the Homeowner's Association would maintain. The roads that serve the rest of the single-family dwellings would be petitioned by the developer to the Road Commission of Oakland County to be public. However, the roads in the multi-family apartment complex would remain private and maintained by the owner of the property.

Commissioner Meagher inquired if there was a need for rental properties.

Mr. Quagliata stated that the applicant can respond to that market analysis.

Commissioner Dehart inquired if the signs would need a variance.

Mr. Quagliata stated that the process of preliminary site plan review includes the area, quantity, location and dimension for signs but only the location was included in the submitted plan. They would have to comply with the residential standards for signs which can be approved administratively. If the requested rezoning passes, they can request a waiver for the third sign that is indicated on the preliminary site plan. The recommendation could be made at final site plan review to recommend for approval to the Township Board some or all of the waivers requested.

Discussion occurred regarding the different residential zoning districts and the density and lot size requirements for them.

Mr. Quagliata stated that if this does get approval it will be governed by a development agreement and the final site plan is a part of the development agreement. The development agreement would have designation stating that they cannot change the product or method of ownership without Township approval. The final site plan requires a list of all waivers requested, the preliminary site plan considers number of units, road layout, and similar details.

Mark Kassab, representing White Lake Hills, LLC, stated that he and his partners bought this property about 17 years ago with the intent of developing it commercially. A PowerPoint presentation was shared featuring other nearby properties they have and the commissioners were invited to visit other properties they have developed in Novi, Wixom and Commerce Township. A market study was completed which indicates demand for both single-family homes and rental properties. There is a considerable grade to be

considered with this site, approximately 75% from Highland Road to the north end of the property. The survey found approximately 8.5 acres of wetlands on the site, however only .75 acres will be impacted by development. Mr. Kassab states that wetlands are a feature that they want to keep as it is desirable to home buyers. Mr. Kassab presented the different unit models and floor plans available. Every unit has a 2 car garage and a washer and dryer with rent ranging from \$2000-\$2700 and home sales ranging from \$450,000-\$500,000. Topography made it impossible for a second access road to the apartment complex. Regarding the sidewalks on Hill Road, they preferred to put sidewalks on both side but topography was a deterrence. The applicants funded a water main study that that found that the northeast portion has low pressure and the loop system through Meijer would alleviate the pressure issue. They have various building elevations to choose from so the building envelopes could be met to limit the impact on the stormwater easements. The public park requirement within the development is believed to be better met with a contribution to Stanley Park as a public benefit. The clubhouse amenities, such as dog wash, dog park and walking trails will be desirable to residents. There will be an Amazon delivery center for packages to be safely received. There will also be a full gym and yoga studio accessed with key card. Every residence will have a separate entryway, no common hallways. This is an all-ages community, with the ranch-style homes benefiting the aging. Single-family dwellings will have a master deed with CCR which will be turned over to a Homeowner's Association. Community benefits include paving Hill Road according to the traffic study comments, a contribution to Stanley Park instead of public park within development.

Commissioners thanked Mr. Kassab for his presentation.

Commissioner Seeley inquired about the willingness to scale back the waivers.

Mr. Kassab stated that they are extremely willing to work with the Township to meet any requirements.

Commissioner Anderson opened public comment at 8:22 PM

Derrick Near of 1850 Hill Road has concerns about the traffic that will travel north on Hill Road. GPS mapping systems navigate travelers north on Hill Road to get to any destination north of M59. Paving the road is going exacerbate the problem. He would like to see that the development only allow access to Highland Road.

Sean O'Callohan of 1831 Hill Road appreciates the rural area that he lives in and is concerned about increased crime. He would prefer there were no two-story buildings.

Robert Lousey of 6501 Manchester was drawn to this area by the rural nature and doesn't believe the project meets the character of Hill Road. He is also concerned about the crime that rental properties draw.

Laura Mahler of 1445 Hill Road is concerned about the density of this development. Mrs. Maher is concerned that the development has not obtained a permit from EGLE. This development is adverse to the character of Hill Road. She requests that the Planning Commission declines the request.

Tamar Near of 1850 Hill Road is concerned about the noise that will be generated by the construction, how long the project will take to complete and what will the hours of construction be.

Jim Powers of 3711 Ormon Road complimented the applicant for the presentation and appreciated that the development will create jobs and help with the tax base for the Township. He believes this will be a great attribute to the Township. He states that traffic is something that we all have to live with and he doesn't believe that crime will increase with a high rent development such as this.

John and Mary Rankin of 1829 Hill Road submitted an email which will be available on record.

Corbin McLaughlin of 1245 Hill Rd is concerned about car accidents on Highland Road and there is littering on Hill Road.

Andrea Liveright?? of 5347 Woodland is concerned about traffic and additional traffic if there is an accident on Highland Road as drivers use Hill Road to detour. She doesn't understand how it fits in with the master plan.

Anna Wilson of 1795 Hill Road enjoys the rural nature and is very upset about the idea of having so many people residing in this area.

Commissioner Anderson closed the public hearing at 8:42 PM

Director O'Neil explained the history of the master plan, how it is developed and that they would encourage residents to be a part of the process when they review the Master Plan.

Andrea Liveright of 5347 Woodland asked if consideration is taken about how the nearby residents feel when they develop the master plan.

Director O'Neil addressed some questions from the residents and informed that the wetlands permit is not required at this stage of the process.

Applicant Mr. Kassab replied to questions about density, traffic, crime and construction time frame. The income levels are expected to be over \$100,000 annually for residents of the rental apartments and it isn't anticipated that the crime rate will increase. The project that was planned for the parcel zoned Planned Business would have been something similar to a Super Target and the buffering would have been multi-family residential. The traffic study does not support increased traffic on Hill Road. This type of development is not determined by density, they aren't trying to cram as many dwellings into the lots as possible and are willing to consider less units to better meet the needs of the Township. Some waivers will be critical to create a proper development. They will abide by Road Commission of Oakland County and MDOT requirements. The duration of construction will likely be in one phase for the single-family and two phases for the multi-family complex, it will be limited by trades and materials availability.

Commissioner Ruggles asked about the anticipated duration of the phases.

Mr. Kassab responded that construction timeframe could be 2 years.

Commissioner Carlock has concerns with the natural areas to the north being preserved.

Commissioner Seward agrees with Commissioner Carlock about the north end wooded lot. He inquired about the possibility of deterring people from traveling north on Hill Road.

Commissioner Dehart sees the need for adding residential to support the local economy but has reservations because she appreciates the rural nature of White Lake.

Commissioner Seeley is concerned about the density and the size of the lots.

Mr. Quagliata addressed the concern about the rezoning stating that the rezoning to Planned Development allows the Planning Commission to consider waivers and whether or not they are appropriate.

Director O'Neil explained the broad range of the zoning of Planned Neighborhood and that the master plan doesn't perfectly align with all of the zoning districts but it is consistent with the future land use for this area and it falls within the prescribed range for density.

Discussion regarding the differences in zoning and the designations in the master plan for this area.

Commissioner Ruggles asked if the roads will be public or private.

Mr. Kassab stated that the roads in the single-family area will be public but the rental apartment homes will be private so that they can maintain them as the rental property management. He also explained that there is a waiver that they can sign so that the police can respond to violations on the private roads.

Commissioner Ruggles shares the concerns of many of the residents about the traffic on Hill Road and with the density.

Commissioner Meagher moved to forward a favorable recommendation, subject to the applicant addressing all of the staff and consultant comments and recommendations to the Township Board, the preliminary site plan for the property described as parcel number 12-20-101-003 (1085 Hill Road), located on the north side of Highland Road, west of Hill Road, consisting of approximately 68.96 acres. Property described as parcel number 12-20-126-006, located north of Highland Road, east of Hill Road, consisting of approximately 41.06 acres.

Commissioner Anderson supported, and the MOTION FAILED with a roll call vote (2 yes votes): (Carlock/no, Dehart/no, Meagher/yes, Anderson/yes, Seeley/no, Seward/no, Ruggles/no)

Commissioner Seeley moved to forward a favorable recommendation, subject to getting preliminary site plan approval, to the Township Board, the rezoning from parcel number 12-20-101-003 from (AG) Agricultural and (PB) Planned Business to (PD) Planned Development or any other appropriate zoning district.

Commissioner Dehart supported, and the MOTION CARRIED with a roll call votes (6 yes votes): (Carlock/yes, Dehart/yes, Meagher/yes, Anderson/yes, Seeley/yes, Seward/no, Ruggles/yes)

Commissioner Seeley moved to forward a favorable recommendation, subject to getting preliminary site plan approval, to the Township Board, the rezoning from parcel number parcel number 12-20-126-006 from (R1-A) Single Family Residential to (PD) Planned Development or any other appropriate zoning district.

Commissioner Meagher supported, and the MOTION CARRIED with a roll call votes (5 yes votes): (Carlock/yes, Dehart/no, Meagher/yes, Anderson/yes, Seeley/yes, Seward/no, Ruggles/yes)

Director O'Neil will have a conversation with the Township attorney about how to proceed.

Commissioner Anderson reminded the attendees that agendas are posted on the website and they will need to check to see when this project is coming back to the Planning Commission for consideration.

B. Hypershine Car Wash

Property described as parcel number 12-23-202-006 (9345 Highland Road), located on the south side of Highland Road, west of Fisk Road, consisting of approximately 4.91 acres.

Requests:

1) Preliminary site plan approval

2) Special land use approval

Applicant: EROP, LLC
2390 East Federal Drive
Decatur, IL 62526

Applicant present: Reid Cooksy of EROP, LLC

Mr. Quagliata presented the project for the parcel that was rezoned two years ago by a developer who wanted to bring plans forward for a carwash but it did not materialize. Driveways are required to meet setbacks from adjacent driveways and be offset from opposing driveways. The applicant will need to request from the Planning Commission a waiver from interlocking driveway rule or they would need a variance from the Zoning Board of Appeals. They are proposing a six-foot vinyl fence to provide screening from the residential properties. The outdoor lighting plan would be reviewed at final site plan review. There are concerns about the dumpster placement and the gate orientation which may require a variance from the Zoning Board of Appeals. The required number of stacking spaces and parking spaces are met. The ordinance requires a certain number of shrubs and trees in greenbelt. There is a water main easement that is deterring them from meeting the planting requirements. They will request a variance for one wall sign placement as the water main easement is deterring them from a monument sign.

Commissioner Dehart inquired about the previous applicant's proposal to give the rear portion of the parcel to the township.

Mr. Quagliata replied that the current applicant has not proposed the same offer.

Commissioner Slicker inquired about the need of a bypass lane.

Mr. Quagliata explained that the ordinance does not require a bypass lane and that they providing more stacking space than is required.

Mr. Quagliata stated that six variances would be requested: potentially two for the driveway, for the 450 ft separation although the Planning Commission can consider a waiver for driveways; one for the dumpster location; potentially two for the landscaping trees & shrubs in the greenbelt; and one for the sign.

Director O'Neil commented on the possible ways that the applicant could avoid requesting variances.

Commissioner Dehart inquired who determines the addition of a deceleration lane.

Director O'Neil responded that MDOT has jurisdiction over Highland Road.

Commissioner Slicker inquired about the greenbelt requirements.

Mr. Quagliata stated that the applicant meets the width for the greenbelt but did not indicate the proper number of trees and shrubs to be planted.

Commissioner Seeley also inquired about the bypass lane and if there is not a teller available in the pay booth how will someone exit who accidentally pulled in to the driveway.

Discussion occurred regarding the requirements of a frontage road for cross access between adjacent businesses.

Mr. Leuffgen of DLZ Engineering presented the second review for engineering feasibility. It was noted

that a 20-foot one way drive was required by the Fire Department for the exit of the carwash. A storm water management plan including a storm water detention pond with an outlet discharging to the MDOT storm system will need to be approved by MDOT. It is recommended that the sanitary sewer connection be a pressure sewer including a grinder station. Clarification from the Oakland County Water Resource Commissioner is needed at final site plan review on the need of an external oil gride separator. Mr. Leuffgen finds nothing that prohibits recommending an approval from engineering.

Commissioner Slicker inquired about the grade entering Highland Road to avoid parking lot run off.

Mr. Cooksy responded to concerns about stacking and circulation of the site. Membership based model, three lanes: two are membership lanes which use license plate readers and one is pay based. Vacuums are free after paying for wash with unlimited use. The entrance was aligned with the opposing boulevard entrance to avoid needing a variance. They weren't aware that they could plant within three feet of the watermain in the greenbelt and they will work with landscaping requirement.

Commissioner Slicker inquired about the bypass lane and how will patrons leave without paying for a carwash if they decide not to use the service.

Mr. Cooksy answered that there are constraints to the parcel including overhead electrical lines to creating a bypass lane and the throughput time is very fast so even with a lot of cars stacked they will get through the tunnel quickly.

Commissioner Dehart inquired about the orientation of the dumpster.

Mr. Cooksy responded that due to the size of the refuse truck, it will not be able to enter the rear of the property. He also is willing to work with the Township to find an alternative.

Commissioner Anderson inquired about the fees for the services.

Mr. Cooksy stated that that the fee structure model is mainly the monthly membership which ranges from \$30 - \$40 per month but there will be employees on site to assist customers but not in a booth to take payment.

Commissioner Meagher asked if someone needed to get through without paying would someone be available to help them continue through without paying for a wash.

Commissioner Seeley informed that there is an ordinance requirement for a frontage road and that would provide a bypass for people who didn't intend on obtaining carwash services.

Mr. Cooksy stated that they will provide a stub and an easement to the east that is part of the employee parking spaces for a future possible frontage road.

Commissioner Anderson opened public comment at 10:26 PM

Commissioner Anderson stated that two emails were received from the Kenneth T Johnson Jr and Rachel Cook who do not support the project.

Shannon Frescas of 9240 Steephollow Dr. is adamantly against this project, is concerned about the project and is very concerned about the noise.

Ken Moomah of 9218 Steephollow Dr. is concerned about the excess lighting in the parking lot. Mr. Moomah has also reminded the commission that routing the traffic through the Dance Studio would not be safe with all of the children entering and leaving the building. Mr. Moomah added the concern about the former Brendel's property being developed.

Richard Morris of 9211 Steephollow Dr. appreciates the quietness of living on Tull Lake. Mr. Morris is concerned about the noise and is concerned about the chemicals and impact of the cleaning agents.

Margaret Penner of 9651 Steephollow Dr. shares the other residents' concerns and is also concerned about the well head protection.

Darryl Davis of 9265 Steephollow Dr. would like a taller fence and landscaping to buffer the noise.

Dave Gian of 9315 Steephollow Dr agrees with all of the concerns from other residents and would like to see trees to buffer the rear of the lot. He would also like to know what the plan is for the runoff from the parking lot as well as the runoff from the cleaning of the cars.

Marcy Denesca of 4745 Berry Patch Lane is concerned about the impact on the lake.

Kathleen Grant of 9268 Steephollow Dr takes great pride in her neighborhood and the lake. Ms. Grant is concerned about the drainage and runoff.

Monica Wilcowski of 9292 Steephollow Dr believes there are other carwashes and doesn't see the need for another one.

Ken Moomah of 9218 Steephollow Dr. returned to ask if there was the possibility of the back part of the parcel being split and sold to other commercial development.

Mr. Quagliata responded that the area indicated is landlocked and would not be able to be split and sold because there would be no way to access it from Highland Road.

A member of the audience asked what the hours of operation would be.

Mr. Cooksy responded that the hours of operation would be 8am-8pm, 7 days of the week.

Commissioner Anderson closed public comments at 10:41 PM

Commissioner Carlock inquired about the water source, if it would be the water main at Highland Road and how run off from the parking lot and waste water would be managed.

Director O'Neil replied that they would be connected to the municipal water and sewer, runoff would

drain into the stormwater basin at the curb and the waste water generated from the carwash will enter a reclamation system for processing, but ultimately enter the sanitary sewer.

Commissioner Slicker asked why the Belle Tire doesn't have an access road.

Director O'Neil answered that the reciprocal access easements came in when there was a traffic study done with MDOT in about 2003, that is when the Township's access management plan was adopted and Belle Tire had been in operation for years before that. They do share the driveway with the old Tim Hortons restaurant. And they were required by the township to make a connection to the shopping center to the east.

Discussion occurred regarding the possibility of a frontage road.

Mr. Cooksy responded to questions from residents about the waste water, fence, trees and water shed. Concerning light and noise, studies have been done on these vacuum systems, which have mufflers, they are less than 60 decibels at the property line. The lights meet the ordinance allowances and will not impact the neighboring. No drainage will leave the site as it will be directed to the detention pond. Considering the sanitary discharge, the reclamation tanks inside separate oil and chemicals and it cleans the water and sends very minimal discharge into the sanitary sewer system. The 6-foot-tall fence is what is required by the Township and can plant trees on the west side. All chemicals are contained and employees will maintain the property. The noise study can be provided. The wash tunnel has silencers on the blowers at the end of the tunnel which mitigate the noise.

Discussion occurred about the noise study and the noise generated from the vacuums and from the tunnel itself.

Commissioner Carlock inquired about the special land use for this zoning.

Commissioner Meagher inquired about the screening wall composition.

Director O'Neil explained that the screening will include the 400-foot buffer of vacant land which will help mitigate all noise and light.

Discussion about the feasibility of the project due to the inability to provide a frontage lane.

Commissioner Slicker moved to table the project until the applicant can comply with the requirement for the front access road.

Commissioner Seward supported and the MOTION FAILED with a roll call vote (2 yes votes): (Carlock/no, Dehart/no, Meagher/no, Anderson/no, Seeley/no, Seward/yes, Ruggles/no, Slicker/yes)

Commissioner Seeley moved to forward a favorable recommendation, subject to the applicant addressing all of the staff and consultant comments and recommendations, the easement requirement, providing a waiver for the coordination of the driveway and subject to special approval, to the Township Board, the preliminary site plan for the property described as parcel number 12-23-202-006 (9345 Highland Road), located on the south side of Highland Road, west of Fisk Road, consisting of approximately 4.91 acres.

Commissioner Meagher supported, and the MOTION CARRIED with a roll call vote (6 yes votes):
(Carlock/yes, Dehart/yes, Meagher/yes, Anderson/yes, Seeley/yes, Seward/no, Ruggles/yes,
Slicker/no)

Commissioner Meagher moved to approve the special land use for the property described as
parcel number 12-23-202-006 (9345 Highland Road), located on the south side of Highland Road,
west of Fisk Road, consisting of approximately 4.91 acres.

Commissioner Seeley supported and the MOTION CARRIED with a roll call vote (8 yes votes):
(Carlock/yes, Dehart/ yes, Meagher/ yes, Anderson/ yes, Seeley/yes, Seward/yes, Ruggles/yes,
Slicker/yes)

CONTINUING BUSINESS

None

NEW BUSINESS

None

OTHER BUSINESS

None

LIAISON'S REPORT

None

DIRECTOR'S REPORT

COMMUNICATIONS

NEXT MEETING DATES: May 5, 2022
May 19, 2022

ADJOURNMENT

Commissioner Meagher moved to adjourn the meeting at 11:27 PM
Commissioner Seeley supported and the MOTION CARRIED with a voice vote: 8 yes votes



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

May 25, 2022

Sean O' Neil
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

RE: The Avalon- f.k.a. White Lake Hill- Preliminary Site Plan Review – 4th Review

Ref: DLZ No. 2145-7233-21

Design Professional: PEA Group

Dear Mr. O' Neil,

Our office has performed the above mentioned Preliminary Site Plan review for the revised plan dated May 16, 2022. The plans were reviewed for feasibility based on general conformance with the Township Engineering Design Standards.

General Site Information

This site is located on the north side of M-59 and east of Ormond Road. The property is located on both sides of Hill Road: across from former Brooks Elementary School and West of Meijers. Total site acreage is approximately 110.02 acres.

Site Improvement Information:

- Construction of a Planned Development consisting of **81 (previously 87)** single family condominium homes on the east side of Hill Road.
- Proposed paved and public road for the single family condominium homes with one point of access off Hill Road.
- Construction of a Planned Development consisting of **406? 393?** [see comment o)] multi-family units for lease on the west side of Hill Road. Associated clubhouse and pool as part of multi-family development.

- For multi- family units: associated paved and curbed parking including ADA accessible parking spaces and maneuvering aisles for clubhouse and pool. Internal streets and drives are also proposed with a point of access off M-59 and a second point of access off Hill Road.
- Site to be serviced by watermain and sanitary sewer.
- Storm water runoff is proposed to be detained as follows: 1) Detention Pond at the northwest corner of Hill Road and M-59- to discharge to existing storm sewer just south. 2) Two detention ponds on the west side of Hill Road and located centrally in the multi-family portion- to discharge to existing culvert under Hill Road. 3) Detention ponds located on the southernmost portion of the single family phase- to discharge to existing watercourse located between the two ponds. 4) Detention pond located on the eastern portion of the single family phase- to discharge to the existing wetlands to the southwest.

We offer the following comments:

Note that comments from our April 13, 2022 review letter are in *italics*. Responses to those comments are in **bold**. New comments are in standard typeface.

The following items should be noted with respect to Planning Commission review:

- a) We note that the number of single family lots has been reduced from 87 to 81 and that the multi-family has been reduced from 406 units to 393 units. These reductions in the number of lots and units will likely not impact utility layout or design. We note that the plan sheets included as part of this submittal did not show the proposed watermain, sanitary sewer, or storm sewer; we assume that the layouts proposed on the previous Preliminary Site Plan dated April 4, 2022 are to remain the same.
 - b) *Pond 2 located in the single family section of the development (see plan Sheet P-5.1) proposes discharge to the adjacent wetlands to the west. Clarify where drainage from this wetland shall be routed as it appears from existing topography that there is no outlet from this wetland. In addition, a portion of this wetland is located off site; an off-site drainage easement would be required. Additional topographical survey information will be required for the property to the south of the wetlands in order to clarify the drainage path. The design engineer has noted that the discharge from the proposed pond (now labeled as Pond 5) will discharge at an agricultural rate and follow its natural off site drainage course. The difference in pre and post development area discharging from proposed Pond 5 to the existing wetlands is an increase of 0.2 acres. We can consider this item*
-

complete for this level of review, however the capacity for the receiving wetland to accommodate the increased runoff volume will need to be demonstrated at the time of Final Site Plan.

- c) *The multifamily exiting drive onto M-59 shows a width of 16 feet. Township Zoning Ordinance 5.11Q.v. requires a width of 20' for one way drives and a minimum width of 24' for two way drives. Dimensions have been clarified; DLZ defers further comment regarding compliance to Township Planning Department.*
- d) *We defer to the Township as to whether 6 foot wide sidewalk is required on both sides of Hill Road. None is proposed at this time. Township Zoning Ordinance 5.21 requires a minimum of 6 foot width for sidewalks along major roadways. Comment outstanding. We continue to defer to the Township with regard to this item. Note that an 8' wide path has now been added along a portion of the west side only of the Hill Road frontage and that two road crossings of the path have been proposed near the Hill Road entrances in order to connect the multi-family to the single-family units. The locations for the path crossings should be reviewed for proper pavement markings and pedestrian crossing signage. Comment addressed at this level of review. Per the design engineer, this item was discussed at a Township Zoom meeting on March 25, 2022. It was determined that an 8' wide path will be added along the western side of Hill Road from M-59 to the single family entrance. Paths are also now shown along the frontage for Units 81-84 and 85-87 only as the adjacent areas pose an issue with regulated wetlands and stream encroachment. The developer agreed at the meeting to make a contribution to the White Lake Sidewalk Fund to supplement pathway areas not installed along Hill Road.*

We note that portions of the proposed sidewalk along the western side of Hill Road are proposed outside the future ROW. This sidewalk locations shall be either adjusted to inside the future ROW or an easement shall be provided. In addition, our comment with respect to the proper pavement markings and pedestrian crossing signage for Hill Road crossing will need to be addressed at the time of FSP/FEP submittal.

- e) *The following single family lots present conflicts with either the proposed house, required grading, or the potential deck/patio encroaching into the wetlands setback: 1, 27, 28, 40, 61, and 88. Impacts to the wetlands buffer will need to be removed. Comment outstanding. The wetlands setback/buffer for all wetlands was not shown on the initial Preliminary Site Plan submittal dated December 8, 2021. There are now units in the single family portion of this development as well as other areas of the development where grading is proposed in the wetlands setback/buffer which is not allowable. The following single family units will require revision with respect to grading in the wetlands setback: 1-7, 20, 27, 28, 39, 40, 52-54, 61, 75, 76, 84, 85, and 88. In addition, the proposed retaining wall adjacent*

grading to the northwest of multi-family Unit 19 will also require adjustment with respect to grading in the wetlands buffer. Since the units listed border EGLE regulated wetlands, our office concurs with the recommendation by Barr Engineering, Inc Wetland Delineation Report (dated February 9, 2022) recommending that Barr's wetland boundary determination and jurisdictional opinion be reviewed by EGLE prior to undertaking any activity near or within any identified wetlands; the proposed layout as submitted may require revision, in response to EGLE's review, to unit/ lot layout in the single family phase, thus impacting the preliminary site layout. **Comment addressed. Per a meeting with the Township on March 25, 2022, it was agreed that grading within the 25' wetland setback would be acceptable. A wetland restoration plan shall be required at the time of FSP/FEP submittal. Plan shall include a timeline for restoration of the wetland buffers. Note that the developer shall also be required to comply with all EGLE requirements with respect to grading and regulated wetlands. A note shall be provided on the FSP/FEP with regard to the wetland buffer restoration.**

- f) *All public roads are required to be built to RCOC standards. Comment remains as a notation.*
 - g) *Specify the proposed width of the shared access driveways for Lots 81-84 and 85-88 of the single family portion. These drives shall be built to private access drive standards of White Lake as specified in the Zoning Ordinance Section 5.16. Section C. ii. requires two points of access for such drives to an adjacent public or private road. Section D. ii. requires that access driveways shall be able to accommodate emergency vehicles. Comment partially addressed. Two points of access for each of the drives are now proposed, however, Ordinance 5.16 C.i. requires a 30' wide easement width for an access drive; 25' is proposed for Lots 81-84 and 85-88. In addition, Zoning Ordinance Section 5.16 C. iii. regarding setbacks shall be met (Unit 85 is not in compliance). Also specify on plan that the 20' drive widths proposed are measured as 20' from the edge of the gutter line per Ordinance 5.16 C. v. Please also provide fire truck turning radius for these private access drives. **Comment addressed. Fire truck movements have been provided and show that while tight the trucks will be able to traverse the drives.***
 - h) *Clarify if there is an existing drainage easement on the property south of the single family Detention Ponds 1 and 3. An easement will be required for discharge of drainage off site. In addition, the design engineer will be required to demonstrate that there will be no downstream impacts from the proposed development in terms of stormwater discharge flows. Engineer will need to demonstrate that adequate downstream capacity exists to handle post development flow. **Comment remains as a notation and can be further clarified at the time of FSP. Design engineer has stated in their February 15, 2022 review response letter: "There is not an easement in place. There is an existing stream which provides the historical drainage route through the said parcel to a box culvert under M-59. Since the development will have a 100-year detention basin and will discharge stormwater at an agricultural rate, the downstream ditch should have adequate capacity. A detailed***
-

engineering analysis will be provided to the township and MDOT during the construction plan phase.”

- i) *End sections for the three detention basins proposed on the single family portion will be required to be located outside the wetland setback. Comment partially addressed. Our office finds the basin outlet locations acceptable and that the outlet pipes for Basins 4 and 5 shall be constructed within the wetlands setback and the land restored to its natural preconstruction condition. Note that location of the basin end sections shall be subject to review and approval by EGLE. EGLE may require revision of the end section locations. Our office recommends the Township require a wetland setback restoration plan and that the developer be required to post a bond amount to guarantee proper and timely completion of restoration of the wetland buffer setbacks in these two areas should EGLE approve the end section locations. **Comment addressed for this level of review. The design engineer notes a wetland setback restoration plan shall be provided at the time of FSP/FEP submittal. A note shall be provided on the FSP/FEP regarding wetland setback restoration.***
 - j) *Extend the sanitary sewer to the north property line along Hill Road. Comment remains. Applicant indicated that the topography near the northern property restricts construction of the sanitary sewer at this location and would require a construction easement from the adjacent property owner. Township Ordinance requires extension to the limits of the property line and the sanitary sewer master plan indicates that gravity sanitary sewer is ultimately proposed north of this location. We defer to the Township if a variance can be granted on this requirement or if completion of this item will be a condition of approval. **Comment addressed. Discussion with the Township concluded that the sewer shall not be extended to the north property line and that an easement for future sanitary sewer extension shall be provided. In addition, the developer shall be required to deposit a monetary fee or escrow with the Township as assurance to supplement the future sewer extension.***
 - k) *With nearly 60 feet of elevation change, the designer should ensure that sufficient pressure exists at the higher elevations for a bathroom on the 2nd story. The water may have to come from Pressure District 4 to service units with higher elevations as it appears that there will be insufficient pressure on the northern portions of the proposed development. To interconnect between the pressure districts, at least one PRV may be required. We suggest that the Township request escrow funds with regard to this item such that DLZ can model the water system to determine any deficiencies that may exist regarding water pressures and/or capacities. Our office has performed modeling of the proposed water system, see attached water model results; In all scenarios the area at the northeast corner of Aurora Circle experienced the lowest resulting pressure. There is a need for a handful of homes in this vicinity to have individual booster pumps to ensure adequate pressure given the various scenarios. It can also not be understated that the proposed design places an incredibly high criticality*
-

rating on the existing 16" watermain along M59. This is the only supply proposed to serve the nearly 500 residential units. If something were to happen to this watermain there is no second source or storage to feed this area temporarily. DLZ recommends a second water supply be installed to provide redundancy to the proposed distribution system. Please note that in order to stay within the same pressure district the source would need to be from south of the existing Pressure Reducing Valves that exist on either side of the existing Meijer store. **Comment addressed at this level of review. As a condition of the Township engineer's recommendation for Preliminary Site Plan approval, the developer acknowledges the critical issue of not having a redundant source of water supply for the proposed development. The design engineer has stated that a second supply connection is being researched.**

- l) *Sanitary sewage from this development is tributary to the existing Meijer sanitary sewer pump station located at the Northeast corner of Highland Road and Bogie Lake Road; an analysis will need to be provided that indicates there is sufficient capacity within the existing pump station, or if upgrades will be necessary to support the additional discharges. **Comment addressed and remains as a notation. Design engineer states in their review response letter dated February 15, 2022: "Since an 18" sewer has been stubbed to the Hill Road/M-59 intersection, it is our understanding that the pump station and forcemain were designed for future development along Hill Road and Ormond Roads. A detailed analysis will be conducted during the construction plan phase."***
 - m) *Proposed future decks or patios for Lots 12,15,82, and 83 of the single family portion of the development appear to encroach into the proposed storm sewer easement. Please revise. Comment outstanding. A 12' wide deck or patio would only allow for 5' of easement on one side of the storm sewer relative to Units 82 and 83; 6' minimum is required. In addition, Units 9-12 would have a similar issue. Unit 80- the deck or patio could only be placed on the NE area of the rear of the house. Units 85 and 86 would not have enough space for a deck or patio without storm sewer easement encroachment. **This comment remains outstanding. Since the lot numbering and count has changed and no utility information has been included with the current submittal, we are unable to review requested changes or provide comment.***
 - n) *Parcel Area Table on Sheet P-2.0 of plans appears to be missing parcel data for Units 82,83,84,86, and 87. Please update. **Comment addressed.***
 - o) *The number of multifamily units of 393 in the 'Multi-Family Site Data Table' on Sheet P-2.0 does not match the total shown (72+334=406) in the same table under subsection "Minimum Lot Size.'*
-

The following comments can be addressed on the Final Site Plan/Final Engineering Plan:

Final Site Plan/Final Engineering Plan Comments-

General

1. Plan shall contain notes per White Lake Township Engineering Design Standards Section A. 8. a.-d.
2. Provide at least two permanent benchmarks on NAVD 88 datum. Benchmarks are required at least every 1,200 feet.
3. Provide soil boring reports that were prepared by CTI and McDowell.
4. The topographical survey shows existing overhead electrical lines on the parcel west of Hill Road. Clarify as to whether these lines shall remain or be relocated and as to whether an easement for the lines exists. In the event the lines are to be relocated, the easements (if existing) will need to be vacated.
5. A landscape plan showing all proposed trees relative to proposed storm sewer, sanitary sewer, and watermain shall be submitted. Note that 10' horizontal separation is required between proposed utilities noted and proposed trees.

Paving/Grading

1. ADA accessible ramps will be required on sidewalk adjacent to ADA parking spaces. Ramp slopes shall meet ADA requirements.
2. Structural wall calculations, that have been signed and sealed by a Registered Structural Engineer, verifying the wall integrity and the ability to support lateral and vertical stresses will need to be provided for retaining walls over 30" tall.
3. Retaining walls >30" in height shall require a decorative fence or railing at the top that is a minimum of 36" in height.
4. Wetland buffers shall be clearly shown on all grading sheets.
5. Sheets 3.1-3.4 have Hill Road mislabeled as Highland Road. Please revise.

Watermain

1. We defer to the Fire Department regarding items related to fire suppression and hydrant coverage.
 2. Show 20' wide easements for all watermain on plan.
 3. Additional gate wells will be required to meet isolation requirements.
 4. Radii of watermain appears to be too small at Units 40-41. Bends may be necessary.
-

5. There appears to be less than 10 feet of separation barrel to barrel between the storm sewer and watermain proposed in front of multifamily Unit 38. Please revise.

Sanitary Sewer

1. A manhole will need to be added along Hill Road southeast of multifamily Unit 28. There is 720 feet between manholes.
2. There appears to be less than 10 feet of horizontal separation to storm sewer in front of multifamily Unit 57. Please revise so minimum separation is achieved.
3. Modify sanitary sewer connection note on Sheet P-4.1 to read: "Connect proposed 10" **and 18"** sanitary to existing 18" sanitary stub."

Stormwater Management

1. We recommend that the proposed ditch end section tie into the MH southwest (adjacent to multi-family Detention Pond 3) be moved such that the end section ties into a separate manhole due south of the end section. This would eliminate the potential for four pipe connections into the same MH. See Sheet 4.2.
2. Show 12' easements for storm sewer on plan.
3. A minimum of 12" diameter sewer is required for storm sewer carrying surface drainage. Reference Sheet 4.4; proposed sewer for Lots 55-80 and 28-36 will need to be changed from 8" to 12".
4. Storm sewer shall be located no closer than a 10' horizontally from proposed buildings/structures. Reference Building #28 multi-family.

Recommendation

Most of our previous comments have been addressed; the need for a redundant water source is a significant outstanding item that needs to be acknowledged by the applicant as a condition of PSP approval should the Planning Commission desire to make that motion. The storm sewer easement deck encroachments mentioned in Item m) above should be discussed as they may pose problems as units are built out. DLZ is confident the remaining items can be further clarified on the Final Site Plan submittals without significant modification to the site layout.



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

WLT-White Lake Hill- PSP Review.04

May 25, 2022

Page 9 of 9

Please feel free to contact our office should you have any questions.

Sincerely,

DLZ Michigan

Michael Leuffgen, P.E.
Department Manager

Victoria Loemker, P.E.
Senior Engineer

Cc: Justin Quagliata, Community Development, *via email*
Hannah Micallef, Community Development, *via email*
Aaron Potter, DPS Director, White Lake Township, *via email*
John Holland, Fire Chief, White Lake Township, *via email*
Jason Hanifen, Fire Marshal, White Lake Township, *via email*

X:\Projects\2021\2145\723321 White Lake Hill\PSP Review.04\Review.04.docx



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

April 13, 2022

Sean O' Neil
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

RE: The Avalon- f.k.a. White Lake Hill- Preliminary Site Plan Review – 3rd Review

Ref: DLZ No. 2145-7233-21

Design Professional: PEA Group

Dear Mr. O' Neil,

Our office has performed the above mentioned Preliminary Site Plan review for the revised plan dated April 4, 2022. The plans were reviewed for feasibility based on general conformance with the Township Engineering Design Standards.

General Site Information

This site is located on the north side of M-59 and east of Ormond Road. The property is located on both sides of Hill Road: across from former Brooks Elementary School and West of Meijers. Total site acreage is approximately 110.02 acres.

Site Improvement Information:

- Construction of a Planned Development consisting of 87 single family condominium homes on the east side of Hill Road.
- Proposed paved and public road for the single family condominium homes with one point of access off Hill Road.
- Construction of a Planned Development consisting of 406 multi-family units for lease on the west side of Hill Road. Associated clubhouse and pool as part of multi-family development.

- For multi- family units: associated paved and curbed parking including ADA accessible parking spaces and maneuvering aisles for clubhouse and pool. Internal streets and drives are also proposed with a point of access off M-59 and a second point of access off Hill Road.
- Site to be serviced by watermain and sanitary sewer.
- Storm water runoff is proposed to be detained as follows: 1) Detention Pond at the northwest corner of Hill Road and M-59- to discharge to existing storm sewer just south. 2) Two detention ponds on the west side of Hill Road and located centrally in the multi-family portion- to discharge to existing culvert under Hill Road. 3) Detention ponds located on the southernmost portion of the single family phase- to discharge to existing watercourse located between the two ponds. 4) Detention pond located on the eastern portion of the single family phase- to discharge to the existing wetlands to the southwest.

We offer the following comments:

Note that comments from our March 15, 2022 review letter are in *italics*. Responses to those comments are in **bold**. New comments are in standard typeface.

The following items should be noted with respect to Planning Commission review:

- Pond 2 located in the single family section of the development (see plan Sheet P-5.1) proposes discharge to the adjacent wetlands to the west. Clarify where drainage from this wetland shall be routed as it appears from existing topography that there is no outlet from this wetland. In addition, a portion of this wetland is located off site; an off-site drainage easement would be required. Additional topographical survey information will be required for the property to the south of the wetlands in order to clarify the drainage path.* **The design engineer has noted that the discharge from the proposed pond (now labeled as Pond 5) will discharge at an agricultural rate and follow its natural off site drainage course. The difference in pre and post development area discharging from proposed Pond 5 to the existing wetlands is an increase of 0.2 acres. We can consider this item complete for this level of review, however the capacity for the receiving wetland to accommodate the increased runoff volume will need to be demonstrated at the time of Final Site Plan.**
 - The multifamily exiting drive onto M-59 shows a width of 16 feet. Township Zoning Ordinance 5.11Q.v. requires a width of 20' for one way drives and a minimum width of 24' for two way drives.* **Dimensions have been clarified; DLZ defers further comment regarding compliance to Township Planning Department.**
-

- c) *We defer to the Township as to whether 6 foot wide sidewalk is required on both sides of Hill Road. None is proposed at this time. Township Zoning Ordinance 5.21 requires a minimum of 6 foot width for sidewalks along major roadways. Comment outstanding. We continue to defer to the Township with regard to this item. Note that an 8' wide path has now been added along a portion of the west side only of the Hill Road frontage and that two road crossings of the path have been proposed near the Hill Road entrances in order to connect the multi-family to the single-family units. The locations for the path crossings should be reviewed for proper pavement markings and pedestrian crossing signage. Comment addressed at this level of review. Per the design engineer, this item was discussed at a Township Zoom meeting on March 25, 2022. It was determined that an 8' wide path will be added along the western side of Hill Road from M-59 to the single family entrance. Paths are also now shown along the frontage for Units 81-84 and 85-87 only as the adjacent areas pose an issue with regulated wetlands and stream encroachment. The developer agreed at the meeting to make a contribution to the White Lake Sidewalk Fund to supplement pathway areas not installed along Hill Road.*

We note that portions of the proposed sidewalk along the western side of Hill Road are proposed outside the future ROW. This sidewalk locations shall be either adjusted to inside the future ROW or an easement shall be provided. In addition, our comment with respect to the proper pavement markings and pedestrian crossing signage for Hill Road crossing will need to be addressed at the time of FSP/FEP submittal.

- d) *Clarify ADA space number determination for ADA spaces associated with the clubhouse for the multi-family portion; are the four ADA spaces based on guest count of 79? Comment outstanding. Although design engineer states that the required ADA parking spaces are provided at the clubhouse for residents or visitors using the facilities, the basis for determining the 4 (four) required spaces for the clubhouse will need to be provided. Comment addressed. Basis for number of ADA spaces has now been provided.*
- e) *The following single family lots present conflicts with either the proposed house, required grading, or the potential deck/patio encroaching into the wetlands setback: 1, 27, 28, 40, 61, and 88. Impacts to the wetlands buffer will need to be removed. Comment outstanding. The wetlands setback/buffer for all wetlands was not shown on the initial Preliminary Site Plan submittal dated December 8, 2021. There are now units in the single family portion of this development as well as other areas of the development where grading is proposed in the wetlands setback/buffer which is not allowable. The following single family units will require revision with respect to grading in the wetlands setback: 1-7, 20, 27, 28, 39, 40, 52-54, 61, 75, 76, 84, 85, and 88. In addition, the proposed retaining wall adjacent*
-

grading to the northwest of multi-family Unit 19 will also require adjustment with respect to grading in the wetlands buffer. Since the units listed border EGLE regulated wetlands, our office concurs with the recommendation by Barr Engineering, Inc Wetland Delineation Report (dated February 9, 2022) recommending that Barr's wetland boundary determination and jurisdictional opinion be reviewed by EGLE prior to undertaking any activity near or within any identified wetlands; the proposed layout as submitted may require revision, in response to EGLE's review, to unit/ lot layout in the single family phase, thus impacting the preliminary site layout. **Comment addressed. Per a meeting with the Township on March 25, 2022, it was agreed that grading within the 25' wetland setback would be acceptable. A wetland restoration plan shall be required at the time of FSP/FEP submittal. Plan shall include a timeline for restoration of the wetland buffers. Note that the developer shall also be required to comply with all EGLE requirements with respect to grading and regulated wetlands. A note shall be provided on the FSP/FEP with regard to the wetland buffer restoration.**

- f) *Is the existing sidewalk along the M-59 road frontage being removed once the new 8' wide concrete sidewalk is installed? Please clarify. Comment partially addressed. The design engineer has indicated that the existing sidewalk shall remain and that the intent shall be for the developer to adhere to MDOT recommendations and requirements. Further clarification shall be required as to whether there will ultimately be two parallel running sidewalks along the M-59 frontage; redundancy with respect to the sidewalks should be avoided.* **Comment addressed. The existing sidewalk will be eliminated per the design engineer and a new walk placed 1' inside the ROW.**
- g) *All public roads are required to be built to RCOC standards.* **Comment remains as a notation.**
- h) *All drive widths adjacent to carports in the multi-family residential shall be specified and built in accordance with White Lake Township width requirements. Comment partially addressed. No carports are required, however the drive widths adjacent to all parking spaces shall be shown as some drive widths have not been provided.* **Comment addressed. All drive widths have now been provided.**
- i) *Specify the proposed width of the shared access driveways for Lots 81-84 and 85-88 of the single family portion. These drives shall be built to private access drive standards of White Lake as specified in the Zoning Ordinance Section 5.16. Section C. ii. requires two points of access for such drives to an adjacent public or private road. Section D. ii. requires that access driveways shall be able to accommodate emergency vehicles. Comment partially addressed. Two points of access for each of the drives are now proposed, however, Ordinance 5.16 C.i. requires a 30' wide easement width for an access drive; 25' is proposed for Lots 81-84 and 85-88. In addition, Zoning Ordinance Section 5.16 C. iii. regarding setbacks shall be met (Unit 85 is not in compliance). Also specify on plan that the 20' drive widths proposed are measured as 20' from the edge of the gutter line per Ordinance 5.16 C. v. Please also provide fire truck turning radius for these private access drives.* **Comment addressed, fire**
-

truck movements have been provided and show that while tight the trucks will be able to traverse the drives.

- j) *Clarify what is being done with the existing culvert that crosses under Hill Road and routes drainage through an existing ditch in front of the parking lot that is east of Hill Road and north of M-59. Comment outstanding. The design engineer has provided clarification with regard to the culvert under Hill Road that is adjacent to the proposed Detention Basin 3. The clarification request was however regarding the culvert at M-59 and Hill Road; this will require a response. **Comment addressed. Clarification has now been provided.***
- k) *Clarify if there is an existing drainage easement on the property south of the single family Detention Ponds 1 and 3. An easement will be required for discharge of drainage off site. In addition, the design engineer will be required to demonstrate that there will be no downstream impacts from the proposed development in terms of stormwater discharge flows. Engineer will need to demonstrate that adequate downstream capacity exists to handle post development flow. **Comment remains as a notation and can be further clarified at the time of FSP. Design engineer has stated in their February 15, 2022 review response letter: "There is not an easement in place. There is an existing stream which provides the historical drainage route through the said parcel to a box culvert under M-59. Since the development will have a 100-year detention basin and will discharge stormwater at an agricultural rate, the downstream ditch should have adequate capacity. A detail engineering analysis will be provided to the township and MDOT during the construction plan phase."***
- l) *End sections for the three detention basins proposed on the single family portion will be required to be located outside the wetland setback. Comment partially addressed. Our office finds the basin outlet locations acceptable and that the outlet pipes for Basins 4 and 5 shall be constructed within the wetlands setback and the land restored to its natural preconstruction condition. Note that location of the basin end sections shall be subject to review and approval by EGLE. EGLE may require revision of the end section locations. Our office recommends the Township require a wetland setback restoration plan and that the developer be required to post a bond amount to guarantee proper and timely completion of restoration of the wetland buffer setbacks in these two areas should EGLE approve the end section locations. **Comment addressed for this level of review. The design engineer notes a wetland setback restoration plan shall be provided at the time of FSP/FEP submittal. A note shall be provided on the FSP/FEP regarding wetland setback restoration.***
- m) *Extend the sanitary sewer to the north property line along Hill Road. Comment remains. Applicant indicated that the topography near the northern property restricts construction of the sanitary sewer at this location and would require a construction easement from the adjacent property owner. Township Ordinance requires extension to the limits of the property line and the sanitary sewer master plan indicates that gravity sanitary sewer is ultimately proposed north of this location. We defer*
-

to the Township if a variance can be granted on this requirement or if completion of this item will be a condition of approval. **Comment addressed. Discussion with the Township concluded that the sewer shall not be extended to the north property line and that an easement for future sanitary sewer extension shall be provided. In addition, the developer shall be required to deposit a monetary fee or escrow with the Township as assurance to supplement the future sewer extension.**

- n) *With nearly 60 feet of elevation change, the designer should ensure that sufficient pressure exists at the higher elevations for a bathroom on the 2nd story. The water may have to come from Pressure District 4 to service units with higher elevations as it appears that there will be insufficient pressure on the northern portions of the proposed development. To interconnect between the pressure districts, at least one PRV may be required. We suggest that the Township request escrow funds with regard to this item such that DLZ can model the water system to determine any deficiencies that may exist regarding water pressures and/or capacities. Our office has performed modeling of the proposed water system, see attached water model results; In all scenarios the area at the northeast corner of Aurora Circle experienced the lowest resulting pressure. There is a need for a handful of homes in this vicinity to have individual booster pumps to ensure adequate pressure given the various scenarios. It can also not be understated that the proposed design places an incredibly high criticality rating on the existing 16" watermain along M59. This is the only supply proposed to serve the nearly 500 residential units. If something were to happen to this watermain there is no second source or storage to feed this area temporarily. DLZ recommends a second water supply be installed to provide redundancy to the proposed distribution system. Please note that in order to stay within the same pressure district the source would need to be from south of the existing Pressure Reducing Valves that exist on either side of the existing Meijer store. **Comment addressed at this level of review. As a condition of the Township engineer's recommendation for Preliminary Site Plan approval, the developer acknowledges the critical issue of not having a redundant source of water supply for the proposed development. The design engineer has stated that a second supply connection is being researched.***
- o) *Sanitary sewage from this development is tributary to the existing Meijer sanitary sewer pump station located at the Northeast corner of Highland Road and Bogie Lake Road; an analysis will need to be provided that indicates there is sufficient capacity within the existing pump station, or if upgrades will be necessary to support the additional discharges. **Comment addressed and remains as a notation. Design engineer states in their review response letter dated February 15, 2022: "Since an 18" sewer has been stubbed to the Hill Road/M-59 intersection, it is our understanding that the pump station and forcemain were designed for future development along Hill Road and Ormond Roads. A detailed analysis will be conducted during the construction plan phase."***
-

- p) *Proposed future decks or patios for Lots 12,15,82, and 83 of the single family portion of the development appear to encroach into the proposed storm sewer easement. Please revise. **Comment outstanding. A 12' wide deck or patio would only allow for 5' of easement on one side of the storm sewer relative to Units 82 and 83; 6' minimum is required. In addition, Units 9-12 would have a similar issue. Unit 80- the deck or patio could only be placed on the NE area of the rear of the house. Units 85 and 86 would not have enough space for a deck or patio without storm sewer easement encroachment.***
- q) Parcel Area Table on Sheet P-2.0 of plans appears to be missing parcel data for Units 82,83,84,86, and 87. Please update.

The following comments can be addressed on the Final Site Plan/Final Engineering Plan:

Final Site Plan/Final Engineering Plan Comments-

General

1. Plan shall contain notes per White Lake Township Engineering Design Standards Section A. 8. a.-d.
2. Provide at least two permanent benchmarks on NAVD 88 datum. Benchmarks are required at least every 1,200 feet.
3. Provide soil boring reports that were prepared by CTI and McDowell.
4. The topographical survey shows existing overhead electrical lines on the parcel west of Hill Road. Clarify as to whether these lines shall remain or be relocated and as to whether an easement for the lines exists. In the event the lines are to be relocated, the easements (if existing) will need to be vacated.
5. A landscape plan showing all proposed trees relative to proposed storm sewer, sanitary sewer, and watermain shall be submitted. Note that 10' horizontal separation is required between proposed utilities noted and proposed trees.

Paving/Grading

1. ADA accessible ramps will be required on sidewalk adjacent to ADA parking spaces. Ramp slopes shall meet ADA requirements.
 2. Structural wall calculations, that have been signed and sealed by a Registered Structural Engineer, verifying the wall integrity and the ability to support lateral and vertical stresses will need to be provided for retaining walls over 30" tall.
-

3. Retaining walls >30" in height shall require a decorative fence or railing at the top that is a minimum of 36" in height.
4. Wetland buffers shall be clearly shown on all grading sheets.
5. Sheets 3.1-3.4 have Hill Road mislabeled as Highland Road. Please revise.

Watermain

1. We defer to the Fire Department regarding items related to fire suppression and hydrant coverage.
2. Show 20' wide easements for all watermain on plan.
3. Additional gate wells will be required to meet isolation requirements.
4. Radii of watermain appears to be too small at Units 40-41. Bends may be necessary.
5. There appears to be less than 10 feet of separation barrel to barrel between the storm sewer and watermain proposed in front of multifamily Unit 38. Please revise.

Sanitary Sewer

1. A manhole will need to be added along Hill Road southeast of multifamily Unit 28. There is 720 feet between manholes.
2. There appears to be less than 10 feet of horizontal separation to storm sewer in front of multifamily Unit 57. Please revise so minimum separation is achieved.
3. Modify sanitary sewer connection note on Sheet P-4.1 to read: "Connect proposed 10" **and 18"** sanitary to existing 18" sanitary stub."

Stormwater Management

1. We recommend that the proposed ditch end section tie into the MH southwest (adjacent to multi-family Detention Pond 3) be moved such that the end section ties into a separate manhole due south of the end section. This would eliminate the potential for four pipe connections into the same MH. See Sheet 4.2.
 2. Show 12' easements for storm sewer on plan.
 3. A minimum of 12" diameter sewer is required for storm sewer carrying surface drainage. Reference Sheet 4.4; proposed sewer for Lots 55-80 and 28-36 will need to be changed from 8" to 12".
 4. Storm sewer shall be located no closer than a 10' horizontally from proposed buildings/structures. Reference Building #28 multi-family.
-

Recommendation

Most of our previous comments have been addressed; the need for a redundant water source is a significant outstanding item that needs to be acknowledged by the applicant as a condition of PSP approval should the Planning Commission desire to make that motion. The storm sewer easement deck encroachments mentioned in Item p) above should be discussed as it may pose problems as units are built out. DLZ is confident the remaining items can be further clarified on the Final Site Plan submittals without significant modification to the site layout.

Please feel free to contact our office should you have any questions.

Sincerely,

DLZ Michigan



Michael Leuffgen, P.E.
Department Manager



Victoria Loemker, P.E.
Senior Engineer

Cc: Justin Quagliata, Community Development, *via email*
Hannah Micallef, Community Development, *via email*
Aaron Potter, DPS Director, White Lake Township, *via email*
John Holland, Fire Chief, White Lake Township, *via email*
Jason Hanifen, Fire Marshal, White Lake Township, *via email*



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

June 15, 2022

Sean O’Neil, Director
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

**RE: Traffic Impact Study Review
Mixed-Use Development at Highland Road (M-59) and Hill Road**

Ref: DLZ File No. 2145-7233-21
Date of Study: 06/07/2022

Design Professional: Fishbeck

The applicant has submitted a revised Traffic Impact Study for the redevelopment of P.I.’s #12-20-101-003 and 12-20-126-006. P.I. #12-20-101-003 and 12-20-126-006 total 110.02 acres and are located on the north side of Highland Road (M-59) on both the east and west side of Hill Road. The study evaluated existing conditions, anticipated background conditions and anticipated traffic generated by the proposed development, then it completed both traffic signal warrants and right turn lane warrants for the proposed site. All of the intersections evaluated along Highland Road are under the jurisdiction of the Michigan Department of Transportation (MDOT).

The first observation of the TIS, is that despite utilizing the same traffic data as the previous TIS, which was submitted in December 2021, the Level of Service (LOS) analysis for the existing conditions had a significant change in the existing LOS of the WB Highland Rd. and EB Crossover intersection in the PM Peak hour. The previous TIS had an existing LOS of F and a delay time of 66.8 sec. The revised TIS has an existing LOS of D and a delay time of 29.1 sec for the same intersection in the PM Peak hour. DLZ is not aware of the reason for the change in delay, but the change provides doubt to the potential findings in the TIS. There is also a significant difference between the two reports for the same intersection and same time period in the Background Conditions analysis (LOS F: 78.0 sec delay vs LOS D: 31.3 sec delay).

Upon running the traffic signal warrants at each intersection, the study determined that Warrant 1 – Eight Hour Vehicular Volume and Warrant 3 – Peak Hour Vehicular Volume are met for the WB Highland Road and EB Cross (east of Hill Road) intersection. The intersection was then modeled with a traffic signal, which resulted in improved LOS for the intersection compared with the unimproved future conditions. However, the improved future condition LOS analysis revealed that the LOS is significant worse for the following intersections in the PM Peak hour compared with the background conditions analysis:

Intersection	Background Condition LOS/Delay	Improved Future Condition LOS/Delay
M-59 and EB crossover (NB)	AM: LOS B – 14.1 sec	AM: LOS D – 45.0 sec
	PM: LOS D – 31.3 sec	PM: LOS E – 60.5 sec
WB M-59 and Hill Road (SB)	AM: LOS B – 14.2 sec	AM: LOS C – 21.3 sec
	PM: LOS D – 30.1 sec	PM: LOS F – 68.2 sec
EB M-59 and WB crossover (SB)	AM: LOS C – 22.3 sec	AM: LOS E – 36.6 sec
	PM: LOS D – 29.1 sec	PM: LOS E – 40.6 sec
EB M-59 and Haven Rd (SB)	PM: LOS D – 34.6 sec	PM: LOS E – 46.4 sec

Due to the number of intersections where the LOS changes from LOS D to LOS E or F, DLZ believes there are further improvements to be made in this area.


We have reviewed the analysis; the methodology appear to be in line with standard practices, and the findings are supported by the data provided, though are in potential conflict with the previous TIS that used the same data. However, the resulting LOS for the intersections is worse than the background conditions for the site on several legs of the analyzed intersections. Several legs currently operating at LOS D or better will change to a LOS E or F, and nearly all legs will operate at a LOS worse than the background conditions. Further evaluation and improvements adjacent to the proposed site should be considered.

Upon running the right turn lane warrant for the WB Highland Road and Hill Road intersection, it was determined that a full right turn lane was warranted due to PM peak hour traffic volumes.

DLZ believes additional improvements are needed in the area in order to improve Level of Service in the corridor to an acceptable level, but would note that final approval of the Traffic Impact Study will be provided by MDOT.

If you have any questions, please feel free to contact to me.

Respectfully,
DLZ Michigan, Inc.

 Digitally signed by Leigh C Merrill III
Date: 2022.06.16 12:52:27-04'00'

Leigh Merrill, P.E.
Project Manager

CC: Cc: Michael Leuffgen, P.E., DLZ *via email*
Justin Quagliata, Community Development *via e-mail*

WHITE LAKE TOWNSHIP PLANNING COMMISSION

REPORT OF THE COMMUNITY DEVELOPMENT DEPARTMENT

TO: Planning Commission

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

DATE: May 25, 2022

RE: The Avalon
Rezoning and Preliminary Site Plan – Review #4

Staff reviewed the revised preliminary site plan (PSP) prepared by PEA Group (revision date May 16, 2022). The previous staff report for the rezoning and PSP (attached) should be referenced for a more complete overview of the project. At its April 21, 2022 meeting the Planning Commission recommended approval of rezoning both parcels to Planned Development (PD) and recommended denial of the PSP. In an effort to address concerns of the Planning Commission, a number of changes were made to the PSP, including:

- Reduction of 13 multiple-family (apartment) units, from 406 to 393
 - Multiple-family density reduced from 6.3 units per acre to 6.1 units per acre
- Reduction of 6 single-family units, from 87 to 81
 - Single-family density reduced from 2.8 units per acre to 2.6 units per acre
- Increased multiple-family setback from north property line, from 50 feet to 120 feet
- Eliminated sign setback waiver request at the corner of Hill Road and Highland Road
- Eliminated Highland Road driveway width waiver request
- Eliminated parking stall striping waiver request
- Eliminated dumpster pad waiver request

Overall, there would be 393 apartment units for rent among 57 buildings (**Building 39 is not located on the PSP; revise building numbers accordingly**) consisting of 17, twelve-unit buildings; 17, six-unit buildings (21 on the prior PSP); 4, five-unit buildings (5 on the prior PSP); 10, four-unit buildings (6 on the prior PSP); and 9, three-unit buildings. **An updated number of two-bedroom units and three-bedroom units shall be provided on Sheet P-2.0.** In the multiple-family portion of the development, the 12-plex buildings would be two-stories in height and all other building types would consist of ranch-style dwellings. The 81 site condominiums would consist of one- and two-story units. All of the single-family and multiple-family units would have an attached two-car garage. Some single-family products have an optional two-and-a-half car garage and/or three-car garage. There are no side-entry garages on either the single-family or the multiple-family units.

On Sheet P-2.0, the following shall be updated in the Multi-Family Site Data Table:

- **Proposed Use: incorrect dwelling units per acre provided.**
- **Building Footprint Area: was not updated from prior PSP.**
- **Minimum Lot Size: number of units and minimum lot size not updated from prior PSP.**
- **Building Lot Coverage: was not updated from prior PSP.**
- **Setback Requirements (proposed only): was not updated from prior PSP.**
- **Parking Calculations: was not updated from prior PSP.**
- **Open Space: was not updated from prior PSP.**

On Sheet P-2.0, the following shall be updated in the Single-Family Site Data Table:

- **Maximum Building Lot Coverage: incorrect standard listed (correct standard is 20%) and proposed maximum lot coverage was not updated from prior PSP.**
- **Proposed Setbacks: the prior PSP noted a 45-foot rear yard setback prescribed for Units 8-13. If proposed, the data table shall note differing setbacks for certain units.**
- **Open Space: was not updated from prior PSP.**

Parallel Plan

For any residential project, a parallel plan demonstrating the layout and density of residential uses that would be possible without use of the PD District is required. A parallel plan must meet all standards for lot area, lot width, and setbacks; roadway improvements; open space; and contain an area which conceptually would provide sufficient area for stormwater detention. Lots in the parallel plan must provide sufficient building envelope size without impacting regulated wetlands.

The applicant provided a parallel plan showing the parcel on the east side of Hill Road developed under R1-D (Single-Family Residential) zoning. According to the plan, 96 units could be developed on “lots” 80 feet wide and 12,000 square feet in area (the minimum lot size standards for R1-D zoning). With 96 units on 32.51 net acres (net acreage for parallel plan purposes only), the parallel plan yields a single-family density of 2.9 dwelling units per acre.

On the west side of Hill Road, the parallel plan shows the parcel developed under RM-2 (Multiple-Family) zoning. As indicated on the plan, 600 units (apartments) could be developed among 49 twelve-unit buildings and 2 six-unit buildings. For the multiple-family portion of the development, the parallel plan shows buildings on the site at the maximum lot coverage (20%), and the minimum amount of recreation space is provided (1.49 acres). Note areas of recreation space are not identified on the plan; it appears areas likely comprising recreation space include the pocket park, clubhouse facility, and park commons noted on the plan. With 600 units on 63.94 net acres (net acreage for parallel plan purposes only), the parallel plan yields a multiple-family density of 9.4 dwelling units per acre.

Waivers

Generally, in a PD the standard requirements for lot size, yards, frontage, setbacks, building height, and type and size of dwelling unit are waived, provided the purpose and intent of the zoning ordinance are incorporated into the overall development plan. For PDs the zoning ordinance is intended to provide flexibility for the Planning Commission and Township Board to set appropriate standards during site plan review. Where modifications of zoning ordinance standards are requested, the Developer must provide a table which clearly compares each requested modification to the zoning ordinance standard to be modified. Unless variations are specifically requested and approved by the Planning Commission, the final site plan must comply with the appropriate standards of the Township. Based on the revised PSP, the Developer is requesting the following waivers for the Avalon PD:

Recreation Space

Multiple-family developments are required to provide recreation space for the use of the residents therein. A formula is applied whereby 5,000 square feet for the first unit plus an additional 100 square feet for each additional unit determines such space required for recreation. For a 406-unit multiple-family development, 45,500 square feet of recreation space is required. The submitted open space plan shall be revised to note the correct recreation space requirement (10,700 square feet is incorrectly listed as required). 18,623 square feet of recreation space (clubhouse, pool, and dog park) is proposed in the multiple-family portion of the development; therefore, a waiver of 26,877 square feet is required for the amount of recreation space. **It appears a recreation space waiver is still required – an updated calculation shall be provided on the PSP.**

Lot Area

The existing R1-A zoning district requires parcels have a minimum lot area of one acre. In the R1-D (Single-Family Residential) zoning district, the densest district in the Township, parcels are required to have a minimum lot area of 12,000 square feet. For the single-family portion of the project, the PD has “lots” ranging from 7,431.38 square feet to 17,750.68 square feet in size. The average “lot” size is 9,118.05 square feet. Staff suggests the Planning Commission consider requiring minimum lot area of at least 8,000 square feet. **Based on the revised PSP, “lots” range from 8,039 square feet (607.62 square foot increase) to 17,205 square feet (545.68 square foot decrease) in size. The average “lot” is 9,337 square feet (218.95 square foot increase) in size.**

Lot Frontage/Width

Lot width is the straight-line distance between parallel side lot lines, measured at the front setback line. Where side lot lines are not parallel, the width is measured at the front setback line parallel to the street or tangent to the curve of the street. The existing R1-A zoning district requires parcels have a minimum of 150 feet of lot frontage. In the R1-D zoning district, parcels are required to have a minimum lot width of 80 feet. Lots on a cul-de-sac or curvilinear street must have a minimum of 65 feet of frontage and comply with the lot width requirement at the minimum front setback line. Additionally, corner lots in condominium subdivisions must be at least 20 feet wider than the minimum width required by the zoning ordinance. For the single-family portion of the project, the PD has “lots” ranging from 62 feet of lot width (including “lots” on a cul-de-sac or curvilinear street) to 107 feet (**now 105 feet**). The average “lot” width is 68 feet. Staff suggests the Planning Commission consider requiring minimum lot width of at least 70 feet. **Based on the revised PSP, the minimum lot width and average lot width remain unchanged from the prior plan. Maximum lot width decreased two feet, from 107 feet to 105 feet. Staff still supports a larger lot width, with 70 feet suggested as the requirement for the PD.**

Setbacks and Lot Coverage

The yard setbacks and lot coverage for the existing R1-A zoning district, R1-D zoning district, PD zoning district, and the proposed PD (single-family) are summarized in the table below.

	R1-A zoning	R1-D zoning	PD zoning	Proposed PD
Front yard setback	35 feet	30 feet	40 feet	25 feet
Side yard setback	25 feet	10 feet	25 feet	10 feet
Rear yard setback	40 feet	30 feet	TBD	35 feet**
Max. lot coverage	20%*	20%*	TBD	35%***

*A maximum 30% lot coverage may be approved administratively by the Community Development Director or his designee on existing lots of record where the lot has sanitary sewer service and the proposed building complies with all setback requirements.

A 45-foot rear yard setback is prescribed for Units 8-13. **As noted on page 2 of this report, clarification is required on the revised PSP.

*** **As noted on page 2 of this report, clarification is required on the revised PSP.**

Buildings within a multiple-family development must have a minimum setback of 25 feet from the back of sidewalk or 25 feet from back of curb (if no sidewalk is present). A five-foot waiver is requested to allow a 20-foot front setback. **Waiver remains requested.**

The Planning Commission may consider the proposed setbacks and lot coverage and determine whether they are appropriate or whether additional setbacks or less lot coverage should be established. The submitted plan notes no deck or patio would encroach into any setback.

Decks, Porches, and Patios

The zoning ordinance states “In no instance shall a deck, porch, patio or paved terrace be located in any recorded easement...” As noted in the DLZ review letter dated April 13, 2022 decks and patios attached to several single-family units would likely encroach into the proposed storm sewer easement. Staff is concerned about deck/patio encroachment into the storm sewer easement. Maintenance activities within the easement could potentially damage decks/patios in the vicinity. While the storm system is private and must be maintained by the condo association (after assignment by the Developer), if the association fails to maintain the storm sewer and the Township exercises its right to maintain/repair/replace the system (as would be outlined in the development agreement and master deed) correcting resulting damage to private decks/patios should not be the responsibility of the Township. Hold harmless language, subject to approval by the Township Attorney, would need to be incorporated into the development agreement and master deed if a waiver was granted to allow deck/patio encroachment into the storm sewer easement. There is an alternative to not install decks/patios on the rear of units where encroachment into the storm sewer easement would occur. The decks/patios on the units in question could potentially be relocated to the sides of units and/or reduced in size. **As noted in the DLZ review letter dated May 25, 2022, since the unit count and numbering has changed and no utility information was included with the current submittal staff and consultants are unable to review requested changes or provide comment.**

Separate from the waiver request, the note under the typical lot layout on Sheets P-2.3 and P-2.4 of the site plan shall be revised to add the word “within” following the word “encroaching.” Also, the words “wetland buffer” shall be replaced with the words “natural features.” **Comment outstanding.**

Additionally, the Developer shall clarify its correspondence to the Township dated April 4, 2022. In said communication, the Developer requested a waiver to allow decks/patios to encroach within the Natural Features Setback on Units 1, 4, 9, 27, and 40. Such a request for waiver is inconsistent with the submitted preliminary site plans. **Comment outstanding; however, it does not appear a waiver for the aforementioned units to encroach into the Natural Features Setback is required.**

Driveway Access

For boulevard-style driveways, the minimum required entering road width is 20 feet and the minimum required exiting road width is 22 feet. The Hill Road boulevard access to the multiple-family portion of the development (both entering and exiting drives) appear to be 19 feet in width (the PSP measures the drive width to the back of curb; road measurement surface is taken between the edges of the gutter pan) and is noncompliant. Waivers (1 foot for entrance; 3 feet for exit) are needed to allow a reduction of the required road surface width.

Street Layouts and Blocks

The maximum length of cul-de-sac streets and maximum length of blocks within condominium subdivisions cannot exceed 1,500 feet. The Developer is seeking a 930-foot waiver to allow maximum block length of 2,430 feet. Topography, steep grades, and natural features on the site were the stated reasons for the requested waiver. The Fire Department has reviewed the length of the streets and blocks and is satisfied with accommodations for emergency access.

Street Continuation

The zoning ordinance requires the street layout in condominium subdivisions provide for continuation of streets to adjoining residential developments or the proper projections of streets (a stub) to adjoining property which could be developed in the future. Currently there is no street stub proposed to the property to the north. The applicant stated there is a 26-foot grade difference from the north property line to the proposed road. Topographic conditions seem to justify a waiver from this requirement.

Sidewalks

The zoning ordinance requires a minimum six-foot-wide sidewalk placed one-foot from the inside edge of the right-of-way along both the east and west Hill Road property frontages, which the applicant is required to install as part of the project. The submitted site plan shows an eight-foot concrete sidewalk along the west side of the Hill Road property frontage from Highland Road to the south side of the single-family access (across the street). Portions of this sidewalk are proposed outside of the future right-of-way; the sidewalk must be relocated inside the road right-of-way or an easement be provided. Right-of-way/easement widths for public walkways when not adjacent to or a part of street rights-of-way must be at least 15 feet and dedicated to the use of the public. Sidewalks on the east side of Hill Road are proposed along the frontage of Units 81-84 (**now Units 75-78**) and Units 85-87 (**now Units 79-81**). There are regulated wetlands and a stream along the remaining portion of Hill Road north of Units 81-84 (**now Units 75-78**); therefore, the Developer is requesting a waiver to not install sidewalks in this location. However, the Developer offered to make a contribution to the Township Sidewalk Fund to supplement the pathway areas not installed along Hill Road. The amount of the proposed donation must be provided and accepted by the Township.

Signs

The zoning ordinance requires the area, quantity, location, and dimensions of all signs to be provided with the preliminary site plan. One monument sign, not more than 30 square feet in area, may be maintained at or adjacent to the principal entrance to a residential development. One additional sign may be permitted if the residential development has access to two thoroughfares or the development has more than one boulevard street entrance from an existing arterial or it has at least 250 dwellings. The signs may not exceed a height of six feet. The multiple-family portion of the development would contain more than 250 units, so a second development entry sign is permitted by right.

A waiver is requested to install a third sign (determined to be the sign at the corner of Highland Road and Hill Road). For the multiple-family portion of the development, the other monument signs are proposed adjacent to (Highland Road) and within (Hill Road) the boulevard entrances. One monument sign is proposed within the boulevard entrance to the single-family portion of the development.

While signage details were not provided, staff can administratively review and approve the sign design. The monument signs would be required to comply with residential district sign regulations, including not more than 30 square feet in area and six feet in height.

Comments to be addressed from previous review

- The apartments would have access to a 6,658 square foot clubhouse consisting of a business center, fitness center, and leasing office. A patio (covered and uncovered) at the rear of the clubhouse is adjacent to a swimming pool. The conceptual clubhouse renderings state the building would be 5,132 square feet in size. Clarify the size of the clubhouse and revise the plans for consistency.
- The open space plan does not clearly indicate if stormwater management areas are counted as open space. Clarification must be provided.
- Parking calculations (for multiple-family dwellings) on Sheet P-2.0 shall be revised; the number of bedrooms, guest parking required, and total parking required are incorrect.
- Phasing, if any, shall be indicated on the plans.
- A trash enclosure detail shall be provided on Sheet P-7.0 showing the finished face on the outside walls of the enclosure and indicate the color of the gate.
- An updated list of all requested waivers shall be provided by the Developer. Furthermore, PD modifications 2, 4, and 5 shall be removed from the table on Sheet P-2.0.

Planning Commission Options / Recommendation

The Planning Commission may recommend approval or denial of the rezoning request, or it may recommend a different zoning designation than proposed by the applicant to the Township Board. The Planning Commission may recommend approval, approval with conditions, or denial of the preliminary site plan to the Township Board. **The proposed rezoning and planned development are both compatible with the Master Plan and with surrounding land uses. Staff recommends approval of the rezoning, and approval of the preliminary site plan subject to the items identified in this report being addressed prior to final site plan.**

The following notations summarize the preliminary site plan review:

- Recommendation of approval is in accordance with the preliminary site plans prepared by PEA Group (revision date ~~April 4, 2022~~ **May 16, 2022**), subject to revisions as required. The utility, grading, and storm drainage plans for the site are subject to the approval of the Township Engineering Consultant and shall be completed in accordance with the Township Engineering Design Standards.
- Recommendation of approval is in accordance with the preliminary ranch unit building elevations and floor plans prepared by Alexander V. Bogaerts & Associates, P.C. dated March 29, 2022, subject to revisions as required and with the preliminary 12-plex elevations and floor plans prepared by Burmann Associates Inc. dated June 27, 2018 and July 17, 2018, subject to revisions as required.

Attachments:

1. Avalon staff report dated April 13, 2022.
2. Revised preliminary site plan prepared by PEA Group (revision date May 16, 2022).
3. Preliminary ranch unit building elevations and floor plans prepared by Alexander V. Bogaerts & Associates, P.C. dated March 29, 2022.
4. Preliminary 12-plex elevations and floor plans prepared by Burmann Associates Inc. dated June 27, 2018 and July 17, 2018.

WHITE LAKE TOWNSHIP PLANNING COMMISSION

REPORT OF THE COMMUNITY DEVELOPMENT DEPARTMENT

TO: Planning Commission

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

DATE: April 13, 2022

RE: The Avalon
Rezoning and Preliminary Site Plan – Review #3

White Lake Hill, LLC has submitted an approximately \$140,000,000 planned development (PD) proposal for a project identified as The Avalon. Overall, the 493-unit PD proposal includes the construction of 87 detached single-family site condominiums (The Residence at Avalon) on approximately 30.66 net acres located on the east side of Hill Road, north of Highland Road and the construction of 406 multiple-family units (The Avalon Apartment Homes) on approximately 64.82 net acres located on the west side of Hill Road, north of Highland Road. Site condominiums are units whereby a person owns their individual “lot” and shares ownership of common space with the rest of the owners in the development. Typically, an owner is responsible for maintaining their own “lot,” much like a traditional subdivision. The site condominium would be governed by a declaration of Covenants, Conditions and Restrictions (CCRs), which were provided with the application. The multiple-family development would be maintained by a management company.

The area proposed for a PD is comprised of two parcels, which would be required to be rezoned. The property west of Hill Road (1085 Hill Road; Parcel Number 12-20-101-003) is zoned PB (Planned Business) and AG (Agricultural), and the property east of Hill Road (Parcel Number 12-20-126-006) is zoned R1-A (Single-Family Residential). The parcels proposed for the PD are identified in the table below:

Property/Parcel Number	Acreage	Street Frontage
Parcel Number 12-20-126-006	41.06 gross acres 30.66 net acres	1,624.88 feet (Hill Road)
1085 Hill Road Parcel Number 12-20-101-003	68.96 gross acres 64.82 net acres	1,406.50 feet (at the chord – Highland Road) 2,443.61 feet (Hill Road)

The intent of the PD district is to permit greater flexibility and more creative design of residential developments than is possible under conventional zoning regulations. A PD allows a developer to propose a residential project with diverse housing types and different lot dimensions and yard setbacks as those prescribed in the standard residential districts. Lot size, yards, frontage requirements, setbacks, building height, and type and size of dwelling unit restrictions are generally waived in a PD. In exchange for the flexible standards, a public benefit must be provided to offset the impact(s) of development on the Township. The Developer is proposing to contribute \$100,000 to the Township Parks and Recreation Fund to be utilized at Stanley Park.

Overall, there would be 406 apartment units for rent among 58 buildings consisting of 17, twelve-unit buildings; 21, six-unit buildings; 5, five-unit buildings; 6, four-unit buildings; and 9, three-unit buildings. There would be 334 two-bedroom units and 72 three-bedroom units. The 12-plex buildings would be two-stories in height and all other building types would consist of ranch-style dwellings. The 87 site condominiums would consist of one- and two-story units. All of the single-family and multiple-family units would have an attached two-car garage. Some single-family products have an optional two-and-a-half car garage and/or three-car garage. There are no side-entry garages on either the single-family or the multiple-family units.

The apartments would have access to an approximately 6,658 square foot clubhouse consisting of a business center, fitness center, and leasing office. A patio (covered and uncovered) at the rear of the clubhouse is adjacent to a swimming pool. The conceptual clubhouse renderings state the building would be 5,132 square feet in size. The Developer must clarify the size of the clubhouse and revise the plans for consistency.

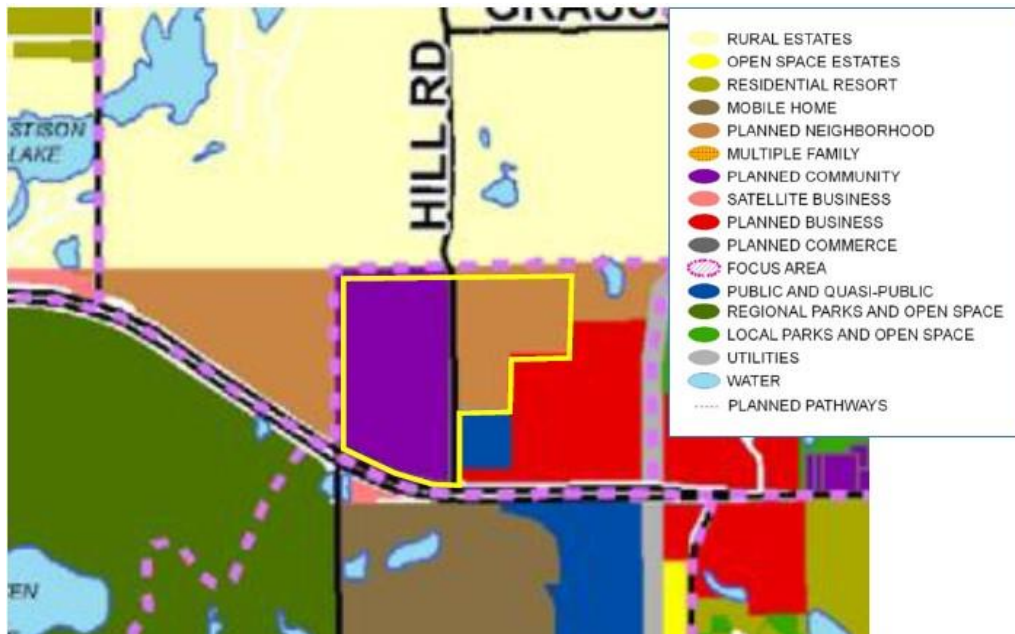
In total, the Developer estimates approximately 1,200 persons would reside within the overall development and anticipates the multiple-family apartments would lease for rates ranging from \$2,000 - \$2,700 per month and the single-family units would be for sale ranging from \$450,000 - \$500,000.

Master Plan

The Future Land Use Map from the Master Plan designates the subject site east of Hill Road in the Planned Neighborhood category, which is envisioned as a primarily residential land use of mixed densities and multiple product types, in a setting which may occasionally include a limited number of neighborhood retail, office, and personal service clusters. Connections to and segments of the Township community-wide pathway system are required as an integral part of all developments. All Planned Neighborhood development is intended to be served by Township sanitary sewers and either Township public water or community well systems. Net residential densities are anticipated to range between 2.0 and 8.0 units per acre, and nonresidential elements should not exceed 25 percent of the net land area after preservation of natural features. With 87 total units on approximately 30.66 net acres, density of the proposed site condominium is 2.8 dwelling units per acre (du/a).

The subject site west of Hill Road is designated as Planned Community on the Future Land Use Map. Planned Community is characterized by a mix of uses including higher residential densities and a variety of housing product types as well as a core area with retail, dining, entertainment, governmental, recreational, institutional, office and personal service establishments. Residential elements of a Planned Community may take the form of a freestanding neighborhood, or may be permitted on the upper floors of nonresidential development in the community core area. Multi-use/story buildings are expected to have two or three stories, however open space must be provided. Connections to and segments of the Township community-wide pathway system are required as an integral part of all developments. With 406 total units on approximately 64.82 net acres, density of the proposed multiple-family portion of the development is 6.3 du/a.

FUTURE LAND USE MAP



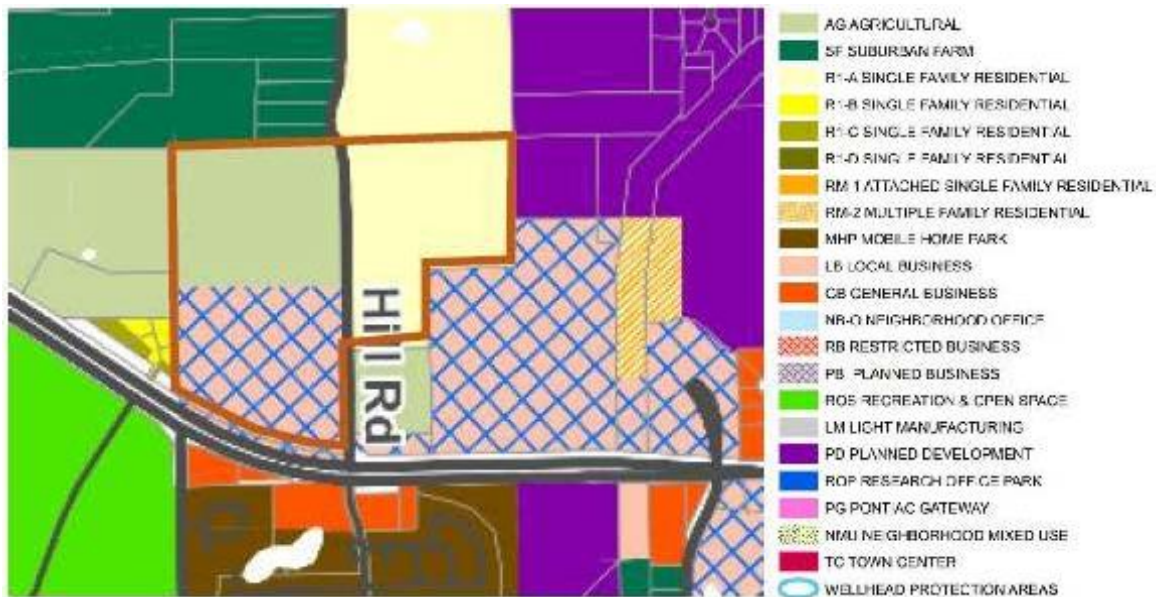
Zoning

The subject site west of Hill Road has split zoning; the south portion of the parcel is located in the PB (Planned Business) zoning district and the north portion of the parcel is located in the AG (Agricultural) zoning district. The subject site east of Hill Road is located in the R1-A (Single-Family Residential) zoning district. The following table illustrates the lot width and lot area standards for the existing and proposed zoning districts:

ZONING DISTRICT	LOT WIDTH	LOT AREA
AG	300 feet	5 acres
PB	No minimum	10 acres
R1-A	150 feet	1 acre

The properties proposed for development are requested to rezone to PD. A PD is allowed on properties a minimum of 10 acres in size. Any type and mix of housing (detached or attached single-family dwellings or multiple-family dwellings) are permitted in a PD. Various types of planned land use on large parcels held in common ownership, which includes preservation of open space, should characterize the PD district.

ZONING MAP



Physical Features

Currently the parcels are undeveloped and in parts are wooded with rolling topography. Wetlands on the properties were delineated by Barr Engineering Co. in March and April of 2021. There were 22 wetlands onsite, identified as A through V in the delineation report. According to the delineation report Wetlands I, J, K, O, R, and S appear to be regulated under Part 303 (Wetlands Protection, of the Michigan Natural Resources and Environmental Protection Act) because they are within 500 feet of the stream located east of Hill Road. Wetlands H and N may be regulated under Part 303 because they extend offsite and may be connected to a larger wetland complex, located west of the area of investigation that appears to be greater than five acres in size. Wetlands T and U may also be regulated under Part 303 because they are part of a larger wetland complex, located offsite, which is likely within 500 feet of the stream and likely five acres or more in size. Therefore, a Part 303 permit would likely be required from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) to place fill, remove soil, drain surface water from, or make use of these specific wetlands. EGLE has regulatory authority regarding the wetland boundary location(s) and jurisdictional status of wetlands on this site. The Developer acknowledged prior to final site plan the wetland boundary determination and jurisdictional opinion shall be reviewed and verified by EGLE. The proposed unit layout may require revision in response to the EGLE review. Based on the submitted plans, 0.41-acre of wetland impact is proposed within the single-family portion of the development and 0.34-acre of wetland impact is proposed within the multiple-family portion of the development.

No building or structure can be located closer than 25 feet to any regulated wetland, submerged land, watercourse, pond, stream, lake or like body of water. The setback shall be measured from the edge of the established wetland boundary as reviewed and approved by the Township. Grading activities should also not occur in the Natural Features Setback (NFS) as the intent is to, as much as possible, leave said area in its natural state (i.e., not maintaining a lawn, not applying fertilizers or pesticides, native plantings only). In the single-family portion of the development, grading is proposed within the NFS. If grading is permitted to occur in the NFS, the area must be restored to its natural, undisturbed state. The Developer acknowledged a NFS restoration plan is required and must be submitted at final site plan, and also acknowledged the following must be conditions of any approval:

- Prior to any construction or grading on the site, the Developer shall install silt fencing at the upland edge of Natural Features Setbacks / limits of grading. The silt fencing shall be removed after construction once the area is stabilized and vegetation has been established.
- Wetland limits shall be clearly identified with permanent markers. The size, number, location, and language on the markers shall be subject to the approval of the Community Development Director.

Access

The site fronts on Highland Road and Hill Road. Highland Road (state trunkline) along the subject site is a four-lane divided highway designated as a Principal Arterial on the Township Thoroughfare Plan. Development of the subject site requires the installation of an eight-foot-wide sidewalk along the Highland Road property frontage (shown on plans; the existing paved shoulder is to be removed and converted to greenbelt). Hill Road is a gravel, two-lane public road without curb and gutter with a proposed 86-foot right-of-way requirement by the Road Commission for Oakland County (RCOC). The Developer will be required to dedicate (if not already completed) the additional portion of the future right-of-way to the RCOC. As part of the project, the Developer would pave Hill Road beginning approximately 140 feet from the northern extent of the condominium southward to Highland Road in accordance with the requirements of the RCOC.

A traffic impact statement (TIS) is required if the proposed use(s) would generate 750 or more driveway trips per day, or 100 or more peak-hour, peak-direction driveway trips. An average day is the average 24-hour total of all vehicle trips counted to and from a study site from Monday through Friday. A peak hour of traffic is the hour of highest volume of traffic entering and exiting the site during the morning and afternoon hours. A TIS prepared by Rowe dated November 22, 2021 was submitted examining traffic generation, access management, safety, and sight distance for the proposed development. The study looks at existing, background (future traffic volumes without the traffic generated by the proposed development; there were no future background developments identified in the study), and future level of service (LOS) during the AM (7:00-9:00 a.m.) and PM (4:00-6:00 p.m.) peak hours at the following intersections around the project site:

- Highland Road and Hill Road
- Highland Road and Le Grand Court
- Westbound Highland Road and crossover east of Hill Road
- Eastbound Highland Road and crossover west of Hill Road
- Westbound Highland Road and crossover west of Hill Road
- Highland Road and Haven Road
- Hill Road and Driveway 1
 - Proposed driveway approximately 2,300 feet north of Highland Road
- Hill Road and Driveway 2
 - Proposed driveway approximately 1,600 feet north of Highland Road

The traffic study notes existing traffic at the studied intersections all operate at an acceptable LOS (LOS D or better) during the AM and PM peak hours, with the exception of westbound Highland Road and eastbound crossover (east of Hill Road). The study shows background traffic at the studied intersections will operate at an acceptable LOS during AM and PM peak hours, with the exception of Highland Road and Haven Road, and westbound Highland Road and eastbound crossover (east of Hill Road). For future traffic, the study indicates all studied intersections will continue to operate at an acceptable LOS during the AM and PM peak hours, with the exception of several movements at the following intersections:

- Westbound Highland Road and Eastbound Crossover (east of Hill Road)
 - The northbound left-turn movement would continue to operate at LOS F in the PM peak hour and experience a total 95th percentile queue length of 411 feet (17 vehicles).
- Highland Road and Hill Road
 - The southbound right turn movement would operate at LOS F in the PM peak hour and experience a 95th percentile queue length of 612 feet (25 vehicles).
- Eastbound Highland Road and Westbound Crossover (west of Hill Road)
 - The southbound left turn movement would operate at LOS E in the PM peak hour and experience a total 95th percentile queue length of 354 feet (14 vehicles).
- Highland Road and Haven Road
 - The southbound left turn movements would operate at LOS E in the PM peak hour and experience a total 95th percentile queue length of 91 feet (4 vehicles).

The 95th percentile queue lengths were reviewed at the studied intersections. Significant queues were observed in the simulation for the westbound Highland Road and eastbound crossover (east of Hill Road) that impacted the eastbound through movements. To mitigate those issues, the study recommends a traffic signal for the westbound Highland Road and eastbound crossover (east of Hill Road). A signal at this intersection would reduce delay for the northbound left turns experienced during the PM peak hour and reduce queues experienced at this intersection and the intersection of Highland Road and Hill Road. The results of the LOS analysis for future conditions with the improvement listed above results in the following:

- Westbound Highland Road and Eastbound Crossover (east of Hill Road)
 - The northbound left turn movement would continue to operate at LOS F in the PM peak hour with a reduction in delay from 239.5 seconds to 189.4 seconds and experience a total 95th percentile queue length of 217 feet (9 vehicles).

- Highland Road and Hill Road
 - The southbound right turn movement would continue to operate at LOS F in the PM peak hour and experience a 95th percentile queue length of 227 feet (9 vehicles).

With improvements, the 95th percentile queue lengths were reviewed at the studied intersections. No significant queue lengths were observed in the simulations and queue lengths did not block any study intersection. The study also suggests a right-turn lane is warranted for the driveway off of westbound Highland Road. The recommended improvements are shown on the plan.

The following table summarizes traffic generation estimates for the proposed project:

Land Use	Land Use Code	Units	AM Peak Hour			PM Peak Hour			Weekday
			In	Out	Total	In	Out	Total	
Single-family Detached Housing	210	88 Units	17	49	66	55	33	88	897
Multi-family Housing (Low-Rise)	220	406 Units	36	113	149	123	72	195	2,678
Total	-	-	53	162	215	178	105	283	3,575

Utilities

Municipal water and sanitary sewer are available in the vicinity of the subject site and would have to be extended to serve the proposed development. The location and capacity of utilities will be reviewed by the Director of Public Services and the Township Engineering Consultant.

The Developer intends to construct sanitary sewer along Hill Road to the furthest extent north possible. To supplement the shortened length (approximately 50 feet from north property line), the Developer will make a contribution to the Township Sanitary Sewer Fund. The amount of the proposed contribution must be provided and accepted by the Township. Additionally, a utility easement will be provided to the Township at north end of the property along Hill Road.

Staff Analysis

In considering any petition for an amendment to the zoning map, the Planning Commission and Township Board must consider the criteria from Article 7, Section 13 of the zoning ordinance in making its findings, recommendations, and decision. Review of the rezoning request should focus on whether the proposed PD zoning is appropriate for the site. When reviewing the preliminary site plan, the Planning Commission should consider if the project meets the design standards for Planned Developments found in Article 6, Section 7 (C) and (D) of the zoning ordinance, the appropriateness of the requested waivers, and the site standards and development procedures for a PD as outlined in Articles 5 and 6, respectively, of the zoning ordinance.

The Planned Development review process is summarized by the following steps:

1. **Preliminary Site Plan:** During this review, the number of units and road layout are established, the amount of open space is determined, and other project details are decided upon. The Planning Commission holds a public hearing on the rezoning, reviews the PD proposal, and makes a recommendation to the Township Board. The Township Board takes final action, approving or denying the preliminary site plan. The rezoning request is reviewed concurrently with the preliminary site plan and is decided by the Township Board.
2. **Final Site Plan:** At this time, building materials and colors are finalized and all conditions of preliminary site plan approval must be satisfied. The Planning Commission reviews and takes action to approve or deny the final site plan, and also reviews the proposed Development Agreement and makes a recommendation to the Township Board.
3. **Development Agreement:** Upon recommendation by the Planning Commission, the Township Board takes final action on the Development Agreement.

Following is a summary of the project's consistency with the provisions of the zoning ordinance.

Open Space

Planned Developments are intended to include the preservation of open space. Common open space is land in an undeveloped state preserving natural resources, natural features, scenic or wooded conditions, agricultural use, or a similar use or condition. Land in an undeveloped state may include a recreational trail, picnic area, children's play area, greenway, or linear park. Land in common open space is not required to be dedicated to the use of the public. With a total of 30.66 acres of developable area, the single-family portion of the development provides 5.93 acres (19.3% of the developable area) as open space. With a total of 64.82 acres of developable area, the multiple-family portion of the development provides 24.22 acres (37.4% of the developable area) as open space. Note the submitted open space plan does not clearly indicate if stormwater management areas are counted as open space. Clarification must be provided.

Parking

For multiple-family dwellings, the zoning ordinance requires two parking spaces for each dwelling unit plus $\frac{1}{4}$ of a space per bedroom for guest parking in common areas. With 406 multiple-family dwelling units consisting of 884 bedrooms, a total of 1,033 spaces would be required for the project (812 resident spaces and 221 guest spaces). A total of 1,297 spaces are proposed (812 resident spaces in garages, 406 guest spaces in driveways, and 79 guest spaces not associated with individual units). Parking calculations on Sheet P-2.0 shall be revised; the number of bedrooms, guest parking required, and total parking required are incorrect.

Phasing: The applicant indicated both the single-family and multiple-family portions of the project will be developed in one phase. Based on the magnitude and scope of the project, staff estimates 2025-2027 as the project build-out year.

Sidewalks: The zoning ordinance requires sidewalks for internal circulation with a minimum of five feet in width. The submitted site plan shows five-foot-wide sidewalks along both sides of each street in the single-family portion of the project and along at least one side of each street in the multiple-family portion of the project. A crosswalk connection is proposed across Hill Road between the entrances of both the single-family and multiple-family developments.

Streets/Circulation: All condominium subdivisions must be developed with public streets conforming to all minimum requirements, general specifications, typical cross-sections and other conditions set forth in the zoning ordinance and any other requirements of the RCOC. All streets must also be approved by and dedicated to the RCOC. In the event the Developer is unable to obtain approval from, and dedicate the proposed streets to the RCOC, a separate application for approval of private condominium streets must be filed with the Planning Commission. All private condominium streets must conform to the standards of the zoning ordinance. The Developer indicated the streets at The Residences at Avalon would be built to public standards and approved and dedicated to the RCOC. All streets in the multiple-family portion of the development would be private.

Building Architecture and Design

Generally, exterior building materials should be comprised primarily of high quality, durable, low maintenance material, such as masonry, stone, brick, glass, or equivalent materials. Buildings should be completed on all sides with acceptable materials. As shown on the preliminary architectural plans, the proposed building materials for the project are a mix of horizontal siding and brick veneer, with asphalt shingle roofing. Ranch units within the multiple-family portion of the project would have rear recessed covered patios. Most 12-plex units would also have a recessed covered patio; those units that do not would have a balcony (second-story). At final site plan, detailed elevations will be required to clearly indicate the exterior building materials to be used. Also, the architectural plans shall not identify the 12-plex units as condominiums, as condominiums are not a housing type but rather a form of ownership.

A sample board of building materials to be displayed at the Planning Commission meeting and elevations in color are required by the zoning ordinance and must be submitted at final site plan. Additionally, address (street number) locations must be shown on the buildings. Three-inch-tall numbers visible from the street are required. The address locations are subject to approval of the Township Fire Marshal.

An outdoor patio is located on the north side of the clubhouse building and around the pool. Details for the items to be located on the patio and details for the patio surfacing shall be provided at final site plan. An ornamental paving treatment should be required by the Planning Commission. The treatment should be something either decorative or something to provide aesthetic quality to the patio. Potential options for ornamental paving treatments include, but are not limited to, CMU pavers; brick; stone; or stamped, stained, and sealed concrete. Accessory items within the development such as railings, benches, trash receptacles, outdoor seating (such as tables and chairs), or sidewalk planters located in the vicinity of sidewalks and/or outdoor seating areas are required to be of commercial quality and complement the building design and style. These details must be provided at final site plan.

Landscaping and Screening

Landscaping must generally comply with the provisions of the zoning ordinance and should be designed to preserve existing significant natural features and to buffer service areas, parking lots, and dumpsters. A mix of evergreen and deciduous plants and trees are preferred, along with seasonal accent plantings. A landscape plan will be provided and reviewed in detail during final site plan if the preliminary site plan is approved.

Lighting

Site lighting is required to comply with the zoning ordinance. Information on site lighting will be provided and reviewed in detail during final site plan.

Waivers

Generally, in a PD the standard requirements for lot size, yards, frontage, setbacks, building height, and type and size of dwelling unit are waived, provided the purpose and intent of the zoning ordinance are incorporated into the overall development plan. For PDs the zoning ordinance is intended to provide flexibility for the Planning Commission and Township Board to set appropriate standards during site plan review. Where modifications of zoning ordinance standards are requested, the Developer must provide a table which clearly compares each requested modification to the zoning ordinance standard to be modified. Unless variations are specifically requested and approved by the Planning Commission, the final site plan must comply with the appropriate standards of the Township. Based on the submitted site plan, the Developer is requesting the following waivers for the Avalon PD:

Recreation Space

Multiple-family developments are required to provide recreation space for the use of the residents therein. A formula is applied whereby 5,000 square feet for the first unit plus an additional 100 square feet for each additional unit determines such space required for recreation. For a 406-unit multiple-family development, 45,500 square feet of recreation space is required. The submitted open space plan shall be revised to note the correct recreation space requirement (10,700 square feet is incorrectly listed as required). 18,623 square feet of recreation space (clubhouse, pool, and dog park) is proposed in the multiple-family portion of the development; therefore, a waiver of 26,877 square feet is required for the amount of recreation space.

Parallel Plan

For any residential project, a parallel plan demonstrating the layout and density of residential uses that would be possible without use of the PD District is required. The Developer requested a waiver of this requirement, as the densities proposed are within the Master Plan guidelines.

Lot Area

The existing R1-A zoning district requires parcels have a minimum lot area of one acre. In the R1-D (Single-Family Residential) zoning district, the densest district in the Township, parcels are required to have a minimum lot area of 12,000 square feet. For the single-family portion of the project, the PD has “lots” ranging from 7,431.38 square feet to 17,750.68 square feet in size. The average “lot” size is 9,118.05 square feet. Staff suggests the Planning Commission consider requiring minimum lot area of at least 8,000 square feet.

Lot Frontage/Width

Lot width is the straight-line distance between parallel side lot lines, measured at the front setback line. Where side lot lines are not parallel, the width is measured at the front setback line parallel to the street or tangent to the curve of the street. The existing R1-A zoning district requires parcels have a minimum of 150 feet of lot frontage. In the R1-D zoning district, parcels are required to have a minimum lot width of 80 feet. Lots on a cul-de-sac or curvilinear street must have a minimum of 65 feet of frontage and comply with the lot width requirement at the minimum front setback line. Additionally, corner lots in condominium subdivisions must be at least 20 feet wider than the minimum width required by the zoning ordinance. For the single-family portion of the project, the PD has “lots” ranging from 62 feet of lot width (including “lots” on a cul-de-sac or curvilinear street) to 107 feet. The average “lot” width is 68 feet. Staff suggests the Planning Commission consider requiring minimum lot width of at least 70 feet.

Setbacks and Lot Coverage

The yard setbacks and lot coverage for the existing R1-A zoning district, R1-D zoning district, PD zoning district, and the proposed PD (single-family) are summarized in the table below.

	R1-A zoning	R1-D zoning	PD zoning	Proposed PD
Front yard setback	35 feet	30 feet	40 feet	25 feet
Side yard setback	25 feet	10 feet	25 feet	10 feet
Rear yard setback	40 feet	30 feet	TBD	35 feet**
Max. lot coverage	20%*	20%*	TBD	35%

*A maximum 30% lot coverage may be approved administratively by the Community Development Director or his designee on existing lots of record where the lot has sanitary sewer service and the proposed building complies with all setback requirements.

**A 45-foot rear yard setback is prescribed for Units 8-13.

Buildings within a multiple-family development must have a minimum setback of 25 feet from the back of sidewalk or 25 feet from back of curb (if no sidewalk is present). A five-foot waiver is requested to allow a 20-foot front setback.

The Planning Commission may consider the proposed setbacks and lot coverage and determine whether they are appropriate or whether additional setbacks or less lot coverage should be established. The submitted plan notes no deck or patio would encroach into any setback.

Decks, Porches, and Patios

The zoning ordinance states “In no instance shall a deck, porch, patio or paved terrace be located in any recorded easement...” As noted in the DLZ review letter dated April 13, 2022 decks and patios attached to several single-family units would likely encroach into the proposed storm sewer easement. Staff is concerned about deck/patio encroachment into the storm sewer easement. Maintenance activities within the easement could potentially damage decks/patios in the vicinity. While the storm system is private and must be maintained by the condo association (after assignment by the Developer), if the association fails to maintain the storm sewer and the Township exercises its right to maintain/repair/replace the system (as would be outlined in the development agreement and master deed) correcting resulting damage to private decks/patios should not be the responsibility of the Township. Hold harmless language, subject to approval by the Township Attorney, would need to be incorporated into the development agreement and master deed if a waiver was granted to allow deck/patio encroachment into the storm sewer easement. There is an alternative to not install decks/patios on the rear of units where encroachment into the storm sewer easement would occur. The decks/patios on the units in question could potentially be relocated to the sides of units and/or reduced in size.

Separate from the waiver request, the note under the typical lot layout on Sheets P-2.3 and P-2.4 of the site plan shall be revised to add the word “within” following the word “encroaching.” Also, the words “wetland buffer” shall be replaced with the words “natural features.”

Additionally, the Developer shall clarify its correspondence to the Township dated April 4, 2022. In said communication, the Developer requested a waiver to allow decks/patios to encroach within the Natural Features Setback on Units 1, 4, 9, 27, and 40. Such a request for waiver is inconsistent with the submitted preliminary site plans.

Driveway Access

One-way drives must be a minimum of 20-feet-wide. Furthermore, for boulevard-style driveways, the minimum required entering road width is 20 feet and the minimum required exiting road width is 22 feet. The exiting drive onto Highland Road is 16 feet in width. DLZ deferred compliance regarding this matter (Item B, Page 2 of the DLZ review letter dated April 13, 2022) to the Community Development Department. The aforementioned item was not addressed. The site plan measures the drive width to the back of curb; the road measurement surface is taken between the edges of the gutter pan. A waiver of six feet is required to allow the Highland Road exit drive to consist of a 16-foot-wide road surface. Additionally, the Hill Road boulevard access (both entering and exiting drives appear to be 19 feet in width) to the multiple-family portion of the development is noncompliant and waivers (1 foot for entrance; 3 feet for exit) are needed to allow a reduction of the required road surface width.

Parking

The zoning ordinance requires each individual parking space be delineated by dual stripes, two feet apart centered on the dividing lines and painted white. A waiver is requested to allow single stripes. Separate from the waiver request, a “Van Accessible” sign detail for the barrier-free parking shall also be provided on Sheet P-7.0 of the site plan.

Street Layouts and Blocks

The maximum length of cul-de-sac streets and maximum length of blocks within condominium subdivisions cannot exceed 1,500 feet. The Developer is seeking a 930-foot waiver to allow maximum block length of 2,430 feet. Topography, steep grades, and natural features on the site were the stated reasons for the requested waiver. The Fire Department has reviewed the length of the streets and blocks and is satisfied with accommodations for emergency access.

Sidewalks

The zoning ordinance requires a minimum six-foot-wide sidewalk placed one-foot from the inside edge of the right-of-way along both the east and west Hill Road property frontages, which the applicant is required to install as part of the project. The submitted site plan shows an eight-foot concrete sidewalk along the west side of the Hill Road property frontage from Highland Road to the south side of the single-family access (across the street). Portions of this sidewalk are proposed outside of the future right-of-way; the sidewalk must be relocated inside the road right-of-way or an easement be provided. Right-of-way/easement widths for public walkways when not adjacent to or a part of street rights-of-way must be at least 15 feet and dedicated to the use of the public. Sidewalks on the east side of Hill Road are proposed along the frontage of Units 81-84 and Units 85-87. There are regulated wetlands and a stream along the remaining portion of Hill Road north of Units 81-84; therefore, the Developer is requesting a waiver to not install sidewalks in this location. However, the Developer offered to make a contribution to the Township Sidewalk Fund to supplement the pathway areas not installed along Hill Road. The amount of the proposed donation must be provided and accepted by the Township.

Signs

The zoning ordinance requires the area, quantity, location, and dimensions of all signs to be provided with the preliminary site plan. The site plan shows the location of a monument sign (at the corner of Highland Road and Hill Road) setback eight feet from the Highland Road right-of-way line. Development entry signs not placed within a boulevard entrance must be setback at least 10 feet from the road right-of-way. Therefore, a two-foot waiver is requested for the aforementioned sign.

One monument sign, not more than 30 square feet in area, may be maintained at or adjacent to the principal entrance to a residential development. One additional sign may be permitted if the residential development has access to two thoroughfares or the development has more than one boulevard street entrance from an existing arterial or it has at least 250 dwellings. The signs may not exceed a height of six feet. The multiple-family portion of the development would contain more than 250 units, so a second development entry sign is permitted by right. A waiver is requested to install a third sign (determined to be the sign at the corner of Highland Road and Hill Road). For the multiple-family portion of the development, the other monument signs are proposed within the boulevard entrances on Highland Road and Hill Road. One monument sign is proposed within the boulevard entrance to the single-family portion of the development.

While signage details were not provided, staff can administratively review and approve the sign design. The monument signs would be required to comply with residential district sign regulations, including not more than 30 square feet in area and six feet in height.

Trash Collection

All units would be served by individual trash carts provided by the waste collection company. A 10-foot by 20-foot dumpster pad/enclosure is located east of the clubhouse building. The zoning ordinance requires dumpsters to be surrounded by a six-foot-tall wall on three sides and an obscuring wood gate on a steel frame on the fourth side, located on a six-inch concrete pad extending 10 feet in front of the gate, with six-inch concrete-filled steel bollards to protect the rear wall and gates. As proposed, the pad does not extend 10 feet in front of the gate; therefore, a 10-foot waiver is required. The zoning ordinance also states dumpsters and trash storage enclosures shall be constructed of the same decorative masonry materials as the buildings to which they are accessory. Brickform concrete (simulated brick pattern) or stained, decorative CMU block are not permitted where the principal building contains masonry. Plain CMU block is also prohibited. As a condition of site plan approval, the dumpster enclosure shall match the same brick veneer/cultured stone veneer as the facade of the clubhouse with a steel-backed wood gate painted a complementary color to the brick veneer/cultured stone veneer. A trash enclosure detail shall be provided on Sheet P-7.0 of the site plan showing the finished face on the outside walls of the enclosure and indicate the color of the gate.

An updated list of all requested waivers shall be provided by the Developer. Furthermore, PD modifications 2, 4, and 5 shall be removed from the table on Sheet P-2.0 of the site plan. Said waivers are not needed.

Planning Commission Options / Recommendation

The Planning Commission may recommend approval or denial of the rezoning request, or it may recommend a different zoning designation than proposed by the applicant to the Township Board. The Planning Commission may recommend approval, approval with conditions, or denial of the preliminary site plan to the Township Board. **The proposed rezoning and planned development are both compatible with the Master Plan and with surrounding land uses. Staff recommends approval of the rezoning, and approval of the preliminary site plan subject to the items identified in this report being addressed prior to final site plan.**

The following notations summarize the preliminary site plan review:

- Recommendation of approval is in accordance with the preliminary site plans prepared by PEA Group (revision date April 4, 2022), subject to revisions as required. The utility, grading, and storm drainage plans for the site are subject to the approval of the Township Engineering Consultant and shall be completed in accordance with the Township Engineering Design Standards.
- Recommendation of approval is in accordance with the preliminary ranch unit building elevations and floor plans prepared by Alexander V. Bogaerts & Associates, P.C. dated March 29, 2022, subject to revisions as required and with the preliminary 12-plex elevations and floor plans prepared by Burmann Associates Inc. dated June 27, 2018 and July 17, 2018, subject to revisions as required.

Attachments:

1. Rezoning application dated December 6, 2021.
2. Site plan review application dated December 10, 2021.
3. Community Impact Statement prepared by Developer dated February 25, 2022.
4. Traffic Impact Statement prepared by Rowe dated February 18, 2022.
5. Wetland Delineation Report prepared by Barr Engineering Co. dated February 9, 2022.
6. Preliminary site plans prepared by PEA Group (revision date April 4, 2022).
7. Preliminary ranch unit building elevations and floor plans prepared by Alexander V. Bogaerts & Associates, P.C. dated March 29, 2022.
8. Preliminary 12-plex elevations and floor plans prepared by Burmann Associates Inc. dated June 27, 2018 and July 17, 2018.
9. Preliminary clubhouse rendering and floor plan prepared by TK Design & Associates dated November 13, 2021.
10. Single-family architectural plans prepared by MJC Companies.



Site / Construction Plan Review

To: Sean O'Neil, Planning Department Director

Date: 05/24/22

Project: The Avalon

File #: N/A

Date on Plans:

The Fire Department has the following comments with regards to the Revised site plan for the project known as The Avalon:

1. Multifamily phase.
 - a. The spacing between hydrants shall not exceed 300 feet. **Comment addressed**
 - b. The hydrants shall be arranged to provide adequate coverage for all buildings including #56 and #57 (additional hydrant to be added to this area). **Comment addressed**
 - c. Include a turn radius profile for units # 49-58. **Comment addressed**
 - d. The layout/configuration of the proposed street names assigned to this project are too closely grouped creating potential confusion to responders. **Pending (Street names are subject to Fire department approval)**

Avoid the following:

- Name changes at jogs and curves.
- Duplicate names.
- Names that could be mispronounced or are difficult to pronounce.
- Names that are spelled or pronounced close to an existing street/road name.

Reference the Township map for guidance.

John Holland
Fire Chief
Charter Township of White Lake
(248)698-3993
jholland@whitelaketwp.com

Plans are reviewed using the International Fire Code (IFC), 2015 Edition and Referenced NFPA Standards.

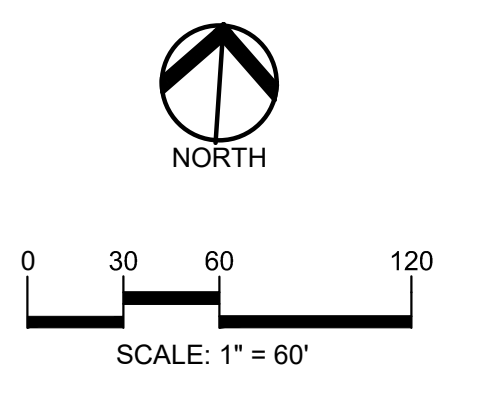
N86°12'16"E 1331.52'

LEGEND

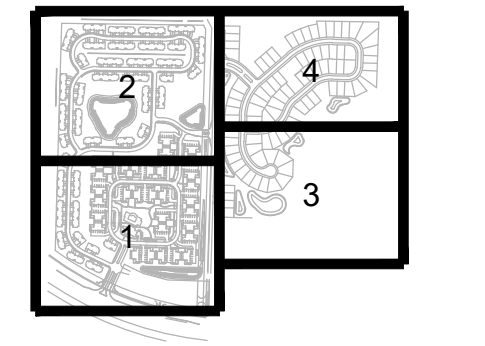
● IRON FOUND	⊗ BRASS PLUG SET	⊙ SEC. CORNER FOUND
⊗ IRON SET	⊙ MONUMENT FOUND	⊙ R. RECORDED
⊗ NAIL FOUND	⊙ NAIL & CAP SET	⊙ M. MEASURED
⊗		⊙ C. CALCULATED

—OH—ELEC—	ELEC. PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE
—UG—CATV—	UNDERGROUND CABLE TV, CATV PEDESTAL
—UG—PHONE—	TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE
—UG—ELEC—	ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE
—GAS—	GAS MAIN, VALVE & GAS LINE MARKER
—S.S.—	SANITARY SEWER, CLEANOUT & MANHOLE
—C.S.—	COMBINED SEWER & MANHOLE
—S.D.—	SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
—R.V.—	POST INDICATOR VALVE
—W.V.—	WATER VALVE BODY/HYDRANT VALVE BOX, SERVICE SHUTOFF
—M.B.—	MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE
—U.S.—	UNIDENTIFIED STRUCTURE
—S.E.—	SPOT ELEVATION
—C.L.—	CONTOUR LINE
—F.—	FENCE
—G.R.—	GUARD RAIL
—S.L.—	STREET LIGHT
—S.—	SIGN
—CONC.—	CONCRETE
—ASPH.—	ASPHALT
—GRAVEL—	GRAVEL SHOULDER
—W.—	WETLAND

—671.21—	310 HEAVY FLOW DUTY ONLY
—671.21—	310 HEAVY FLOW DUTY ONLY
—671.21—	310 HEAVY FLOW DUTY ONLY
—671.21—	310 HEAVY FLOW DUTY ONLY



CAUTION!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY AS GUARANTEED BY OTHER PROFESSIONALS OR APPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT
WHITE LAKE HILL, LLC
31550 NORTHWESTERN HWY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE AVALON
HIGHLAND ROAD
WHITE LAKE, MI

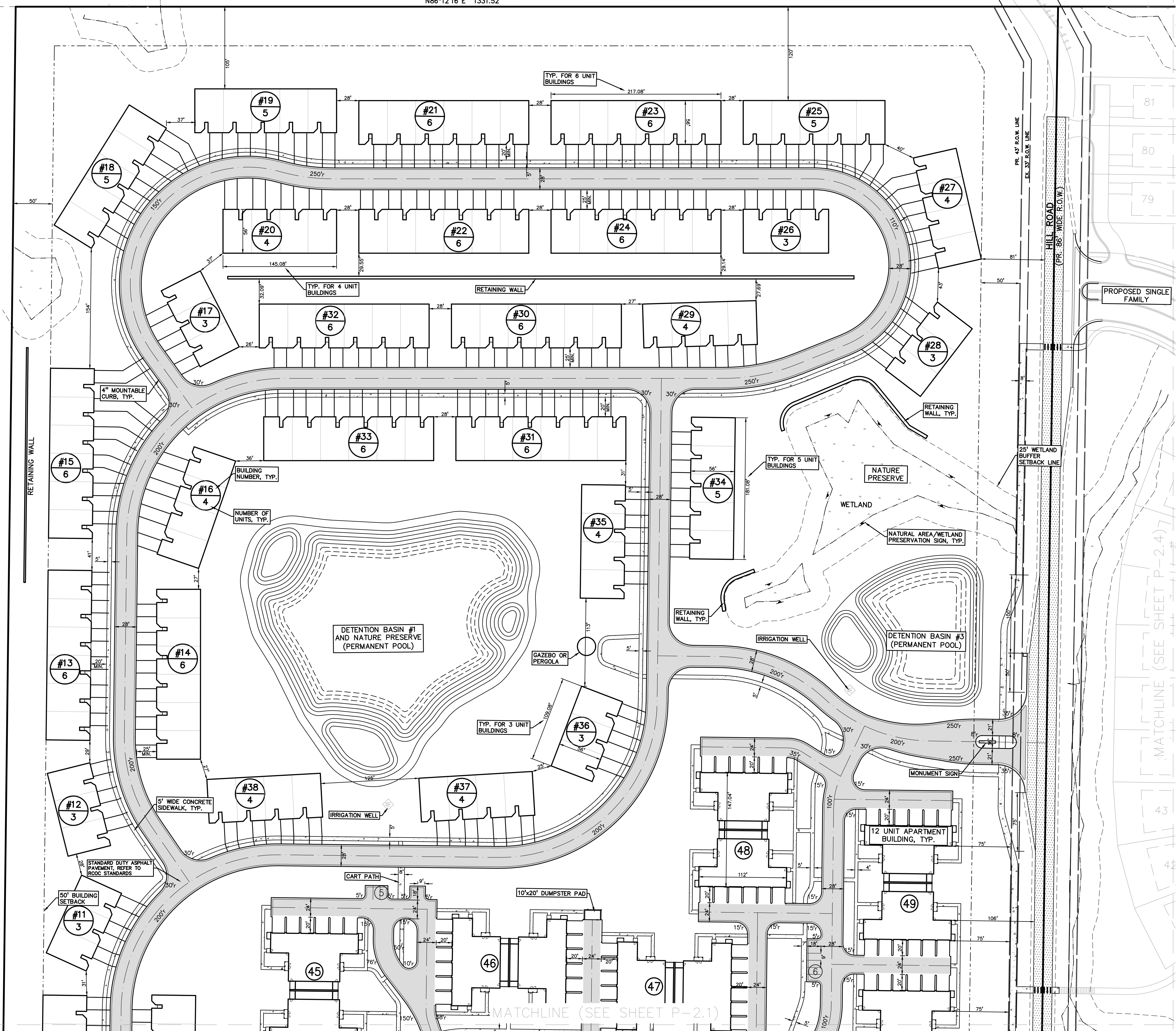
REVISIONS	

REVISED SITE LAYOUT	5-16-2022
TOWNSHIP PSP REVIEW	4-4-2022
TOWNSHIP PSP REVIEW	2-25-2022
OWNER REVIEW	11-29-2021
ORIGINAL ISSUE DATE:	12-8-2021

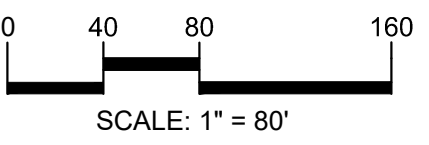
DRAWING TITLE
PRELIMINARY SITE PLAN - 2

PEA JOB NO.	2021-0084
P.M.	JC
DN.	KMB
DES.	DSK
DRAWING NUMBER:	

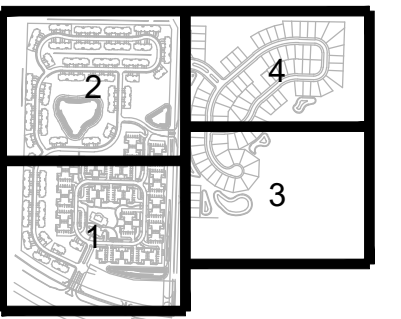
NOT FOR CONSTRUCTION **P-2.2**



S:\PROJECTS\2021\0084\WHITE LAKE HILL\DWG\SITE PLANS\P-2.1.DWG (MULTI)-210084.dwg



CAUTION!!
THE LOCATIONS AND ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THIS DRAWING ARE ONLY APPROXIMATE. NO GUARANTEE IS EITHER EXPRESSED OR IMPLIED AS TO THE COMPLETENESS OR ACCURACY THEREOF. THE CONTRACTOR SHALL BE EXCLUSIVELY RESPONSIBLE FOR DETERMINING THE EXACT UTILITY LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.



CLIENT
WHITE LAKE HILL, LLC
31550 NORTHWESTERN HWY
FARMINGTON HILLS, MI 48334

PROJECT TITLE
THE AVALON
HIGHLAND ROAD
WHITE LAKE TWP, MI

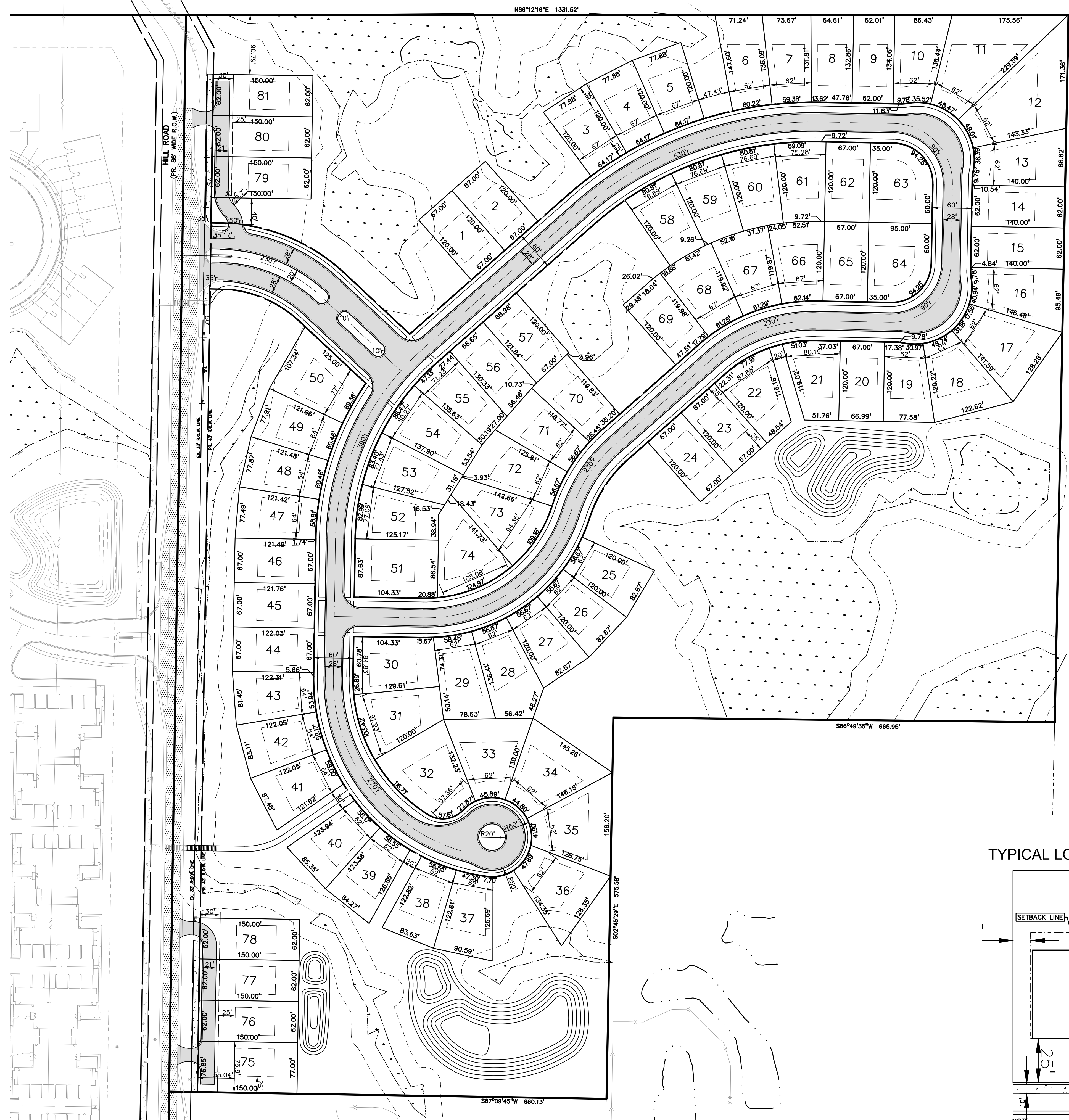
REVISIONS	

REVISED SITE LAYOUT	5-16-2022
TOWNSHIP PSP REVIEW	4-4-2022
TOWNSHIP PSP REVIEW	2-25-2022
OWNER REVIEW	11-29-2021
ORIGINAL ISSUE DATE:	12-8-2021

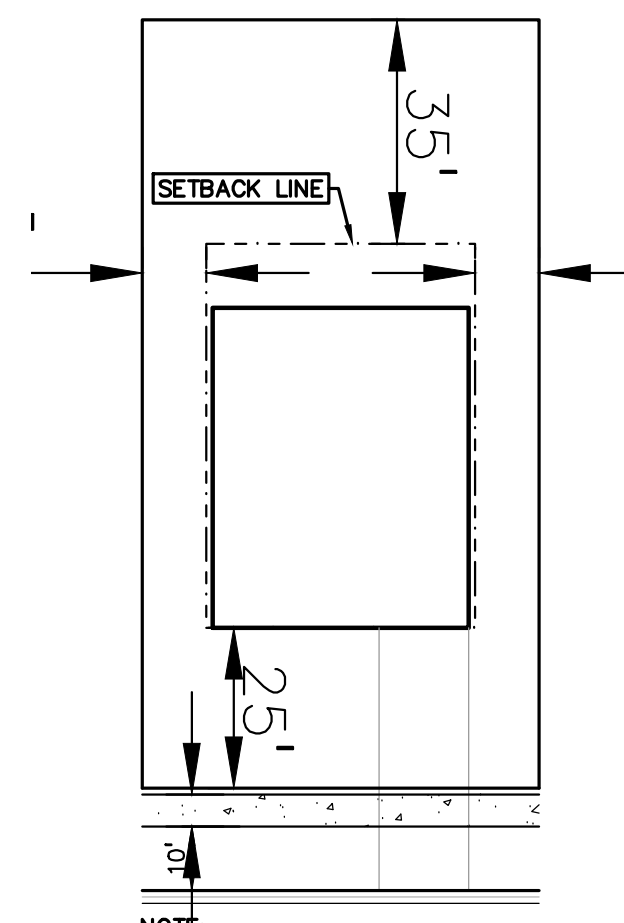
DRAWING TITLE
PRELIMINARY SITE PLAN - 4

PEA JOB NO.	2021-0084
P.M.	JC
DN.	KMB
DES.	DSK
DRAWING NUMBER:	

P-2.4



TYPICAL LOT LAYOUT



LEGEND	
● IRON FOUND	⊗ BRASS PLUG SET
⊗ IRON SET	⊗ MONUMENT FOUND
● NAIL FOUND	⊗ MONUMENT SET
⊗ NAIL & CAP SET	⊗ SEC. CORNER FOUND
	R RECORDED
	M MEASURED
	C CALCULATED
EXISTING	
—OH—ELEC—W—O	ELEC. PHONE OR CABLE TV O.A. LINE, POLE & GUY WIRE
—UC—CATV—	UNDERGROUND CABLE TV, CATV, PEDESTAL
—UC—PHONE—	TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE
—UC—ELEC—	ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE
—GAS—	GAS MAIN, VALVE & GAS LINE MARKER
—WATER—	WATERMAIN, HYD. GATE VALVE, TAPPING SLEEVE & VALVE
—SEWER—	SANITARY SEWER, CLEANOUT & MANHOLE
—STORM—	STORM SEWER, CLEANOUT & MANHOLE
—COMB—	COMBINED SEWER & MANHOLE
—SQUARE—	SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
—POST—	POST INDICATOR VALVE
—VALVE—	WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF
—METER—	METER BOX, TRANSFORMER, IRRIGATION CONTROL, VALVE
—UNIDENT—	UNIDENTIFIED STRUCTURE
—SPOT—	SPOT ELEVATION
—CONTOUR—	CONTOUR LINE
—FENCE—	FENCE
—GUARD—	GUARD RAIL
—STREET—	STREET LIGHT
—SIGN—	SIGN
—CONC—	CONCRETE
—ASPH—	ASPHALT
—GRAVEL—	GRAVEL SHOULDER
—WETLAND—	WETLAND
—STD—	STD. HEAVY R.O.W. DUTY ONLY
—DN—	DN. HEAVY DEEP DUTY, DUTY STRENGTH

NOT FOR CONSTRUCTION

S:\PROJECTS\2021\2021-0084 WHITE LAKE HILL, MI\DWG\SITE PLANS\P-2.4.DWG (9/7/2024) DWG

seal:

client:
LAUTREC
 31550 Northwestern
 Hwy
 Farmington Hills,
 Michigan

project:
AVALON

project location:
 White Lake Twp.
 Michigan
 Highland Road & Hill
 Road

sheet title:
**parallel site
 plan study**

job no./issue/revision date:
 LP20.077.09 REVIEW 10-1-2020
 LP20.077.09 REVIEW 11-25-2020
 LP21.008.01 REVIEW 1-6-2021
 LP21.008.01 REVIEW 1-12-2021
 LP22.052.05 REVIEW 5-11-2022
 REVIEW 5-13-2022

drawn by:
JP, DK, PH
 checked by:
FP
 date:
5-10-2022

notice:
 Copyright © 2022
 This document and the subject matter
 contained therein is proprietary and is
 not to be used or reproduced without
 the written permission of Felino Pascual
 and Associates



The location and elevation of existing
 underground utilities as shown on this
 drawing are only approximate. No guarantee
 is either expressed or implied as to the
 completeness of accuracy. Contractor shall be
 exclusively responsible for determining the
 exact location and elevation prior to the start
 of construction

project no:
LP22.052.05
 sheet no:



parallel site plan study for:
Avalon
 - a plan residential community
White Lake Township, Michigan

note:
 preliminary plat for inspection purposes only and in no
 way official or approved for record purposes.

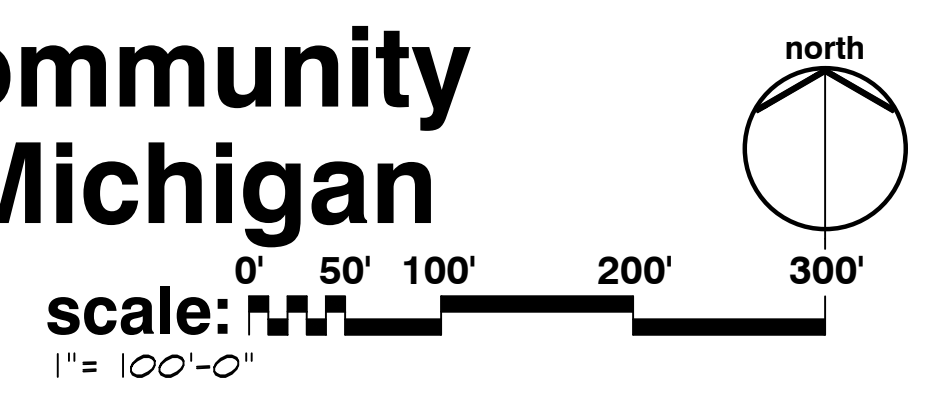
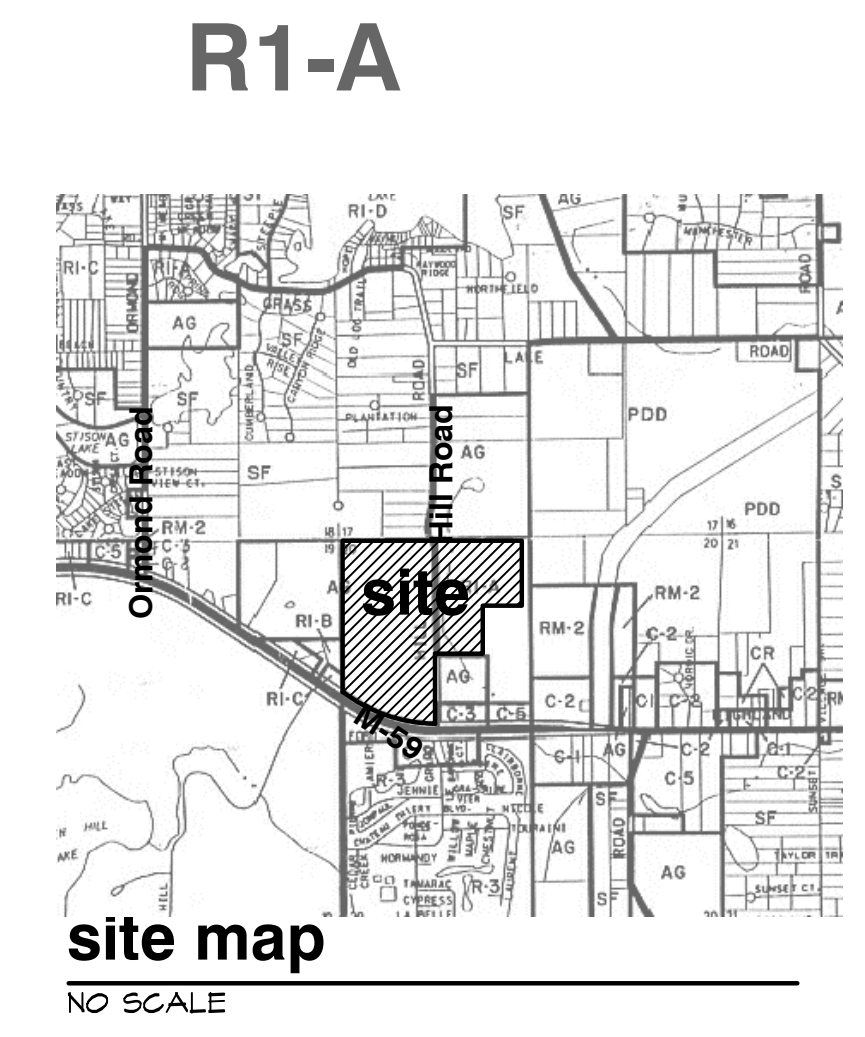
single family parcel (R1-D)

ACRES OF SINGLE FAMILY SITE (R1-D)	41.06±
ACRES OF R.O.W.	1.60 ±
ACRES OF WETLAND	5.11 ±
ACRES OF DETENTION	1.84±
ACRES OF NET	32.51 ±
NO. OF SINGLE FAMILY LOTS	96
TYPICAL LOT SIZE	80'x150'
MIN. LOT SIZE	12,000 SQ.FT
MIN. LOT WIDTH	80'
DENSITY PER ACRE	2.9
(96 LOTS / 32.51 ACRES = 2.9 UNITS/ACRE)	

multi-family (RM-2)

ACRES OF RESIDENTIAL SITE (RM-2)	69.96±
ACRES OF R.O.W.	2.41 ±
ACRES OF WETLAND	1.91 ±
ACRES OF DETENTION	1.7 ±
ACRES OF SITE NET	63.94 ±
NO. OF RESIDENTIAL APARTMENT UNITS	600
44- 12- PLEX UNITS BLDGS.	588
2- 6- PLEX UNITS BLDGS.	12

TOTAL NO. OF PARKING REQUIRED	1,550
(2-SPACES UNIT + 1/4 SPACE PER BEDROOM)	
2-SPACES X 600 UNITS = 1,200-SPACES	
25-SPACE X 1,400 BEDRM = 350-SPACES	
TOTAL NO. OF PARKING PROVIDED	2,400
NO. OF GARAGE PARKING	1,200
NO. OF PARKING APPROACH	1,200
RECREATIONAL SPACE REQUIRED	1.49
5,000 (FIRST UNIT) + (599 UNITS x 100 SQ.FT. PER UNIT)	
= 64,900 / 43,560 = 1.489 ACRES	
RECREATIONAL SPACE PROVIDED	5.0
MAXIMUM LOT COVERAGE	12.74
(20% OF 63.94 ACRES (SITE NET) = 12.788 ACRES)	
LOT COVERAGE PROVIDED	12.74
44 x 11,000 SQ.FT (12-PLEX BLDGS.) = 588,000 SQ.FT. ±	
2 x 5,500 SQ.FT (6-PLEX BLDGS.) = 11,000 SQ.FT. ±	
1 x 5,000 SQ.FT (CLUBHOUSE) = 5,000 SQ.FT.	
= 555,000 SQ.FT. / 43,560 = 12.74 ACRES	
ALLOWABLE DENSITY PER ACRE	
43,560 / 2-BEDRM @ 4,000 SQ.FT. = 10.89 UNITS/AC.	
43,560 / 3-BEDRM @ 4,500 SQ.FT. = 9.68 UNITS/AC.	
DENSITY PER ACRE PROVIDED	9.38 UNITS/AC.
600 UNITS / 63.94 (SITE NET) = 9.38 UNITS/AC.	



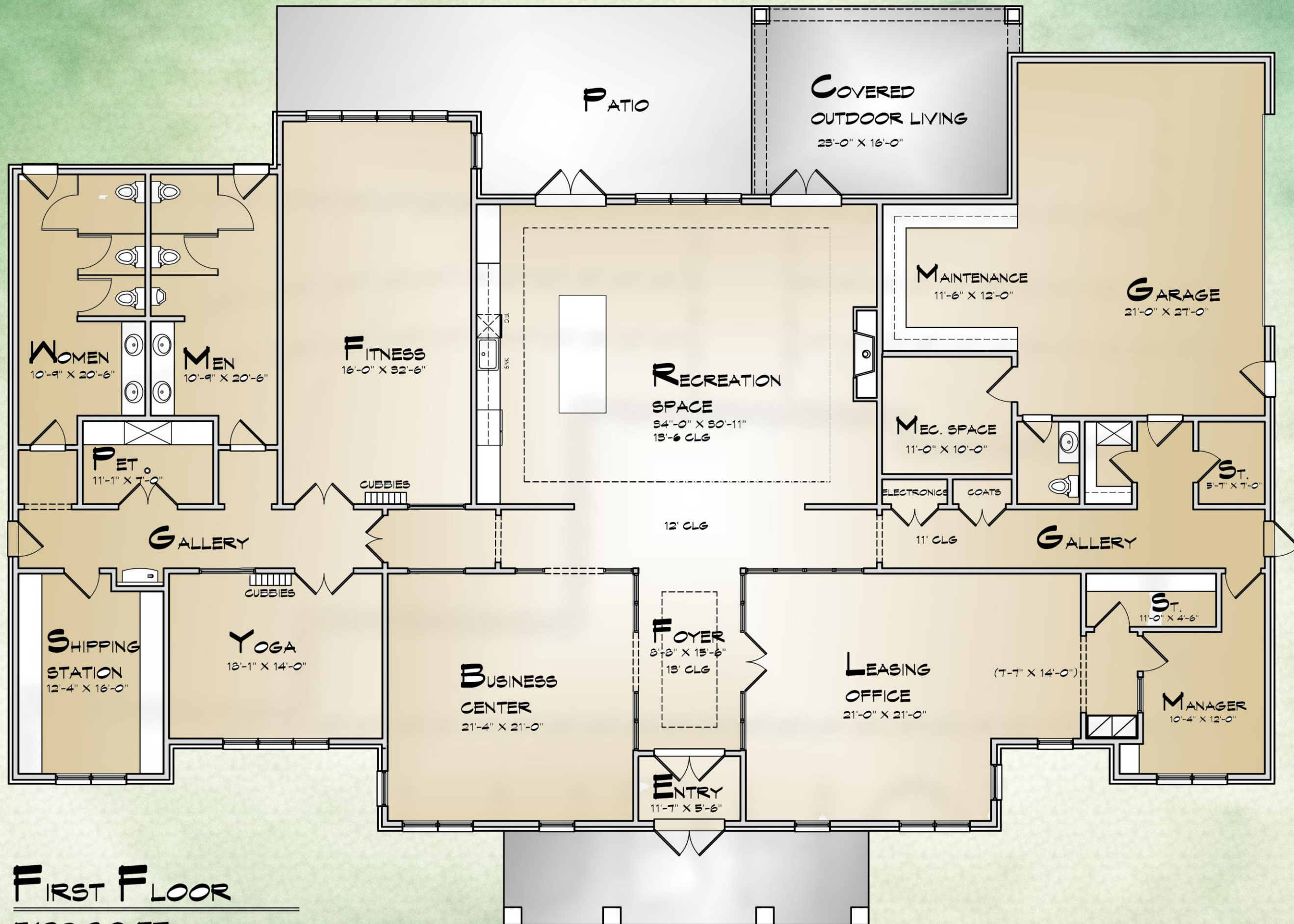
WHITE LAKE HILLS
PROPOSED CLUBHOUSE

+ OPT. 5132 SQ.FT. BONUS

11-13-2021

VERSION 3





FIRST FLOOR

5132 SQ FT

(EXCLUDES GARAGE AND MAINTANCE AREA)

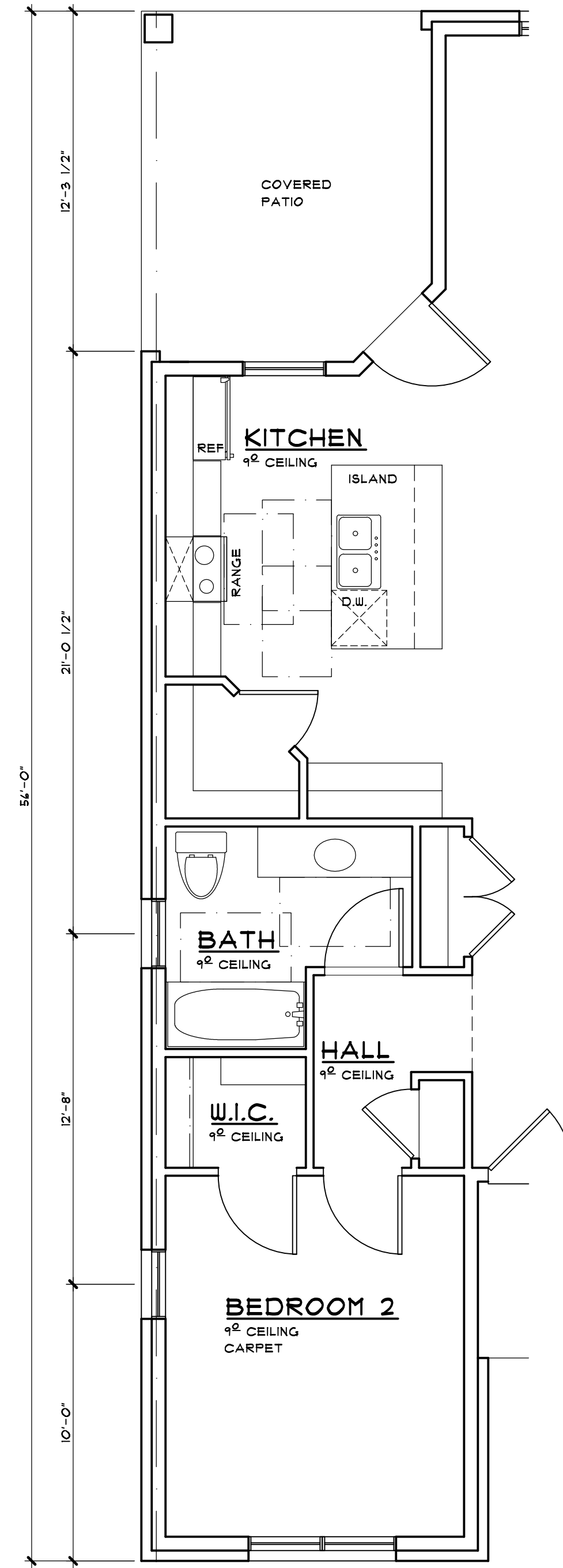
10' CLG



PROPOSED CRAFTSMAN CLUB HOUSE
ENTRY SIDE

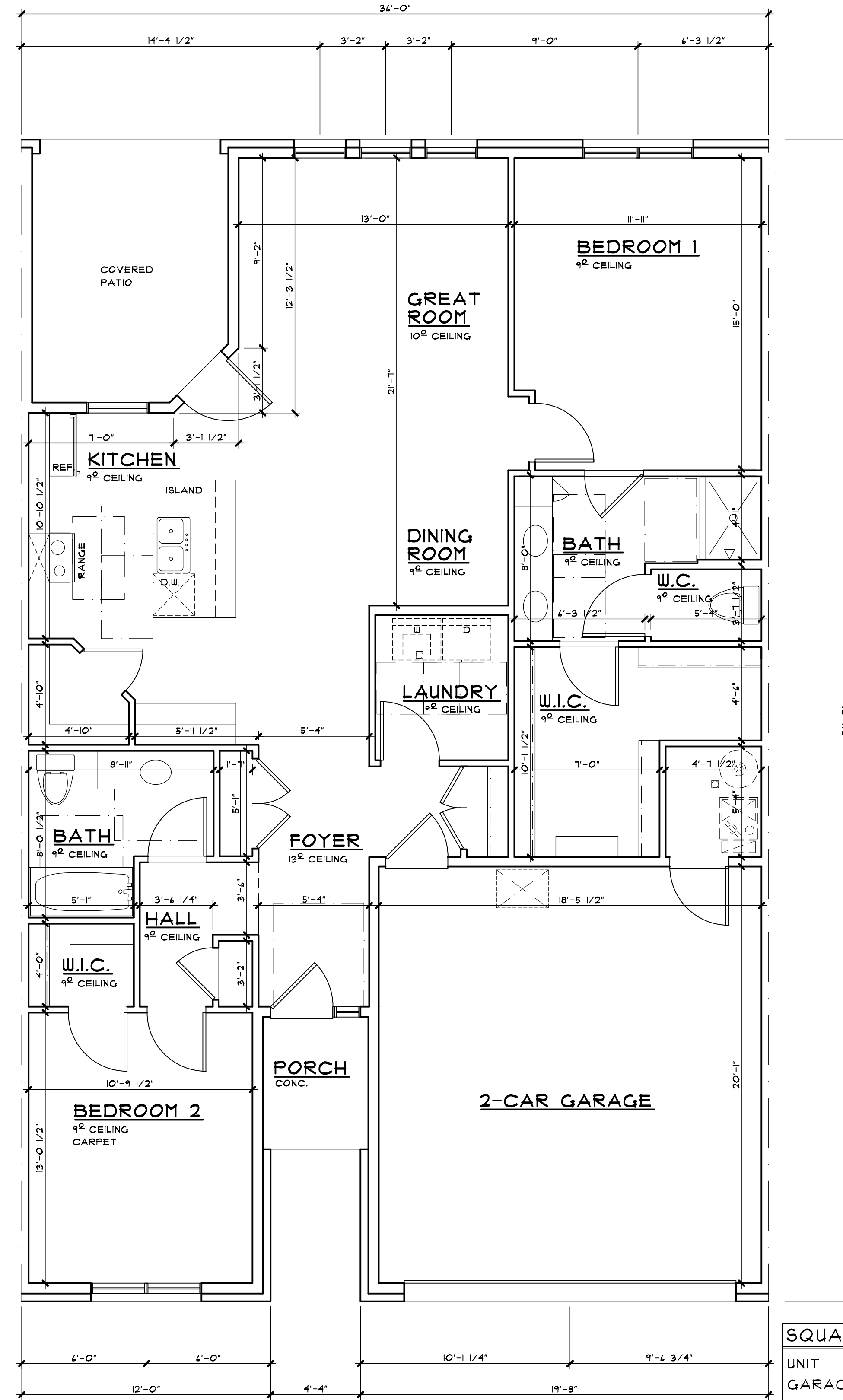


PROPOSED CRAFTSMAN CLUB HOUSE
POOL SIDE



**UNIT FLOOR PLAN -
LEFT SIDE END**

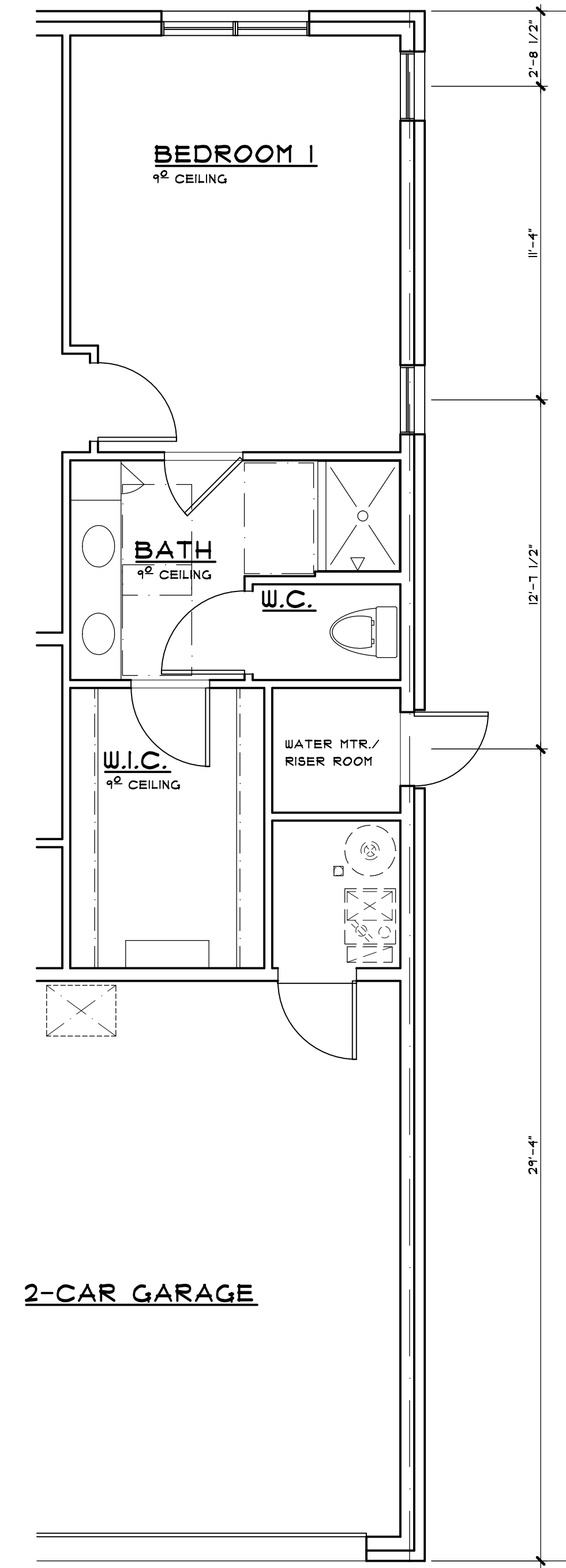
SCALE: 1/4" = 1'-0"



SQUARE FOOTAGE	
UNIT	1,424 SQ FT
GARAGE	403 SQ FT
COV. PAT.	122 SQ FT

UNIT FLOOR PLAN

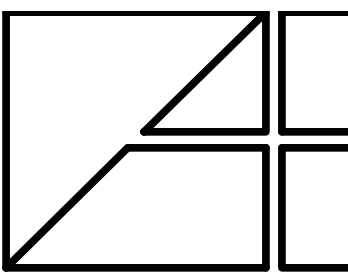
SCALE: 1/4" = 1'-0"



**UNIT FLOOR PLAN -
RIGHT SIDE END**

SCALE: 1/4" = 1'-0"

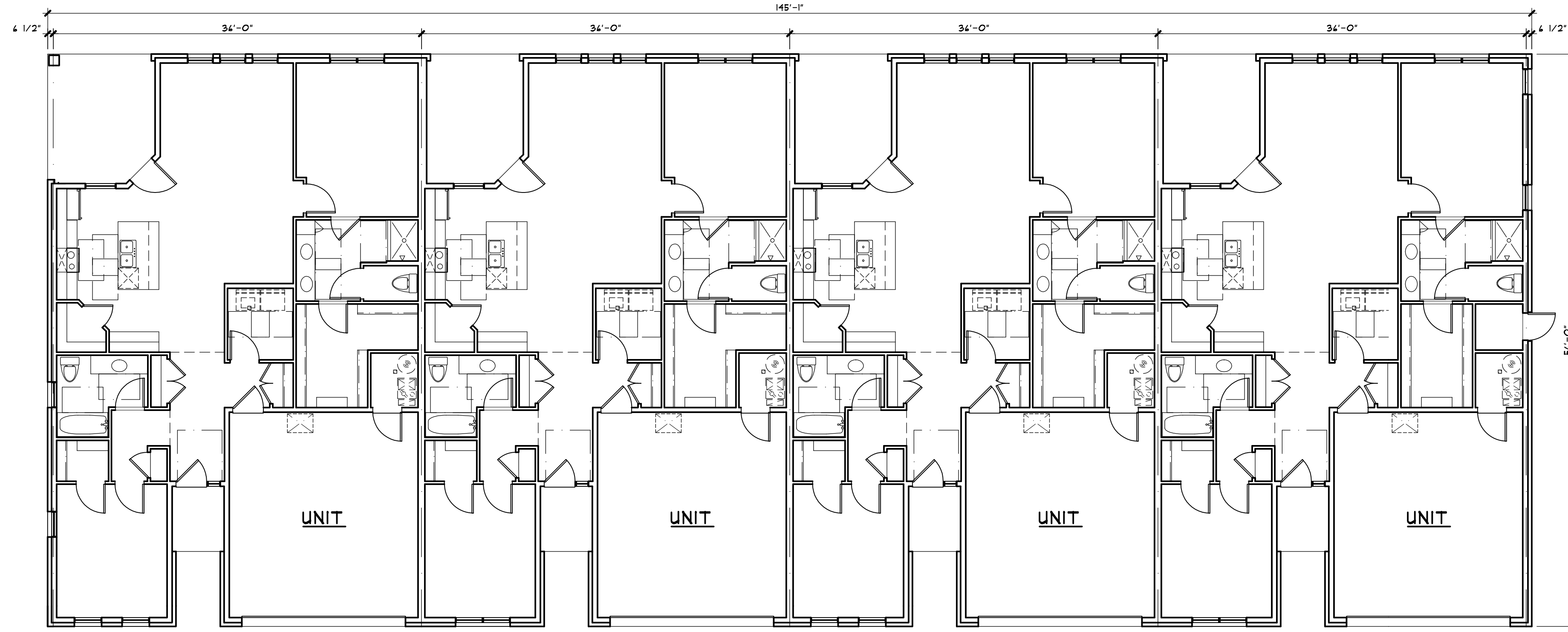




 Alexander V. Bogaerts + Associates, P.C. • Architecture • Planning • Interior Design

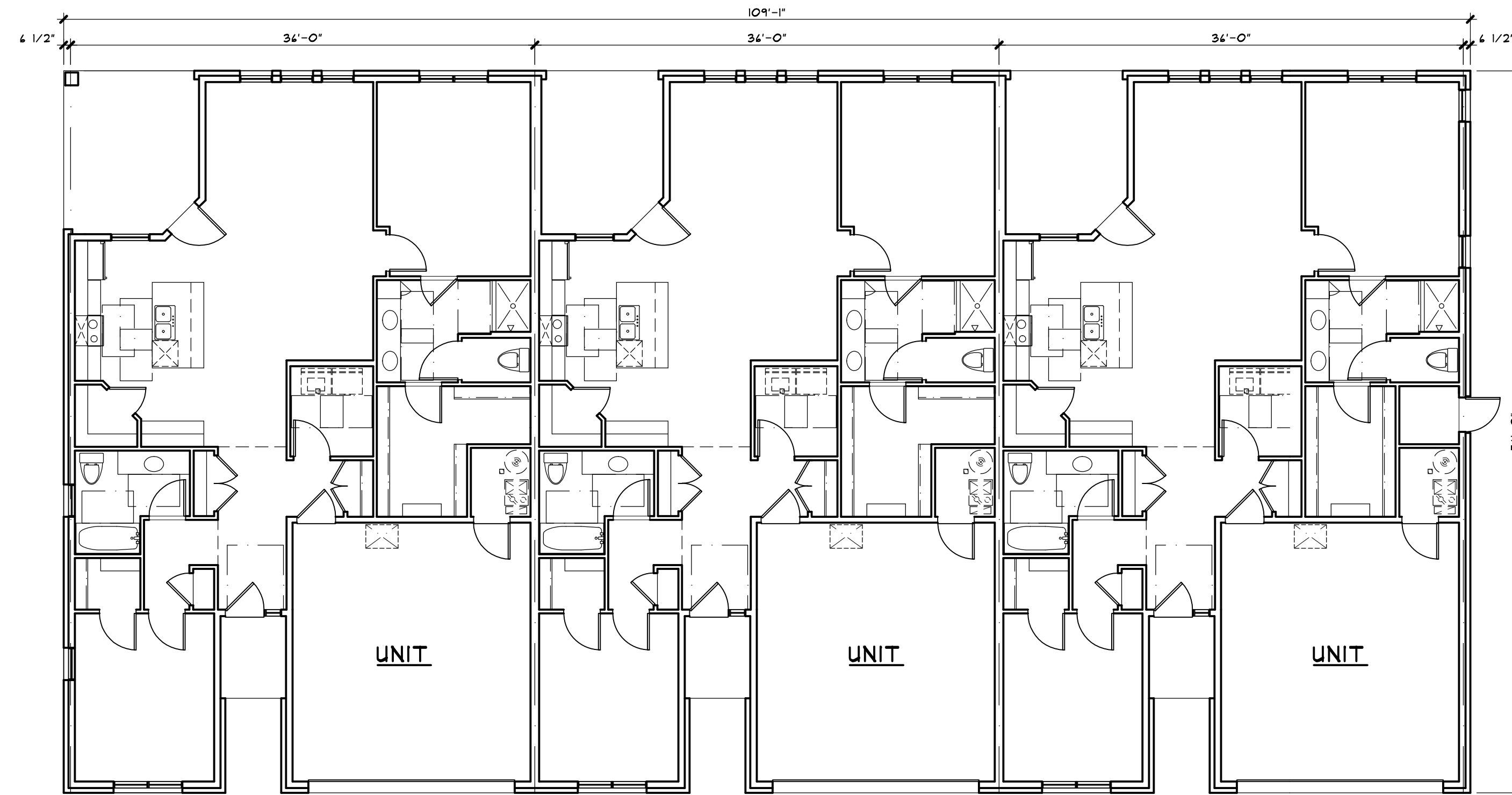
2445 Franklin Road
 Bloomfield Hills, MI 48302
 248-334-5000

CLIENT/PROJECT WHITE LAKE HILL, LLC AVALON - RANCHES WHITE LAKE TOWNSHIP, MICHIGAN	SHEET TITLE UNIT FLOOR PLAN
COPYRIGHT 2022 ALEXANDER V. BOGAERTS + ASSOC.	
PRELIMINARY 2022-03-29	
<input type="checkbox"/> BIDS <input type="checkbox"/> PERMITS <input type="checkbox"/> CONSTRUCTION	
REVISIONS 2022-03-29 SITE PLAN APPROVAL	
DRAWN BY CAD FILENAME CHECKED BY	JOB NUMBER 2451 DATE 2022-03-29 SHEET NUMBER A100



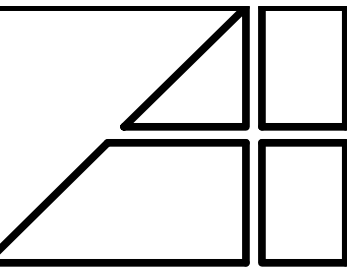
4 UNIT BUILDING FLOOR PLAN

SCALE: 1/8" = 1'-0"



3 UNIT BUILDING FLOOR PLAN

SCALE: 1/8" = 1'-0"



Alexander V. Bogaerts + Associates, P.C. • Interior Design
 2445 Franklin Road
 Bloomfield Hills, MI 48302
 248 • 334 • 5000

BUILDING FLOOR PLANS

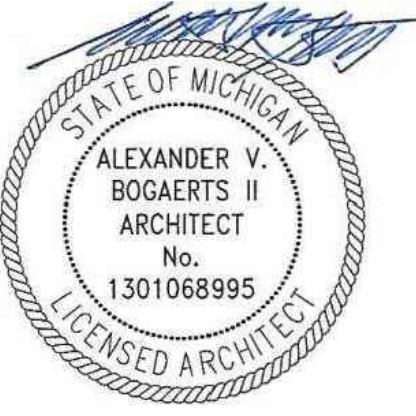
CLIENT/PROJECT
 WHITE LAKE HILL, LLC
 AVALON - RANCHES
 WHITE LAKE TOWNSHIP, MICHIGAN

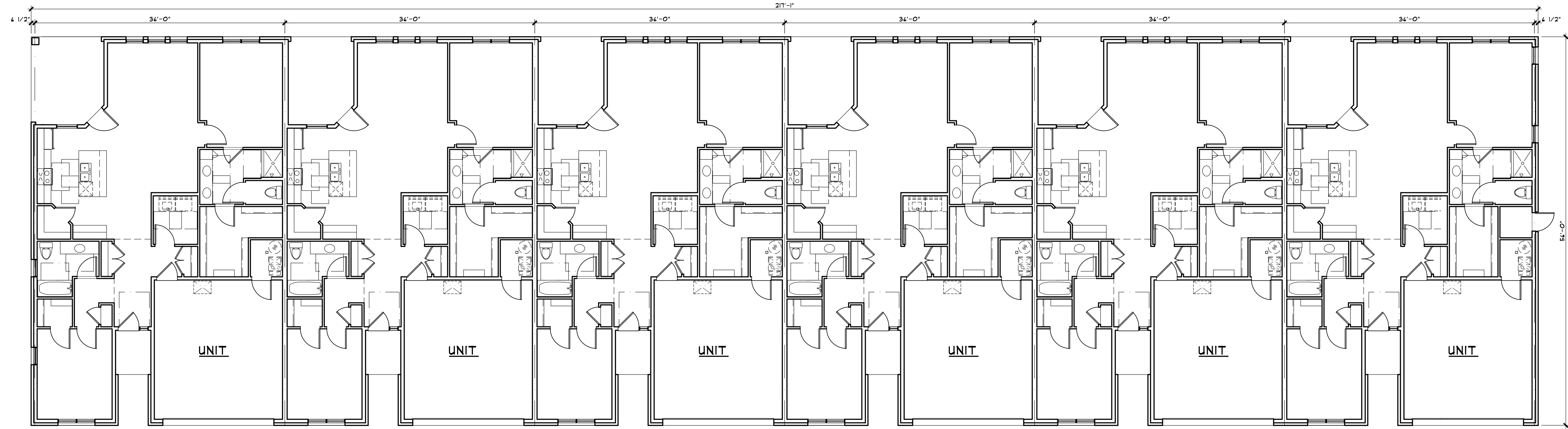
COPYRIGHT 2022
 ALEXANDER V.
 BOGAERTS + ASSOC.

PRELIMINARY
 2022-03-29

REVISIONS
 2022-03-29
 SITE PLAN APPROVAL

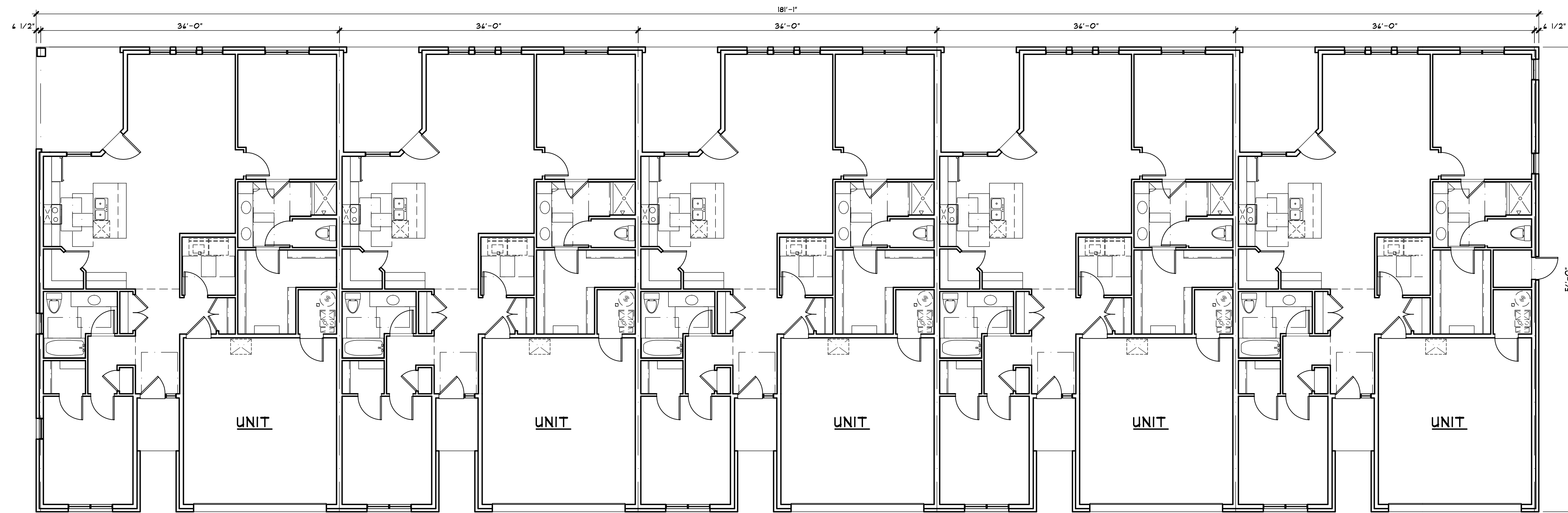
DRAWN BY
 CAD FILENAME
 CHECKED BY
 JOB NUMBER
 2451
 DATE
 2022-03-29
 SHEET NUMBER
A101





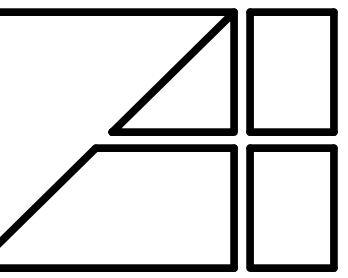
6 UNIT BUILDING FLOOR PLAN

SCALE: 1/8" = 1'-0"



5 UNIT BUILDING FLOOR PLAN

SCALE: 1/8" = 1'-0"



Alexander V. Bogaerts + Associates, P.C. • Interior Design
 2445 Franklin Road
 Bloomfield Hills, MI 48302
 248 • 334 • 5000

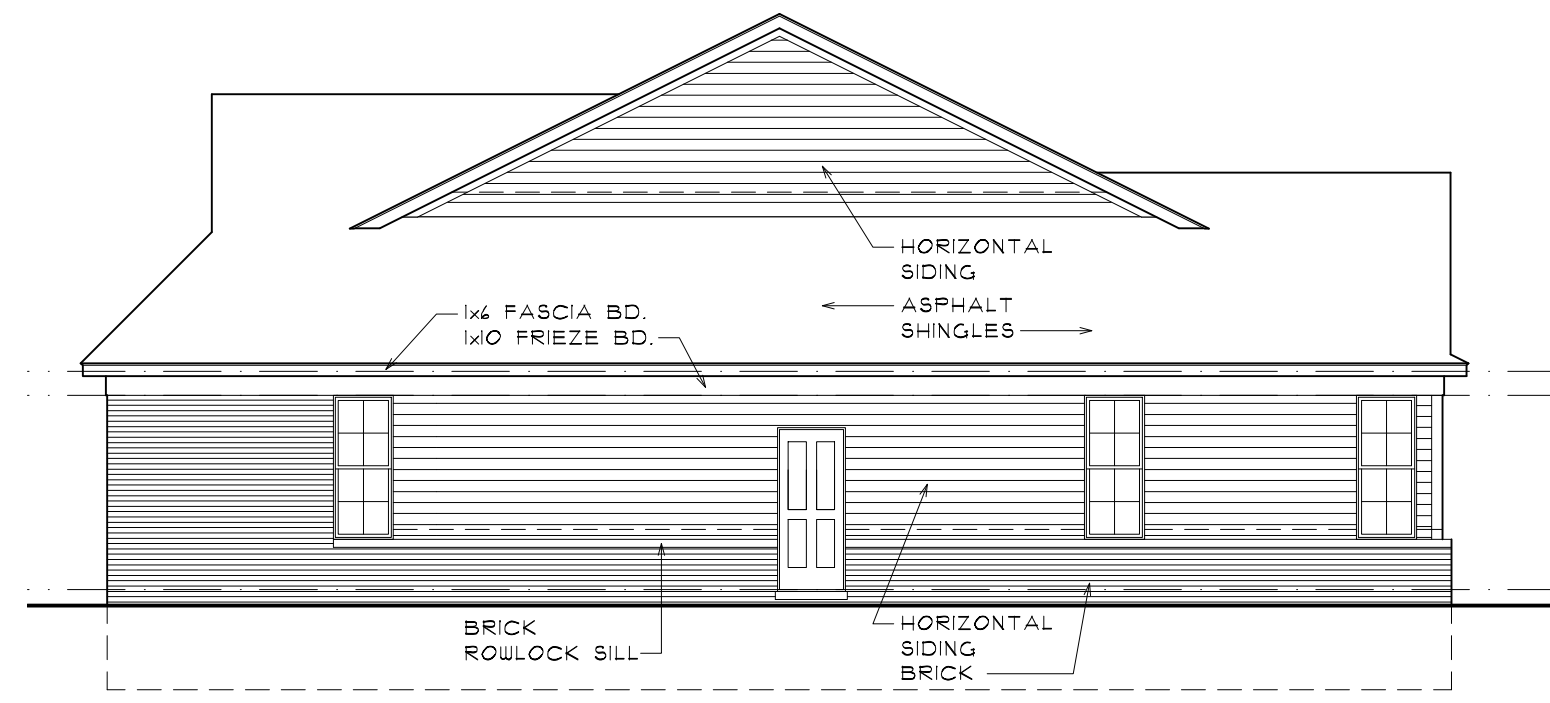
BUILDING FLOOR PLANS

CLIENT/PROJECT
 WHITE LAKE HILL, LLC
 AVALON - RANCHES
 WHITE LAKE TOWNSHIP, MICHIGAN

COPYRIGHT 2022
 ALEXANDER V. BOGAERTS + ASSOC.
 ■ PRELIMINARY
 2022-03-29
 BIDS
 PERMITS
 CONSTRUCTION
 REVISIONS
 2022-03-29
 SITE PLAN APPROVAL

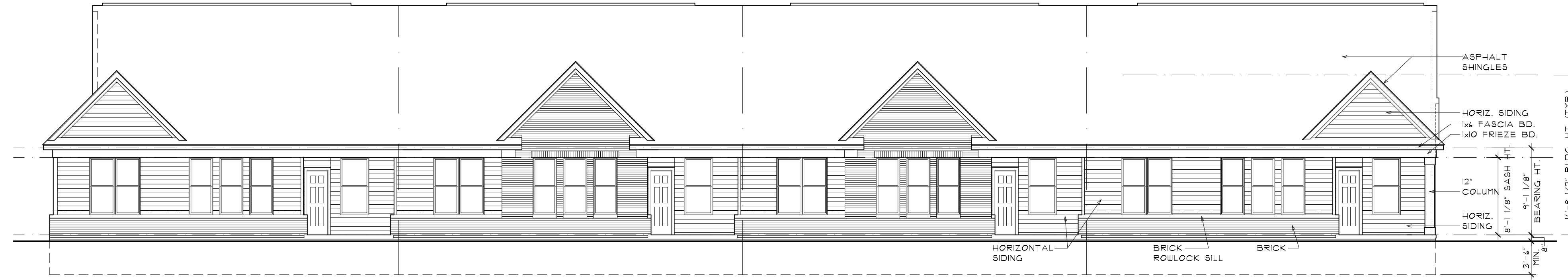
DRAWN BY
 CAD FILENAME
 CHECKED BY
 JOB NUMBER
 2451
 DATE
 2022-03-29
 SHEET NUMBER
A102





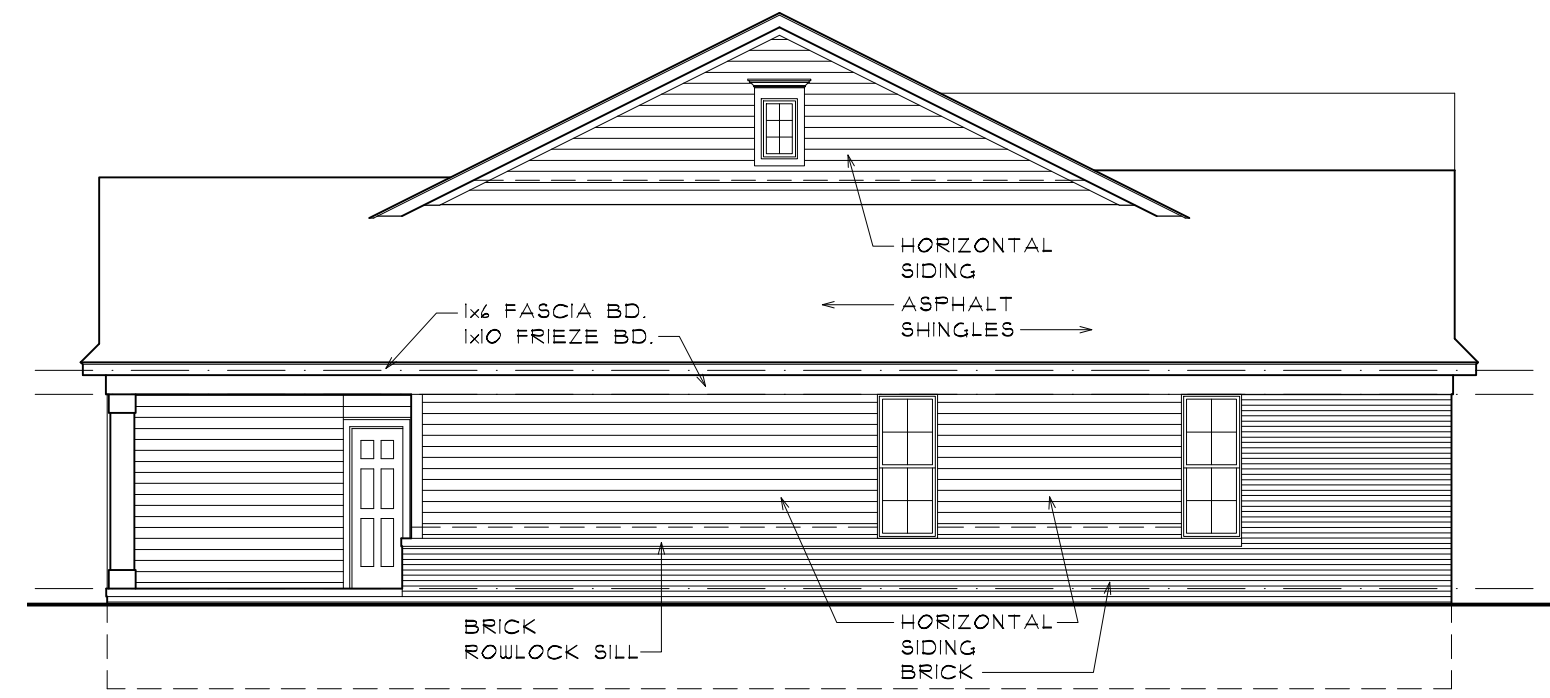
RIGHT SIDE ELEVATION 'B' ('A' and 'C' SIMILAR)

SCALE: 1/8" = 1'-0"



REAR ELEVATION 'A' and 'C' ('B' SIMILAR)

SCALE: 1/8" = 1'-0"



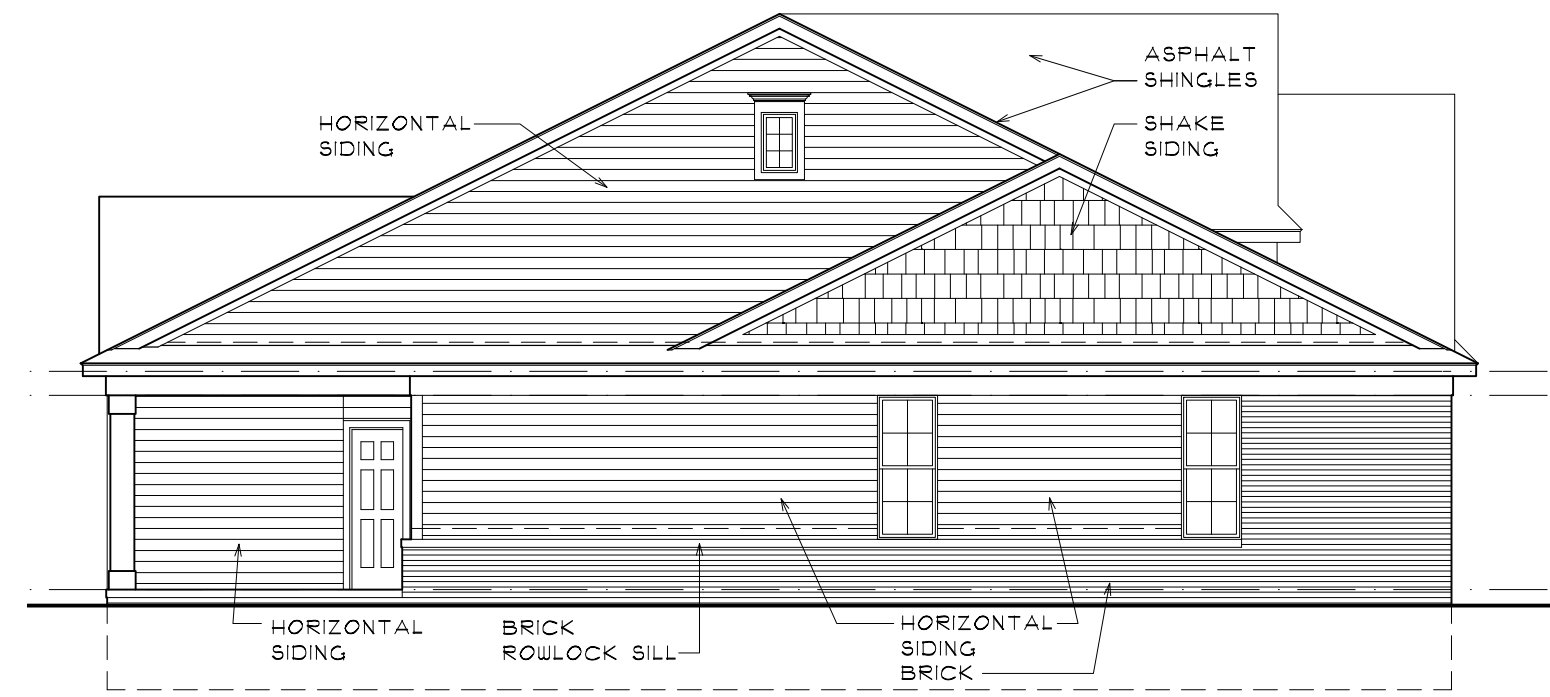
LEFT SIDE ELEVATION 'A' and 'C'

SCALE: 1/8" = 1'-0"



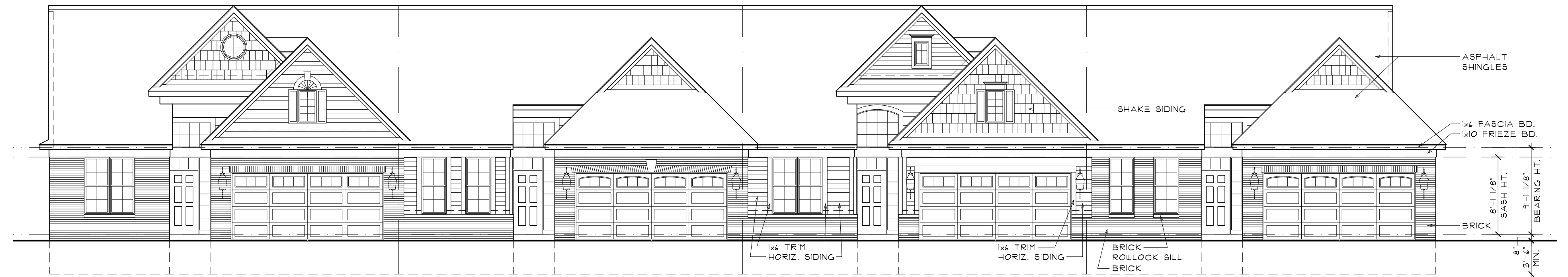
4 UNIT FRONT ELEVATION 'A'

SCALE: 1/8" = 1'-0"



LEFT SIDE ELEVATION 'B'

SCALE: 1/8" = 1'-0"



4 UNIT FRONT ELEVATION 'B'

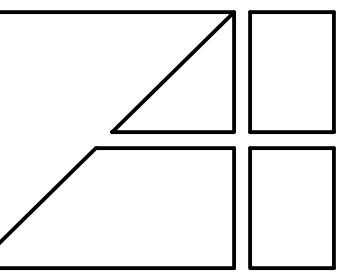
SCALE: 1/8" = 1'-0"



4 UNIT FRONT ELEVATION 'C'

SCALE: 1/8" = 1'-0"

NOTE:
SEE BUILDING RENDERINGS FOR ALL BUILDING MATERIAL COLORS. 3 DIFFERENT COLOR SCHEMES PROPOSED FOR A, B, AND C. 3RD SCHEME C SIMILAR TO 4 AND 6 UNIT RENDERINGS.
ELEVATIONS RENDERED: 4 UNIT FRONT ELEVATION 'B' & 4 UNIT FRONT ELEVATION 'A'



Interior Design
2445 Franklin Road
Bloomfield Hills, MI 48302
248 • 334 • 5000

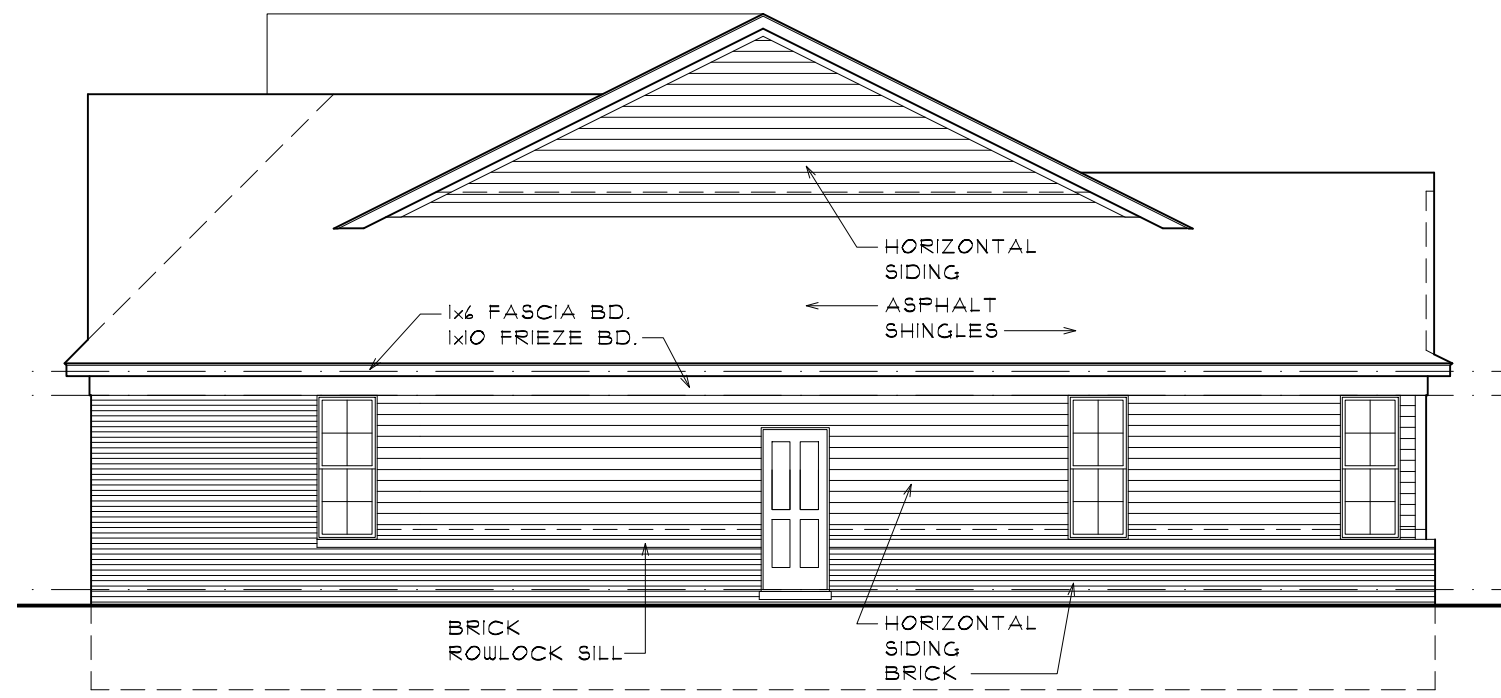
BUILDING ELEVATIONS

WHITE LAKE HILL, LLC
AVALON - RANCHES
WHITE LAKE TOWNSHIP, MICHIGAN

COPYRIGHT 2022 ALEXANDER V. BOGAERTS + ASSOC.	
<input checked="" type="checkbox"/> PRELIMINARY 2022-03-29	
<input type="checkbox"/> BIDS	
<input type="checkbox"/> PERMITS	
<input type="checkbox"/> CONSTRUCTION	
REVISIONS 2022-03-29 SITE PLAN APPROVAL	
DRAWN BY	
CAD FILENAME	
CHECKED BY	
JOB NUMBER 2451	
DATE 2022-03-29	
SHEET NUMBER A104	

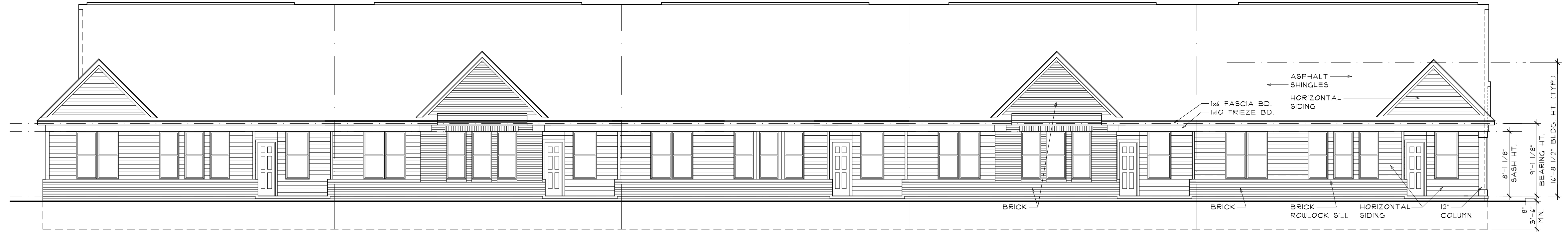


Alexander V. Bogaerts + Associates, P.C. • Architecture • Planning



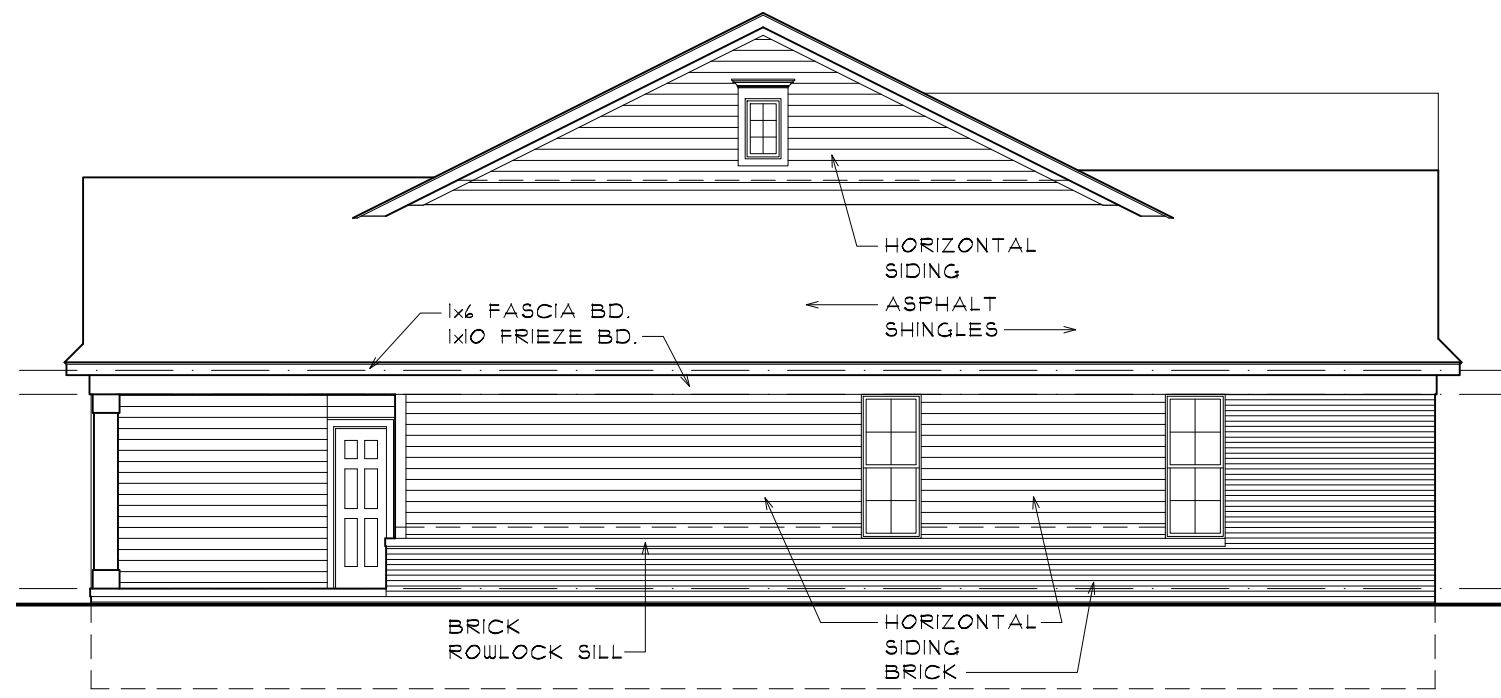
RIGHT SIDE ELEVATION 'B' ('A' and 'C' SIMILAR)

SCALE: 1/8" = 1'-0"



REAR ELEVATION 'A' and 'C' ('B' SIMILAR)

SCALE: 1/8" = 1'-0"



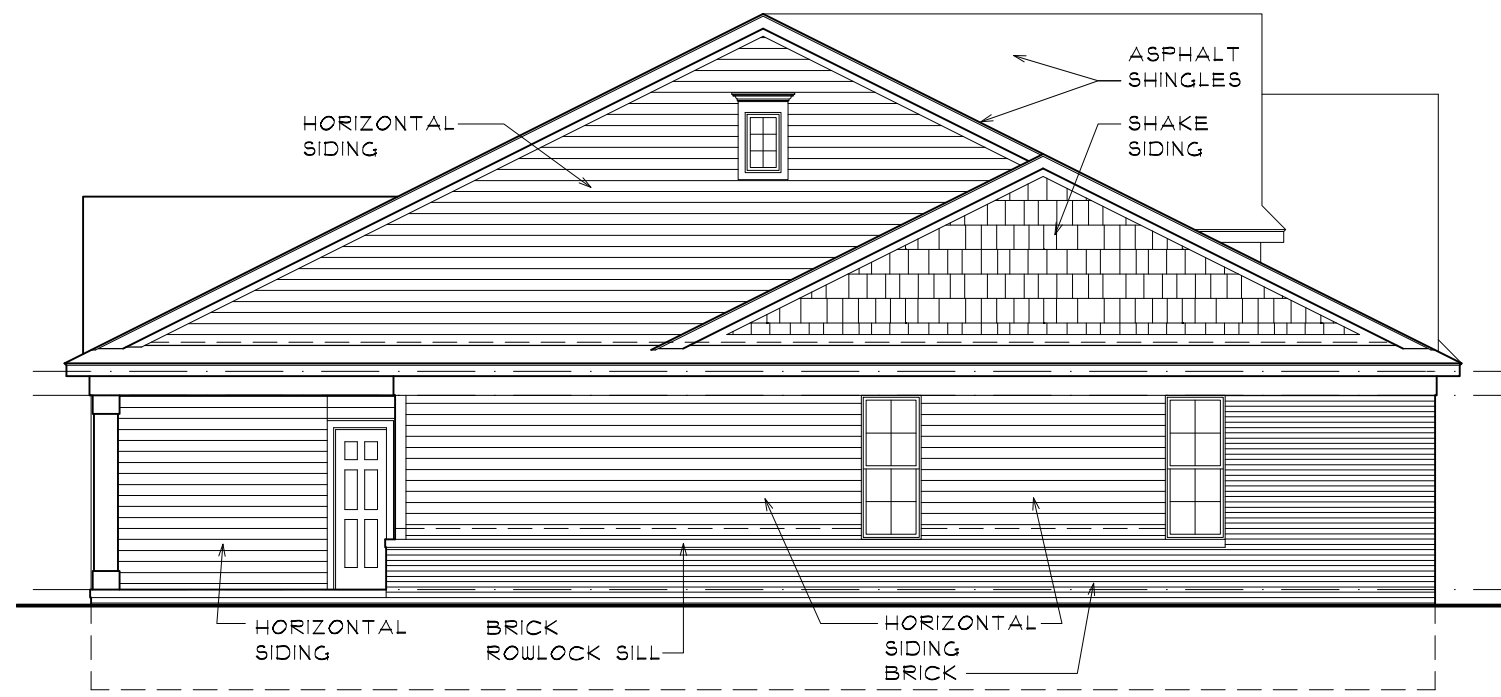
LEFT SIDE ELEVATION 'A' and 'C'

SCALE: 1/8" = 1'-0"



5 UNIT FRONT ELEVATION 'A'

SCALE: 1/8" = 1'-0"



LEFT SIDE ELEVATION 'B'

SCALE: 1/8" = 1'-0"



5 UNIT FRONT ELEVATION 'B'

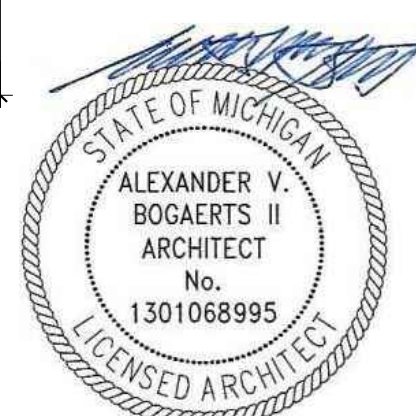
SCALE: 1/8" = 1'-0"



5 UNIT FRONT ELEVATION 'C'

SCALE: 1/8" = 1'-0"

NOTE:
SEE BUILDING RENDERINGS FOR ALL BUILDING MATERIAL COLORS. 3 DIFFERENT COLOR SCHEMES PROPOSED FOR A, B, AND C. 3RD SCHEME C SIMILAR TO 4 AND 4 UNIT RENDERINGS.
ELEVATIONS RENDERED: 4 UNIT FRONT ELEVATION 'B' & 4 UNIT FRONT ELEVATION 'A'

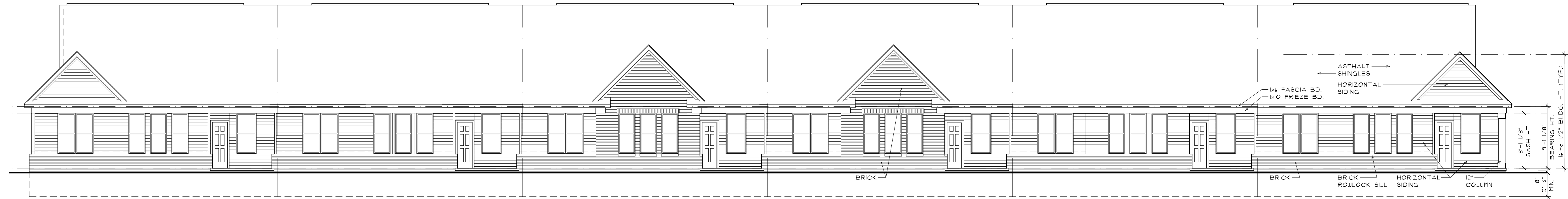


Alexander V. Bogaerts + Associates, P.C. • Architecture • Planning • Interior Design
 2445 Franklin Road
 Bloomfield Hills, MI 48302
 248 • 334 • 5000

SHEET TITLE: BUILDING ELEVATIONS
 CLIENT/PROJECT: WHITE LAKE HILL, LLC
 AVALON - RANCHES
 WHITE LAKE TOWNSHIP, MICHIGAN

COPYRIGHT 2022
 ALEXANDER V. BOGAERTS + ASSOC.
 ■ PRELIMINARY 2022-03-29
 BIDS
 PERMITS
 CONSTRUCTION
 REVISIONS
 2022-03-29
 SITE PLAN APPROVAL

DRAWN BY:
 CAD FILENAME:
 CHECKED BY:
 JOB NUMBER: 2451
 DATE: 2022-03-29
 SHEET NUMBER: A105



REAR ELEVATION 'A' and 'C' ('B' SIMILAR)

SCALE: 1/8" = 1'-0"



6 UNIT FRONT ELEVATION 'A'

SCALE: 1/8" = 1'-0"

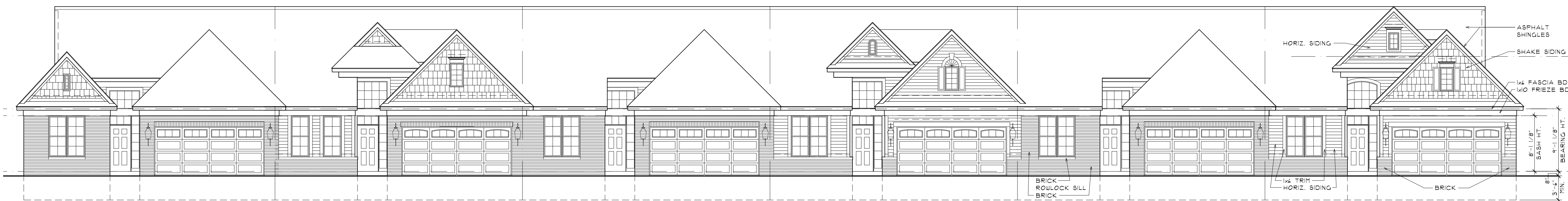


6 UNIT FRONT ELEVATION 'B'

SCALE: 1/8" = 1'-0"

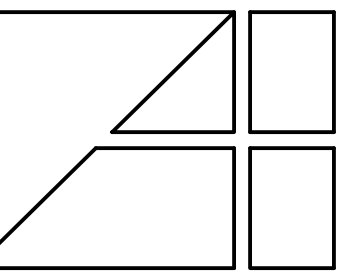
NOTE:
SEE BUILDING RENDERINGS FOR ALL BUILDING MATERIAL COLORS. 3 DIFFERENT COLOR SCHEMES PROPOSED FOR A, B, AND C. 3RD SCHEME C SIMILAR TO 4 AND 6 UNIT RENDERINGS.
ELEVATIONS RENDERED: 4 UNIT FRONT ELEVATION 'B' & 4 UNIT FRONT ELEVATION 'A'

NOTE:
REFER TO SHEET A105 FOR BUILDING SIDE ELEVATIONS



6 UNIT FRONT ELEVATION 'C'

SCALE: 1/8" = 1'-0"



Interior Design
2445 Franklin Road
Bloomfield Hills, MI 48302
248 • 334 • 5000

BUILDING ELEVATIONS

WHITE LAKE HILL, LLC
AVALON - RANCHES
WHITE LAKE TOWNSHIP, MICHIGAN

COPYRIGHT 2022
ALEXANDER V. BOGAERTS + ASSOC.

PRELIMINARY
2022-03-29

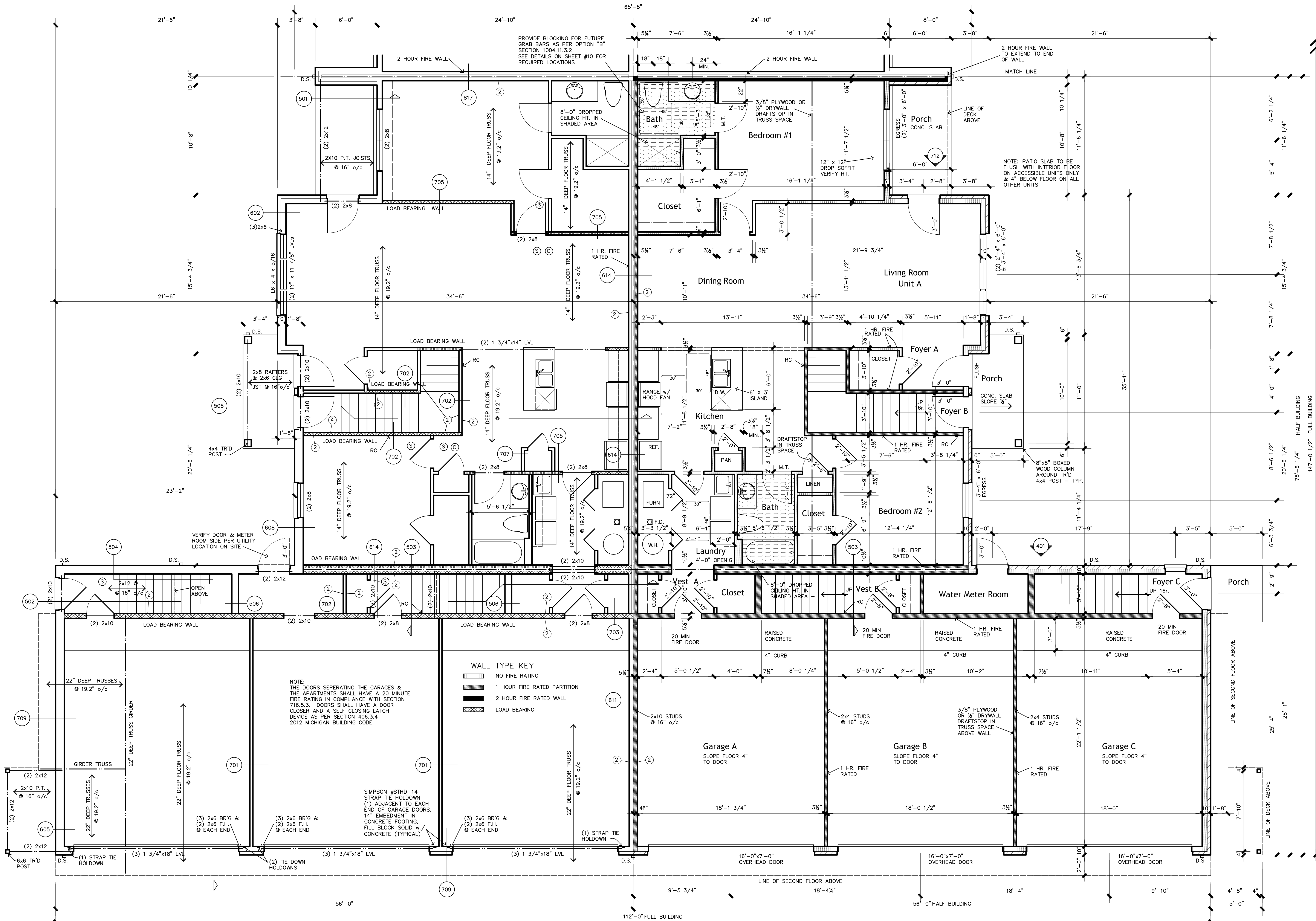
- BIDS
- PERMITS
- CONSTRUCTION

REVISIONS
2022-04-01
SITE PLAN APPROVAL

DRAWN BY
CAD FILENAME
CHECKED BY
JOB NUMBER
2451
DATE
2022-03-29
SHEET NUMBER



A106



WALL TYPE KEY

[White Box]	NO FIRE RATING
[Grey Box]	1 HOUR FIRE RATED PARTITION
[Black Box]	2 HOUR FIRE RATED WALL
[Hatched Box]	LOAD BEARING

NOTE: THE DOORS SEPARATING THE GARAGES & THE APARTMENTS SHALL HAVE A 20 MINUTE FIRE RATING IN COMPLIANCE WITH SECTION 716.5.3. DOORS SHALL HAVE A DOOR CLOSER AND A SELF-CLOSING LATCH DEVICE AS PER SECTION 406.3.4 2012 MICHIGAN BUILDING CODE.

SIMPSON #5THD-14 STRAP TIE HOLDDOWN - (1) ADJACENT TO EACH END OF GARAGE DOORS. 14\"/>

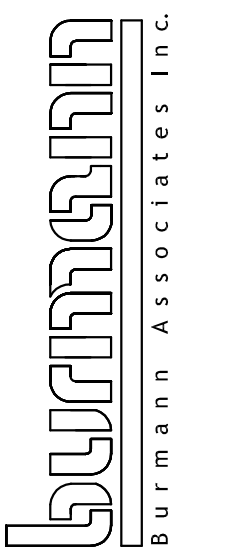
First Floor Plan
Scale: 1/4" = 1'-0"

Type "B" Units
ALL UNITS EXCEPT FOR: BUILDINGS #3, #4 & #9 - SEE SHEET #10 BUILDING #10 - SEE SHEET #11

REPRODUCTION OF PRINTS IS PROHIBITED.

Proposed Condominiums for:
MJC
12 - Plex Condominiums

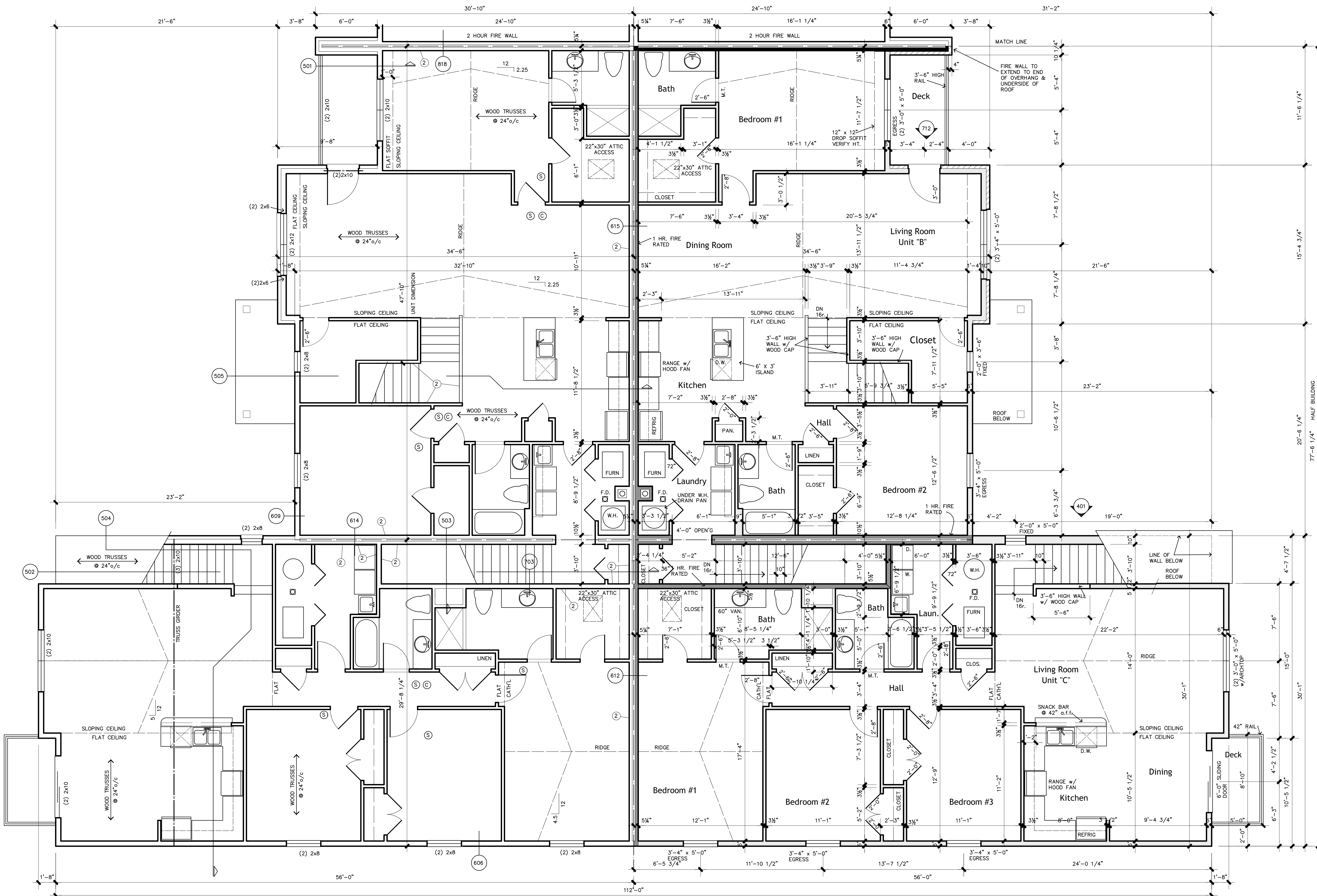
Architects • Engineers • Historic Restorations
110 W. St. Clair • Romeo • Michigan • 48065-4655
Office: 586-752-9010 • 586-201-1602 Cell
greatarchitects@charter.net
greatarchitects@charter.net



Member of the American Institute of Architects

Sheet Contents:
First Floor Plan

Job: 18173
Drawn by: REB
Date: 27JUN18
Sheet Number:

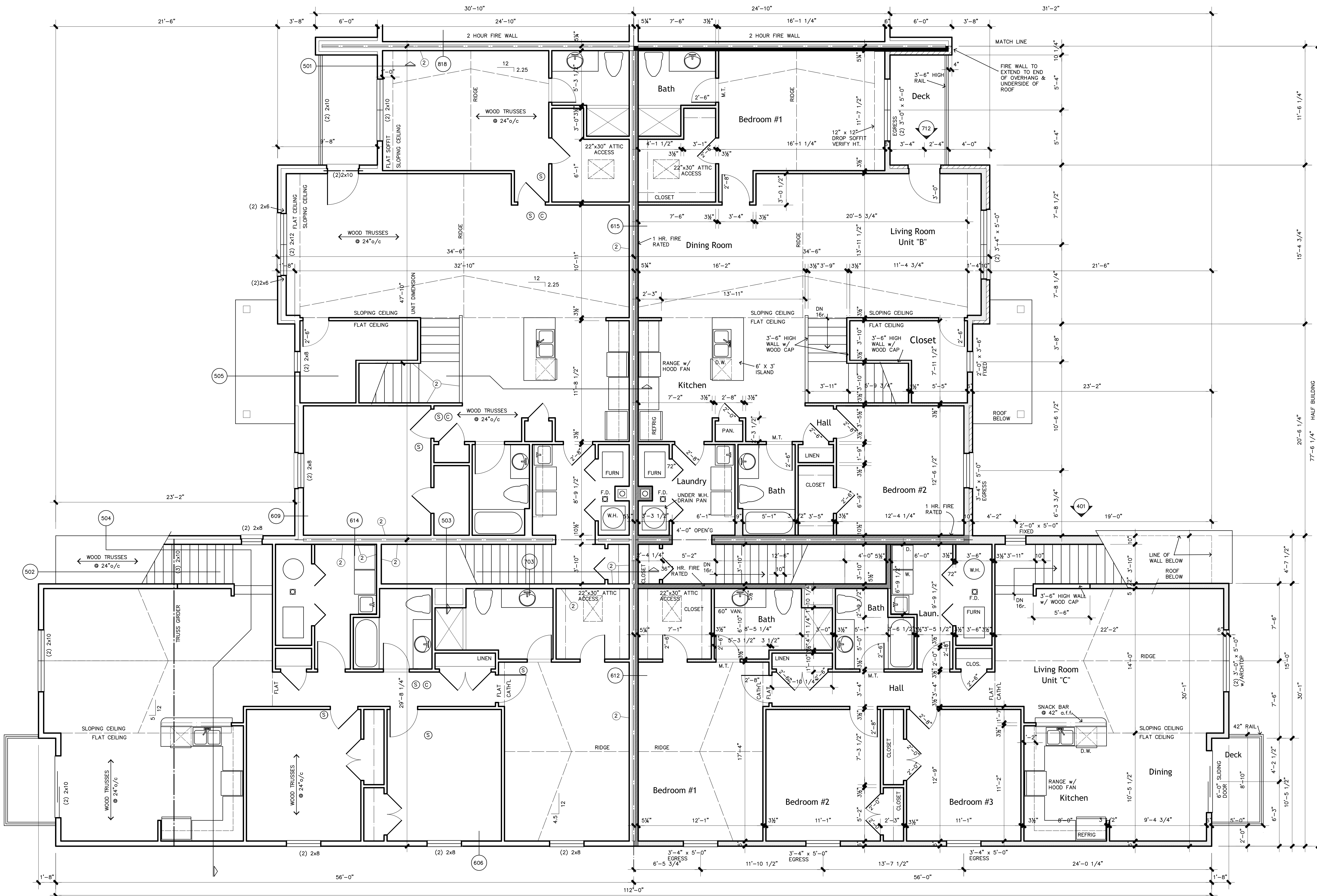


WALL TYPE KEY

(Thin solid line)	NO FIRE RATING
(Thick solid line)	1 HOUR FIRE RATED PARTITION
(Dashed line)	2 HOUR FIRE RATED WALL
(Cross-hatched)	LOAD BEARING

Second Floor Plan
 Scale: 1/4" = 1'-0"

ALL UNITS "B" & "C" ARE NOT ACCESSIBLE UNITS.

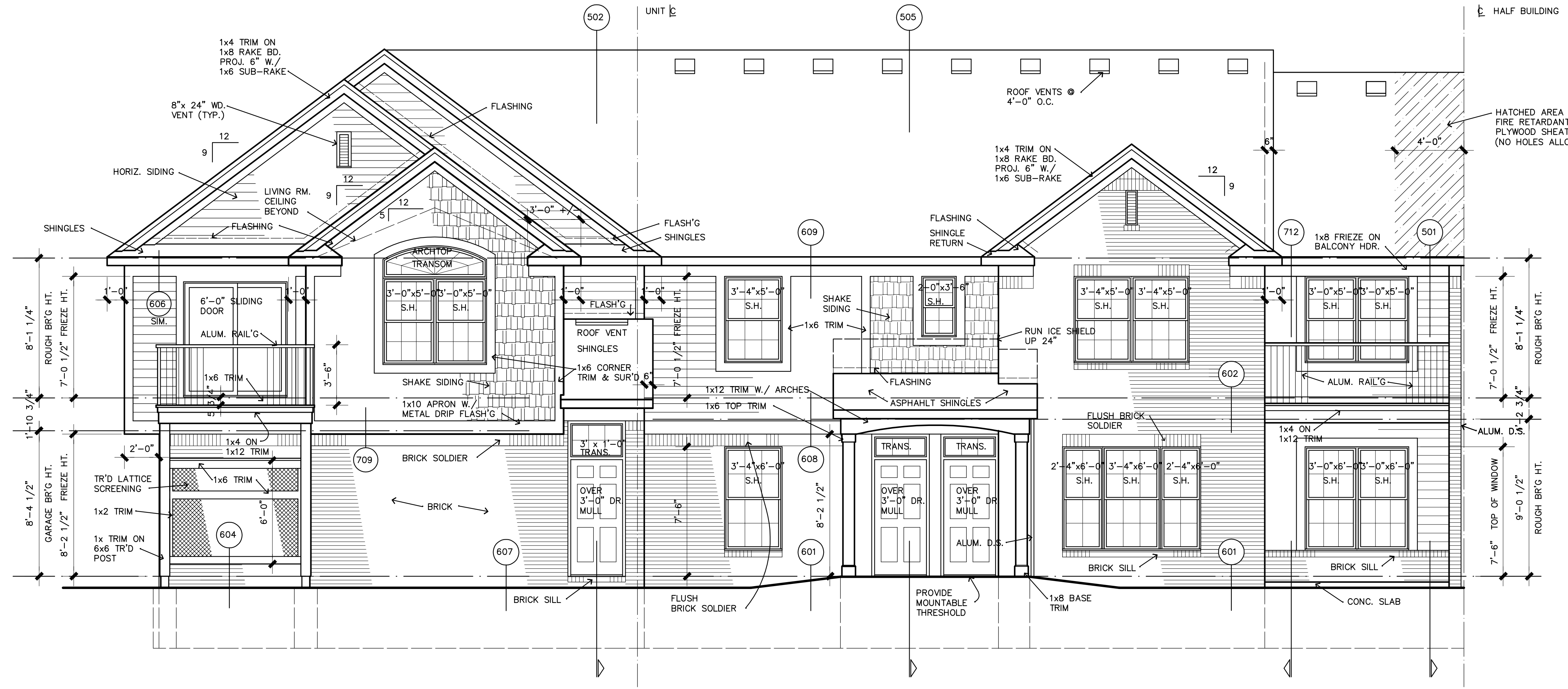


WALL TYPE KEY

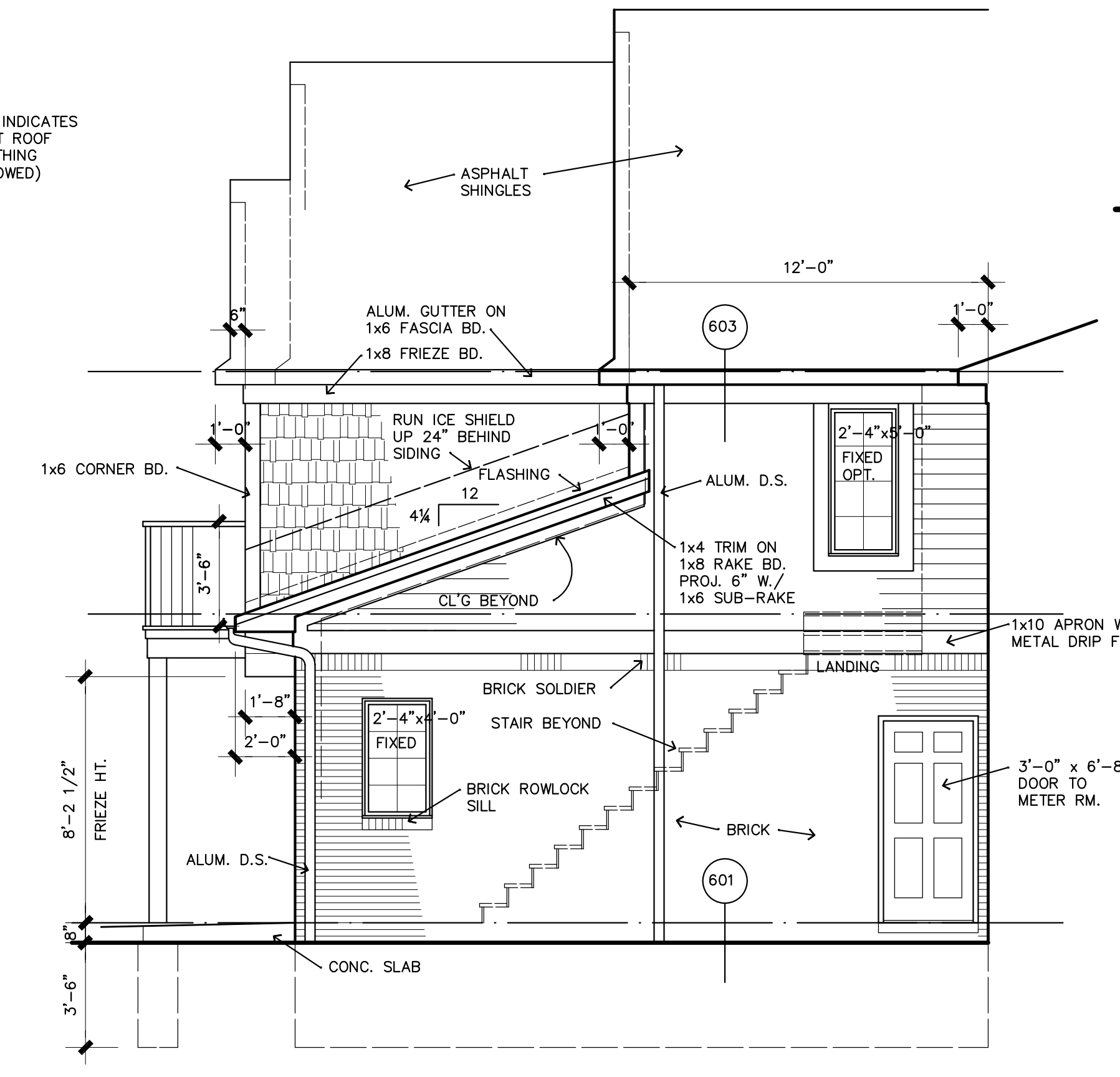
[Solid line]	NO FIRE RATING
[Dashed line]	1 HOUR FIRE RATED PARTITION
[Thick solid line]	2 HOUR FIRE RATED WALL
[Cross-hatched]	LOAD BEARING

Second Floor Plan
 Scale: 1/4" = 1'-0"

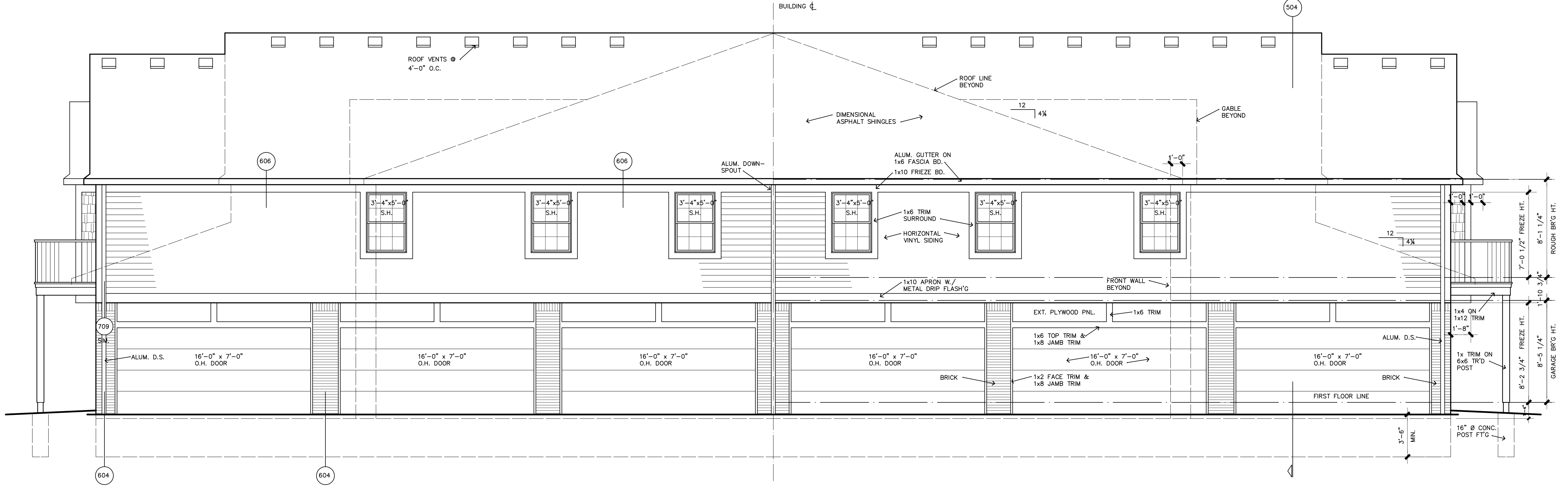
ALL UNITS "B" & "C" ARE NOT ACCESSIBLE UNITS.



Front/Rear Elevation "A"
 Scale: 1/4" = 1'-0"



Partial Elevation "A"
 Scale: 1/4" = 1'-0"

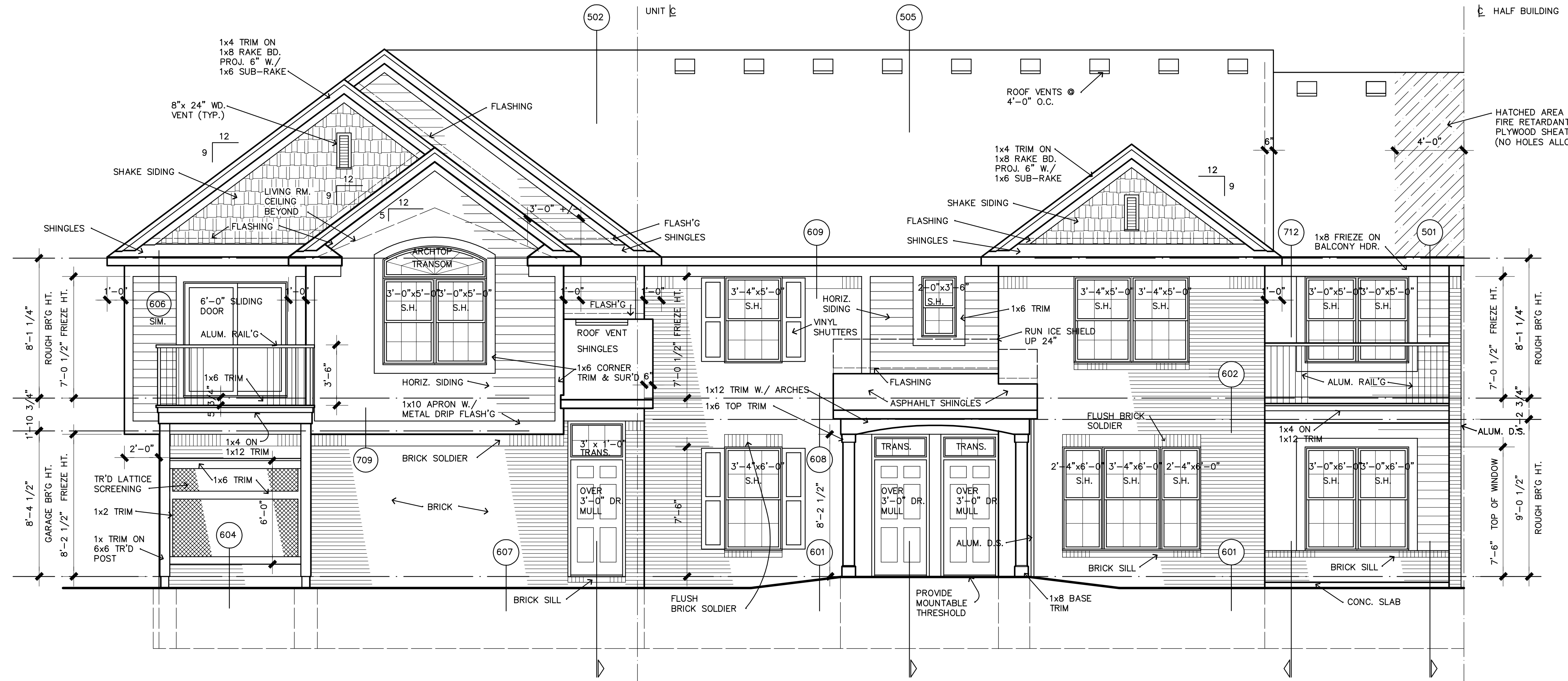


Side Elevation "A"
 Scale: 1/4" = 1'-0"

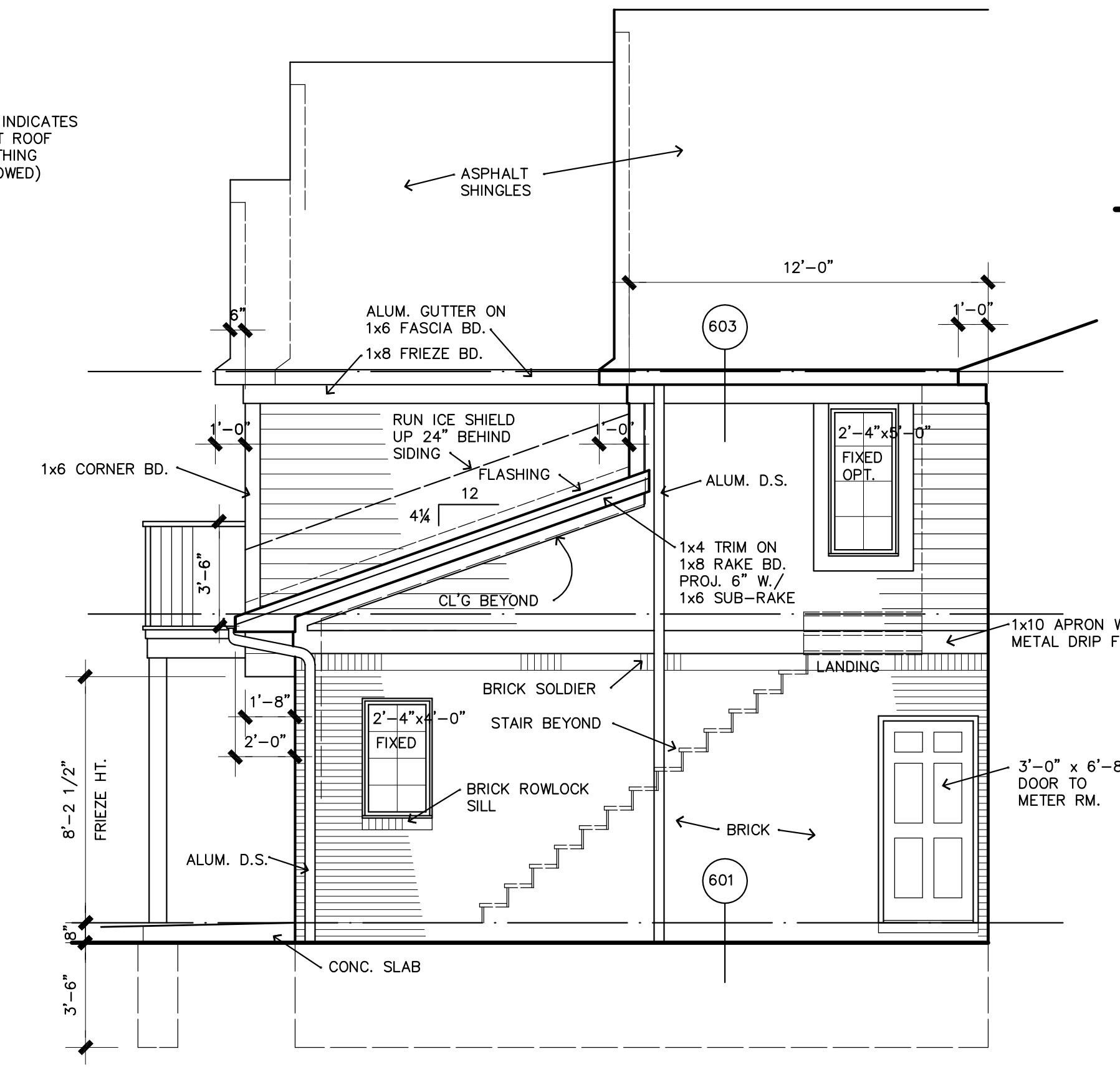
Proposed Condominiums for:
MJC
 12 - Plex Condominiums
 Architects • Engineers • Historic Restorations
 110 W. St. Clair • Romeo • Michigan • 48065-4655
 Office: 586-752-9010 • 586-201-1602 Call
 greatarchitects@charter.net
 A.I.A.
 Member of the American Institute of Architects
 BURMANN ASSOCIATES INC.

Sheet Contents:
 Elevations

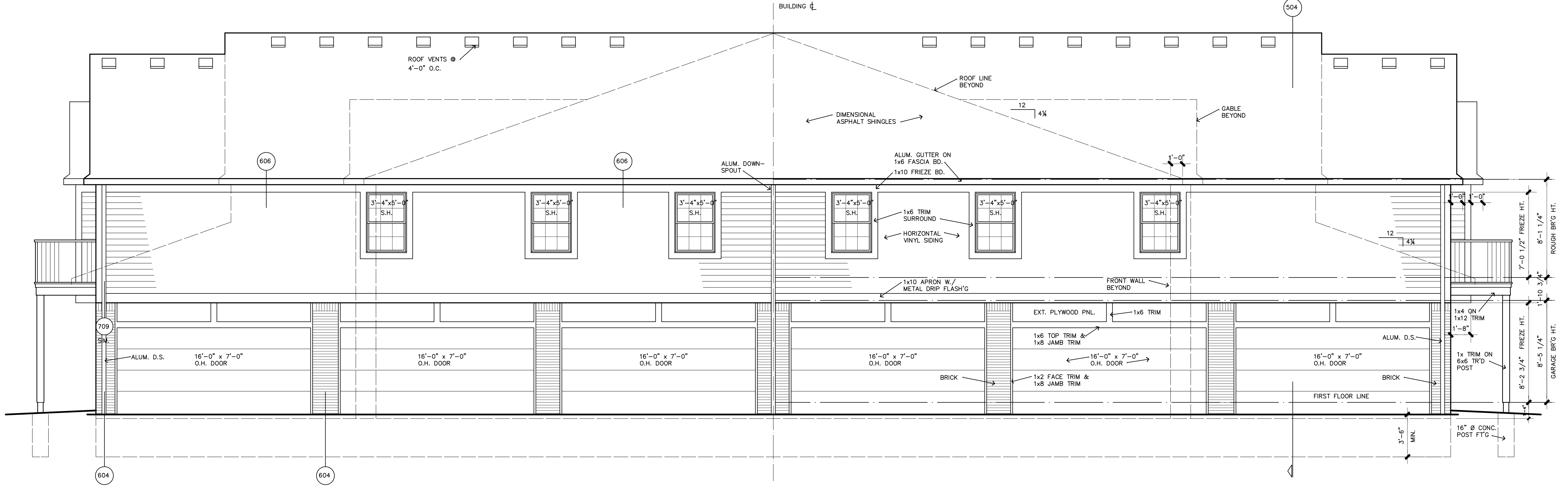
Job: 18173
 Drawn by: MAK
 Date: 17JUL18
 Sheet Number:



Front/Rear Elevation "B"
 Scale: 1/4" = 1'-0"



401 Partial Elevation "B"
 Scale: 1/4" = 1'-0"



Side Elevation "B"
 Scale: 1/4" = 1'-0"

Proposed Condominiums for:
MJC
 12 - Plex Condominiums
 Architects • Engineers • Historic Restorations
 110 W. St. Clair • Romeo • Michigan • 48065-4655
 Office 586-752-9010 • 586-201-1602 Call
 greatarchitects@charter.net
 A.I.A.
 Member of the American Institute of Architects
 BURMANN ASSOCIATES INC.

Sheet Contents:
 Elevations

Job: 18173
 Drawn by: MAK
 Date: 27JUN18
 Sheet Number:



ABERDEEN

First Level	1,182 sf
Second Level	1,091 sf
Total	2,273 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

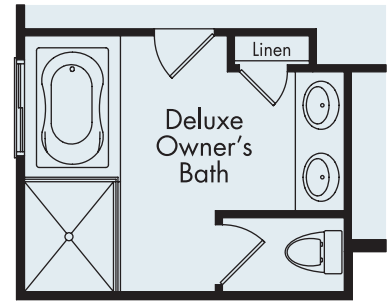
MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

ABERDEEN

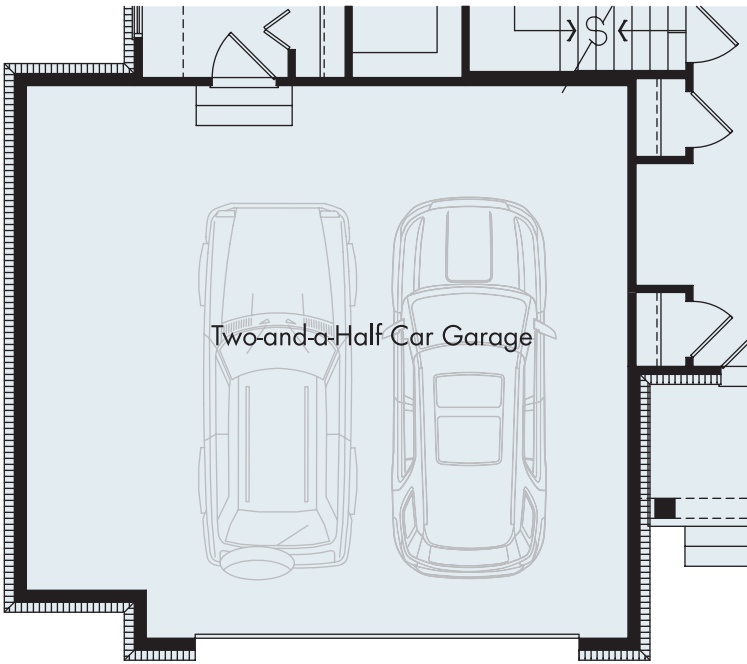
First Level 1,182 sf
 Second Level 1,091 sf
 Total 2,273 sf



The Aberdeen is designed for entertaining and flexible family living. There's smart space for everything — main-floor study, a mud room with an optional bench, island kitchen with walk-in pantry, large family room with fireplace, and options for a covered porch or harvest room off the dining area. Upstairs, there's a convenient laundry room, private wing with an elegant owner's suite, complete with its own luxurious bath and walk-in closet. There are also options for an oversized 2.5-car or 3-car garage.



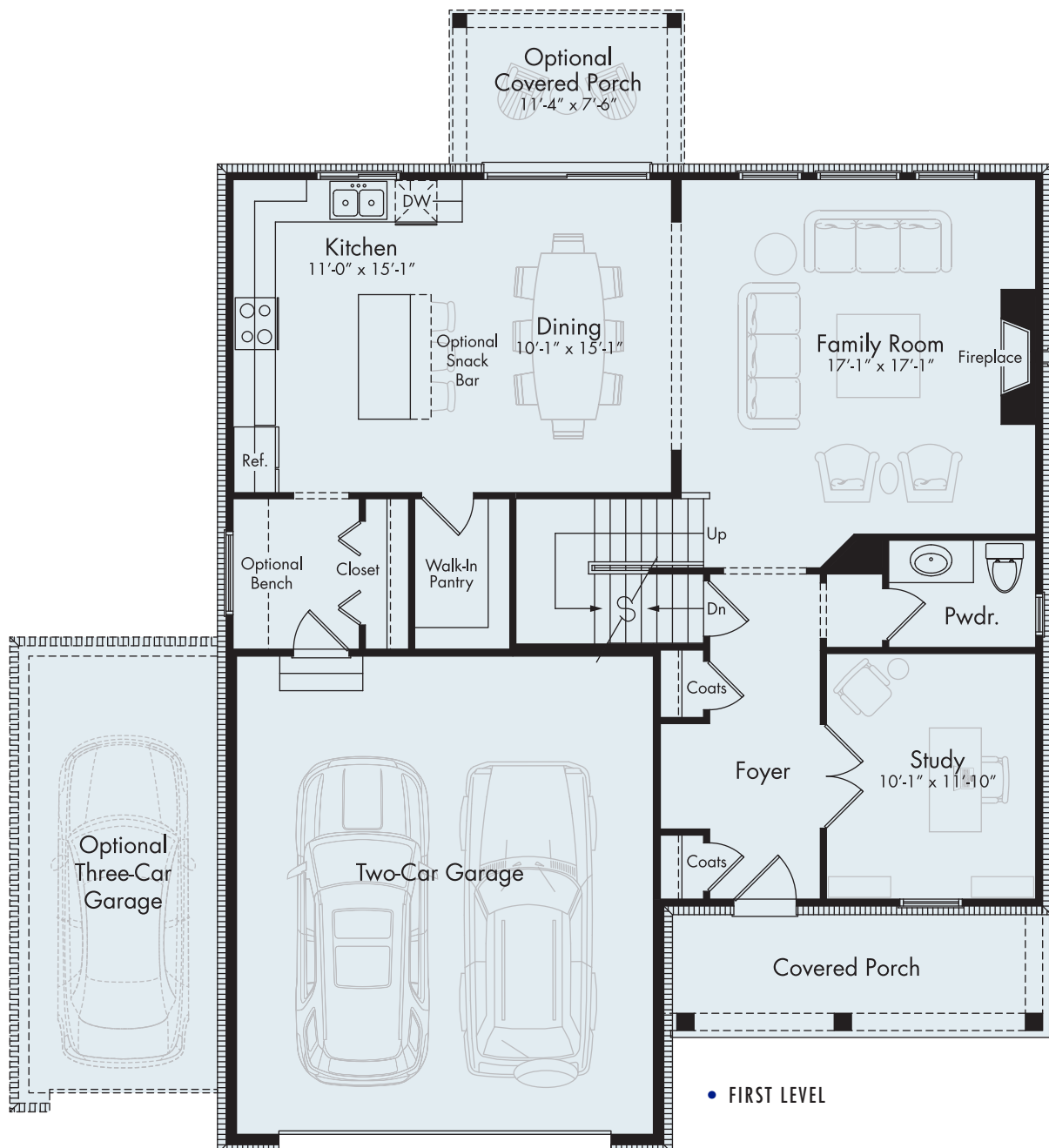
• OPTIONAL DELUXE OWNER'S BATH



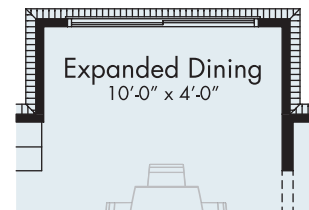
• OPTIONAL TWO-AND-A-HALF CAR GARAGE



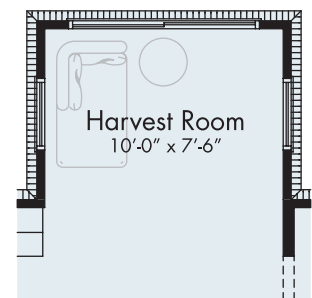
• SECOND LEVEL



• FIRST LEVEL



• OPTIONAL EXPANDED DINING ROOM



• OPTIONAL HARVEST ROOM

The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FRENCH ECLECTIC

American soldiers returned home in the mid-1920's with romantic thoughts of French architecture. This timeless, eclectic style showcases rich exterior materials with tall, steeply pitched roofs, dormers and shutters.



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



MJCompanies.com

All information contained herein was accurate at the time of publication. In order to maintain the high degree of quality and incorporate improvements with greater facilities and economy, we reserve the right to make changes in price, specifications, or materials or to change or discontinue models without notice or obligation. Floor plan dimensions are approximate. Renderings are artist's conception. © 2019 MJC Companies





BERKSHIRE

First Level 1,653 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

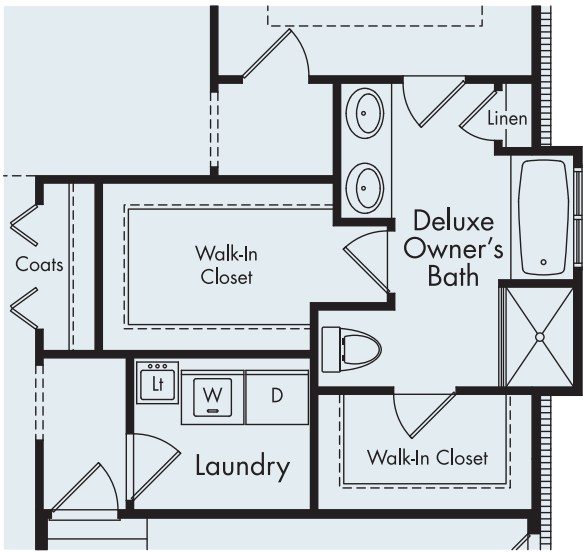
MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

BERKSHIRE

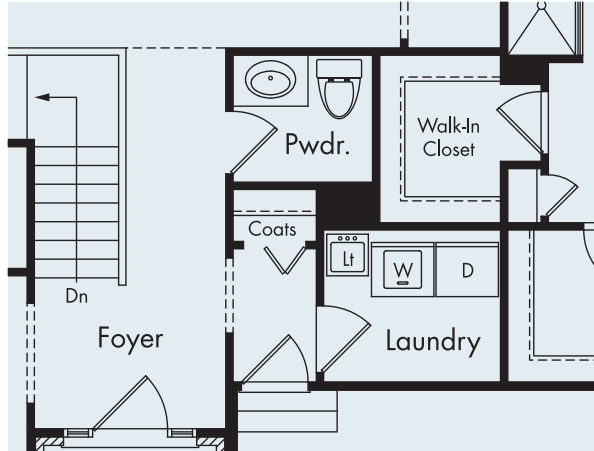
First Level 1,653 sf



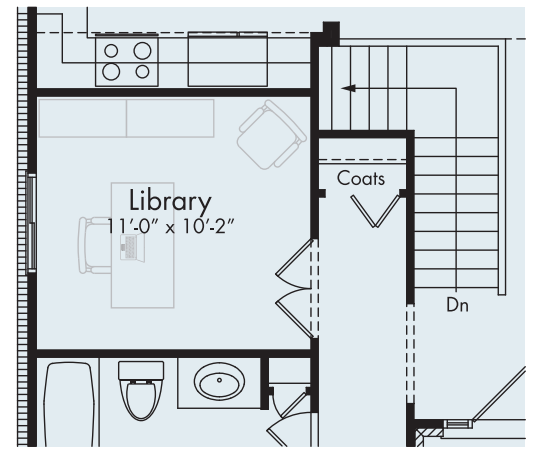
We designed the Berkshire to offer modern, single-level living with a casual touch. The kitchen, family room and dining area have all been brought together to create an open flow for relaxed family times and lively entertaining. Whether you were unwinding in the family room or gathering in the spacious island kitchen, you'll love the natural sunlight that comes in from all the windows in the main living area. The owner's suite showcases the stepped ceiling, spacious private bath and twin walk-in closets. Another wing at the front of the home contains two spacious bedrooms with walk-in closets and access to a second full bath.



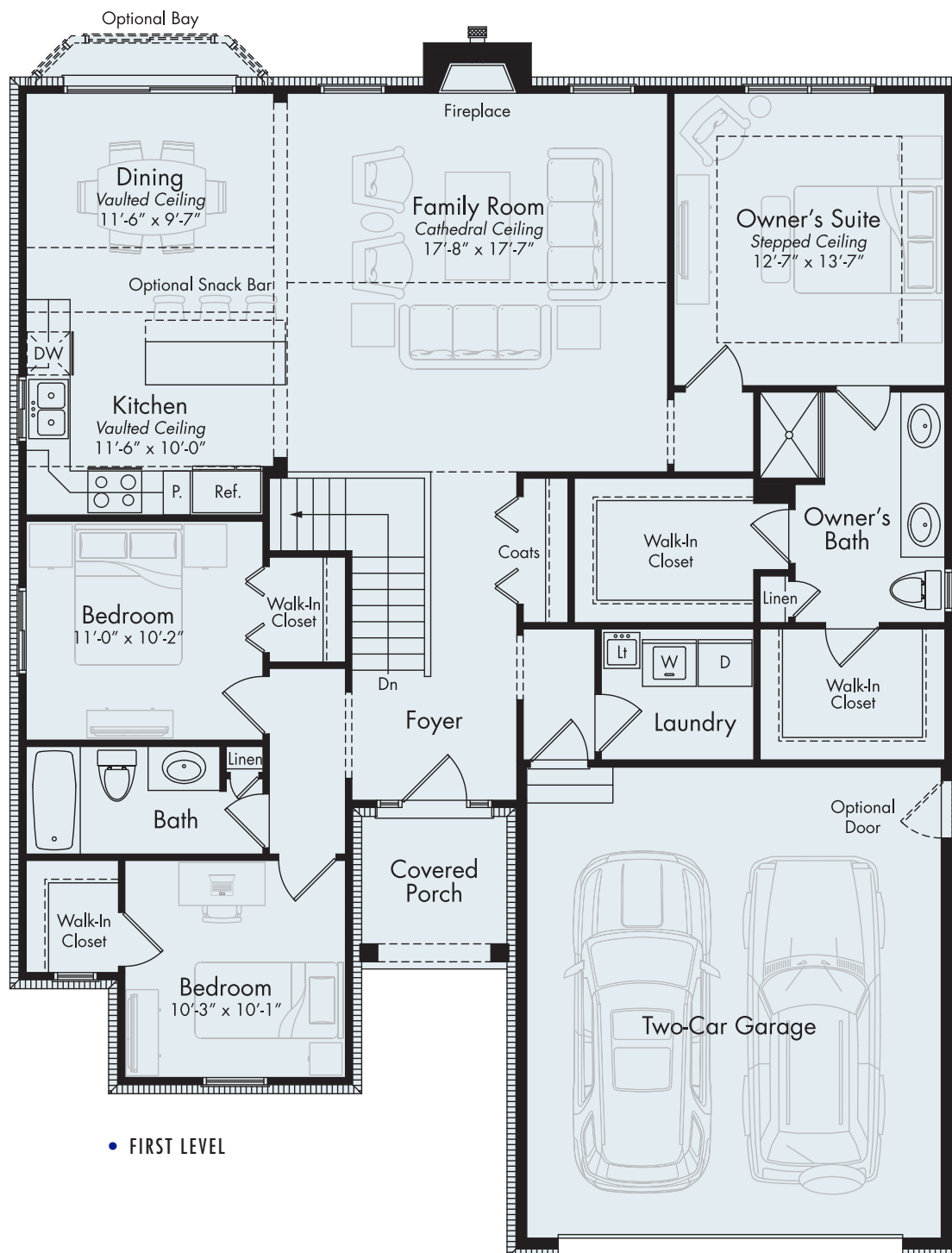
• OPTIONAL DELUXE OWNER'S BATH



• OPTIONAL POWDER ROOM



• OPTIONAL LIBRARY



• FIRST LEVEL

The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FRENCH ECLECTIC

American soldiers returned home in the mid-1920's with romantic thoughts of French architecture. This timeless, eclectic style showcases rich exterior materials with tall, steeply pitched roofs, dormers and shutters.



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



MJCompanies.com

All information contained herein was accurate at the time of publication. In order to maintain the high degree of quality and incorporate improvements with greater facilities and economy, we reserve the right to make changes in price, specifications, or materials or to change or discontinue models without notice or obligation. Floor plan dimensions are approximate. Renderings are artist's conception. © 2019 MJC Companies





BURBANK

First Level	1,332 sf
Second Level	1,160 sf
Total	2,492 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

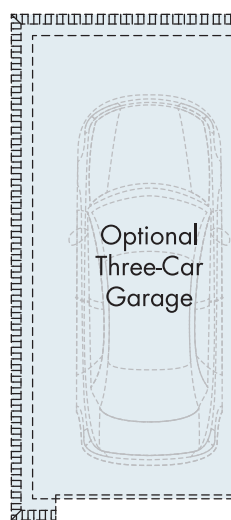
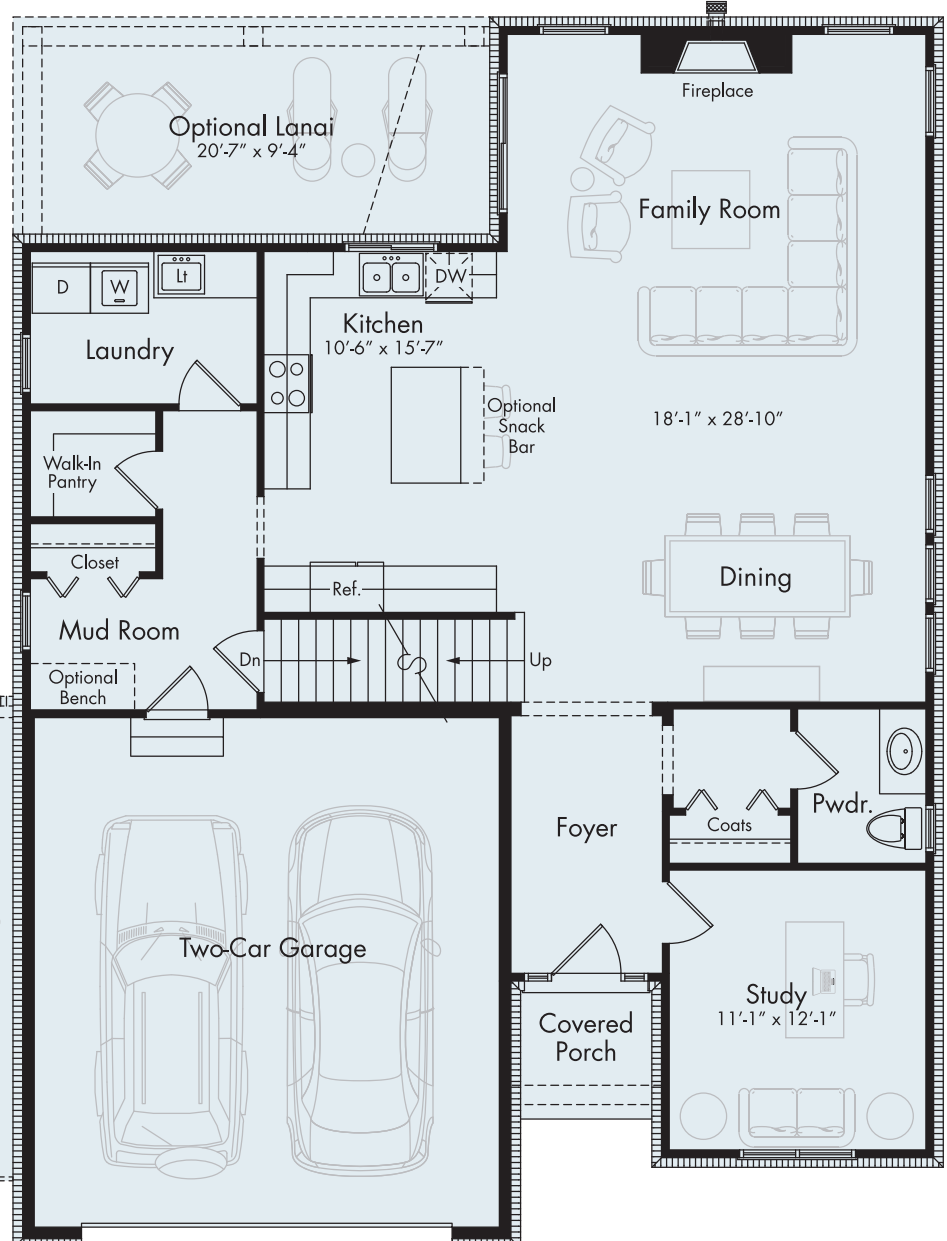
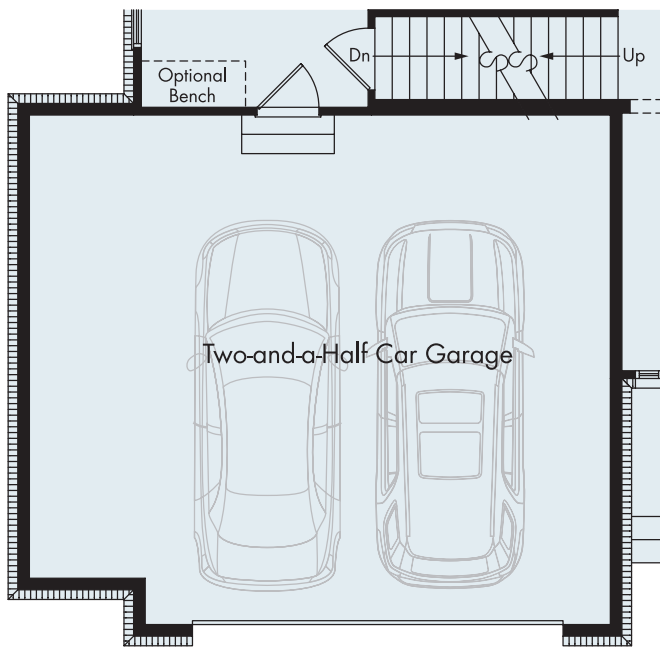
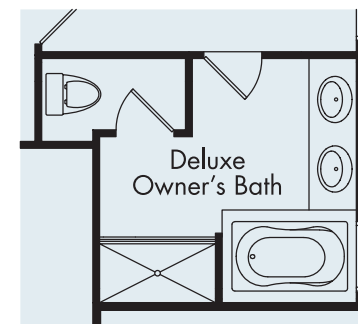
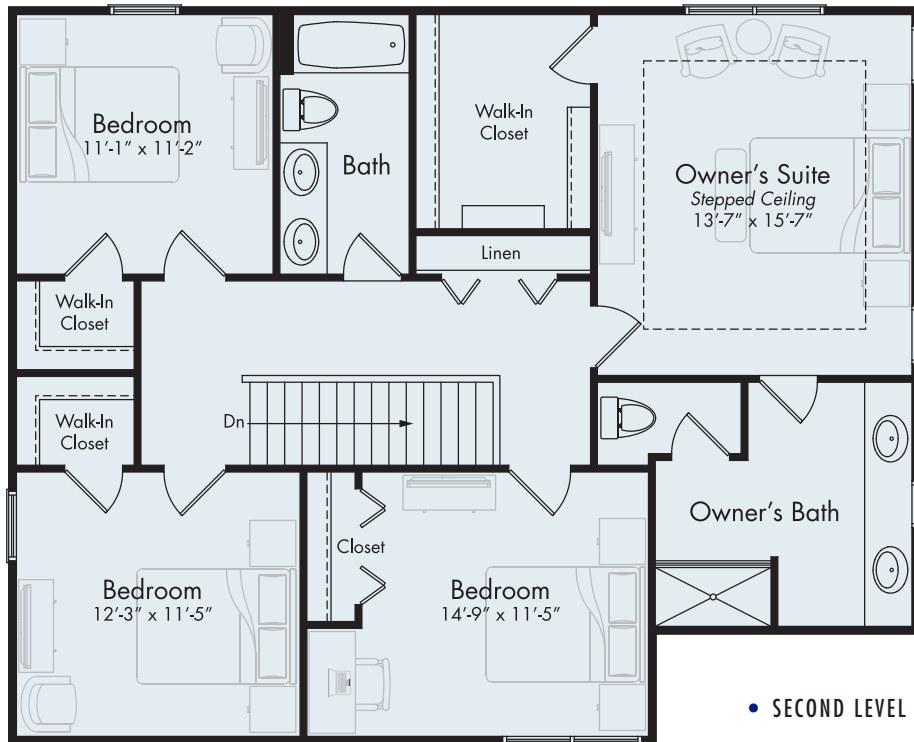
BURBANK

First Level 1,332 sf
 Second Level 1,160 sf
 Total 2,492 sf



The two-story Burbank is a stunning open concept plan with an L-shaped living area that includes the family room, oversized dining room and enormous island kitchen. The optional lanai vastly increases the living space and brings the outdoors into this spacious home. The main floor also includes a secluded study, guest closet, powder room, mud room, walk-in pantry and laundry room. No convenience was overlooked, including the option of a 2.5- or 3-car garage.

Upstairs, the owner's suite features a stepped ceiling, spacious bath with an optional whirlpool tub and oversized walk-in closet. Three more large bedrooms share a central bath with double sinks. No convenience was overlooked, including the option of a 2.5- or 3-car garage.



The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



CAMPBELL

First Level	1,217 sf
Second Level	1,402 sf
Total	2,619 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

CAMPBELL

First Level 1,217 sf
 Second Level 1,402 sf
 Total 2,619 sf

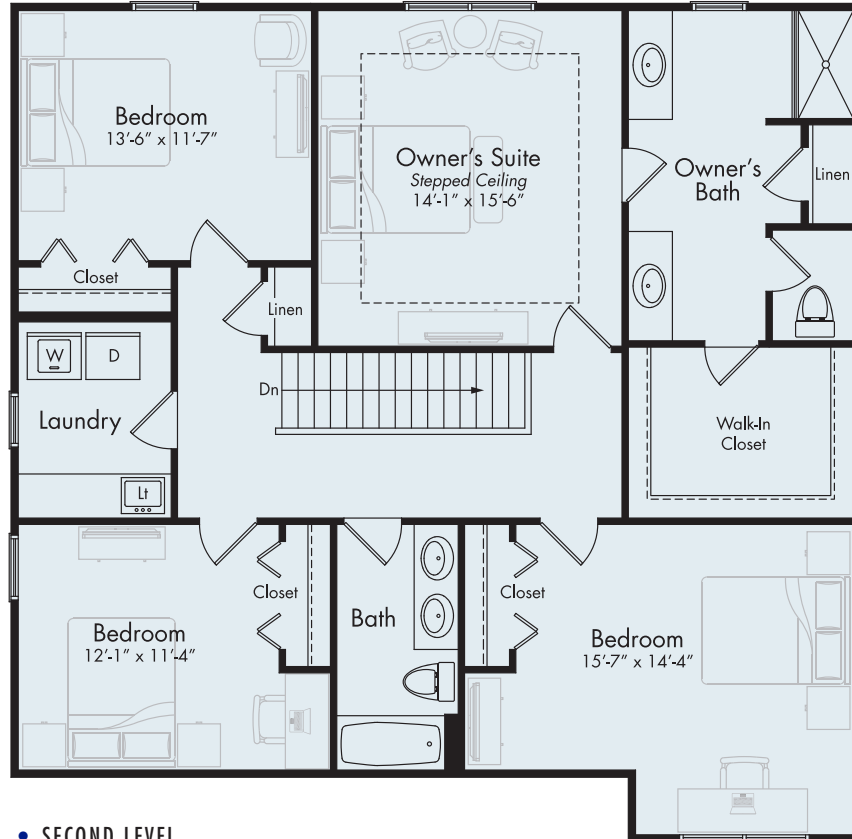


The four-bedroom Campbell is an ideal family home with two spacious levels. The foyer opens to reveal the family room with its centered fireplace and triple windows. This sunny dining room with its sliding glass doorwall can extend outdoors for an optional covered porch. The U-shaped kitchen is centered on a convenient island with snack bar seating. The main floor also includes a secluded study, powder room, mud room and walk-in pantry.

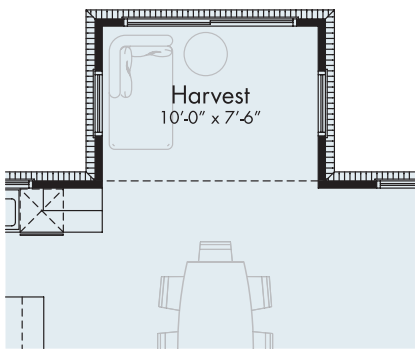
The upper level showcases the owner's suite with stepped ceiling, spacious bath with twin vanities, and large walk-in closet. There is also an option to include a whirlpool tub. There are three more bedrooms on the second floor along with a full bath and oversized laundry room.



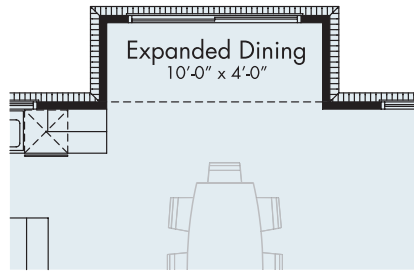
• OPTIONAL DELUXE OWNER'S BATH



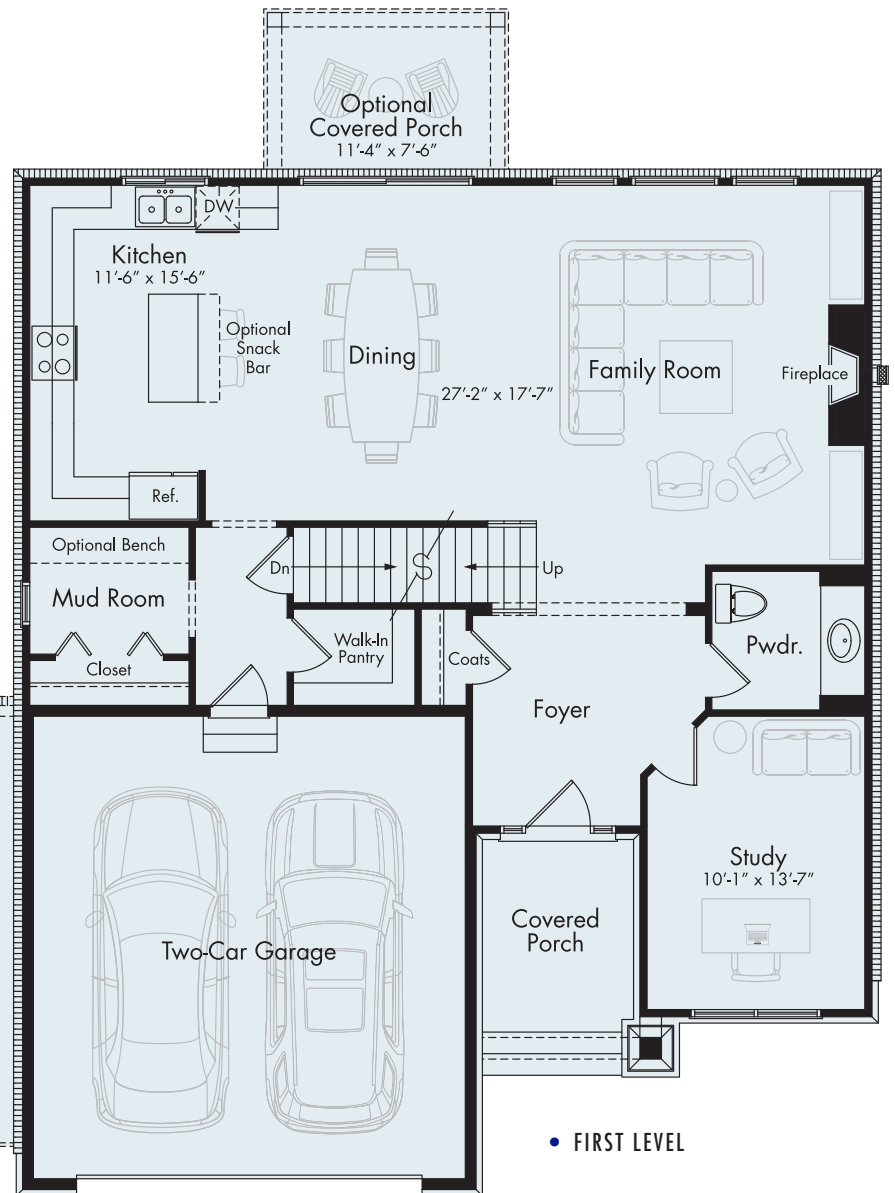
• SECOND LEVEL



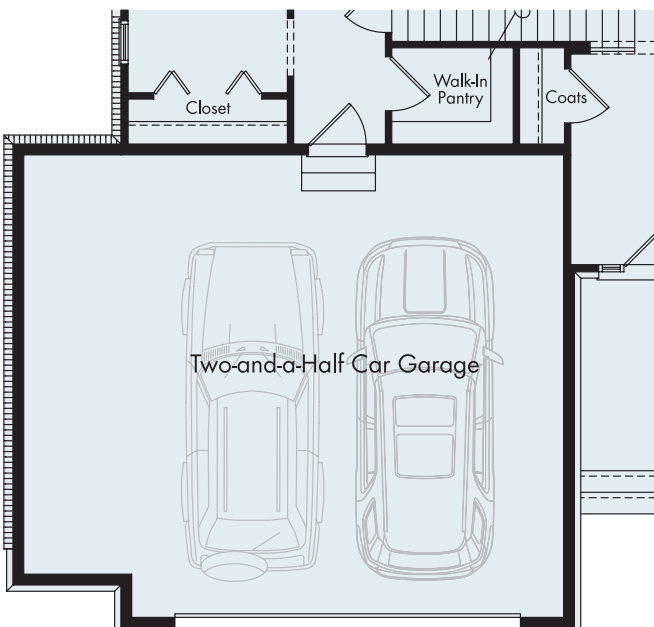
• OPTIONAL HARVEST ROOM



• OPTIONAL EXPANDED DINING ROOM



• FIRST LEVEL



• OPTIONAL TWO-AND-A-HALF CAR GARAGE



For Information Visit
MJCCompanies.com

The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



CYPRESS

First Level 1,539 sf

THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

CYPRESS

First Level 1,539 sf



If you're looking for the perfect ranch floor plan with no wasted space, then the Cypress is ideal for you! The open island kitchen, dining area with its optional bay window, and family room with a cozy fireplace, will keep your family together and enhance the connections during special times hosted at your home. The Cypress also keeps privacy in mind with the elegant owner's suite and two additional bedrooms and a full bath nicely separated from the living space. The 2-car garage opens to a large mud room with a closet and adjacent laundry room.



• FIRST LEVEL



For Information Visit
MJCCompanies.com



MJCompanies.com

All information contained herein was accurate at the time of publication. In order to maintain the high degree of quality and incorporate improvements with greater facilities and economy, we reserve the right to make changes in price, specifications, or materials or to change or discontinue models without notice or obligation. Floor plan dimensions are approximate. Renderings are artist's conception. © 2019 MJC Companies





DAVENPORT

First Level	1,411 sf
Second Level	1,293 sf
Total	2,704 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

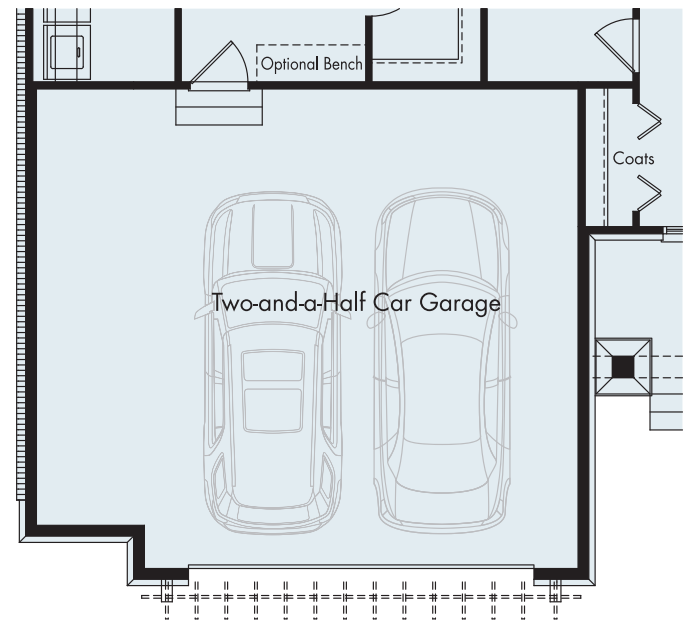
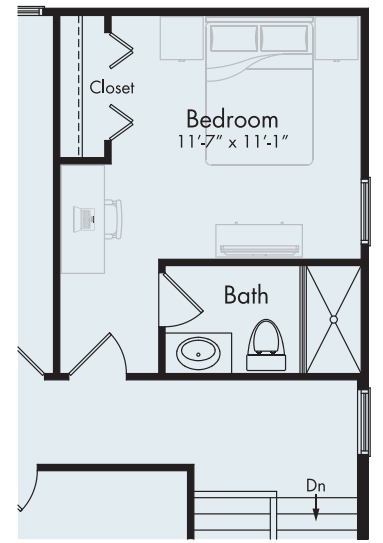
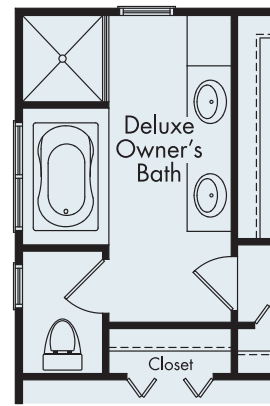
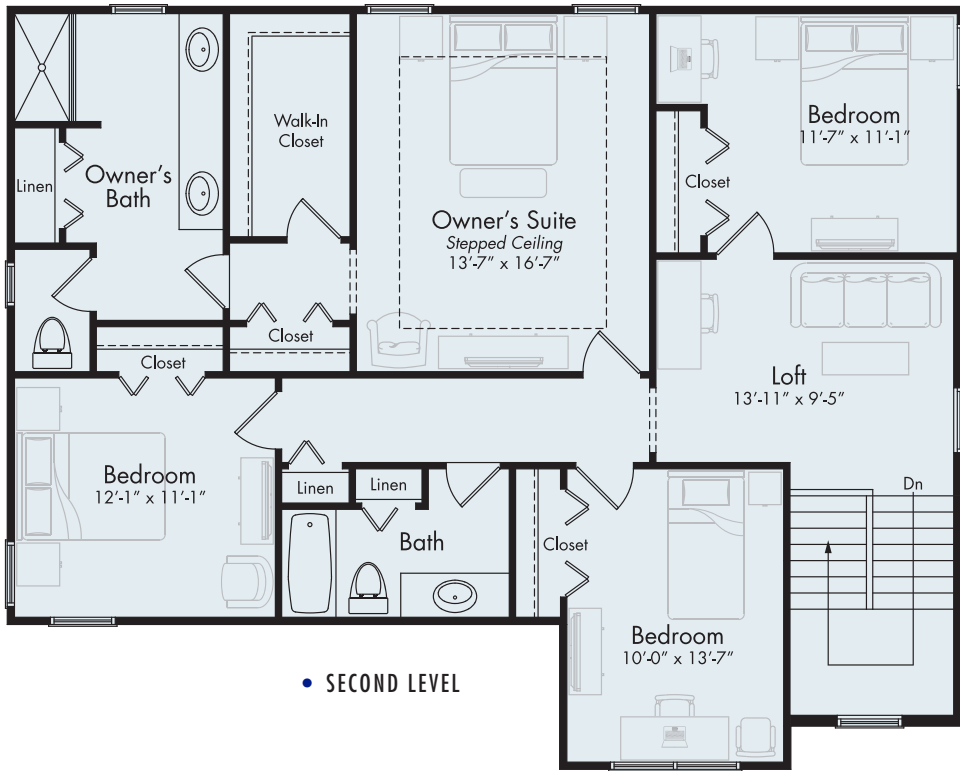
DAVENPORT

First Level 1,411 sf
 Second Level 1,293 sf
 Total 2,704 sf



Fall in love with the spacious open flow of the Davenport's main floor living area. The Davenport offers an imaginatively designed two-story home with an inviting central family room with a cozy fireplace and triple windows. The adjoining kitchen is a dream with lots of counter space and a functional island with optional snack bar seating. The dining room is extended beyond the balance of the room with triple windows and a French door. A flex-room is a pleasant surprise off this area with its double doors and double window. The first floor also offers a powder room, mud room, laundry and walk-in pantry.

The second floor showcases four bedrooms including the owner's suite with its stepped ceiling, plenty of closet space and an elegant bath with the option of a spa tub and stall shower. There is an option for a second bedroom suite with a full bath on this level or a large loft as the standard. A covered front porch adds a distinctive touch to the home as well as an optional 2.5-car or 3-car garage.



The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



MJCompanies.com

All information contained herein was accurate at the time of publication. In order to maintain the high degree of quality and incorporate improvements with greater facilities and economy, we reserve the right to make changes in price, specifications, or materials or to change or discontinue models without notice or obligation. Floor plan dimensions are approximate. Renderings are artist's conception. © 2019 MJC Companies





EASTWIND

First Level 1,848 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

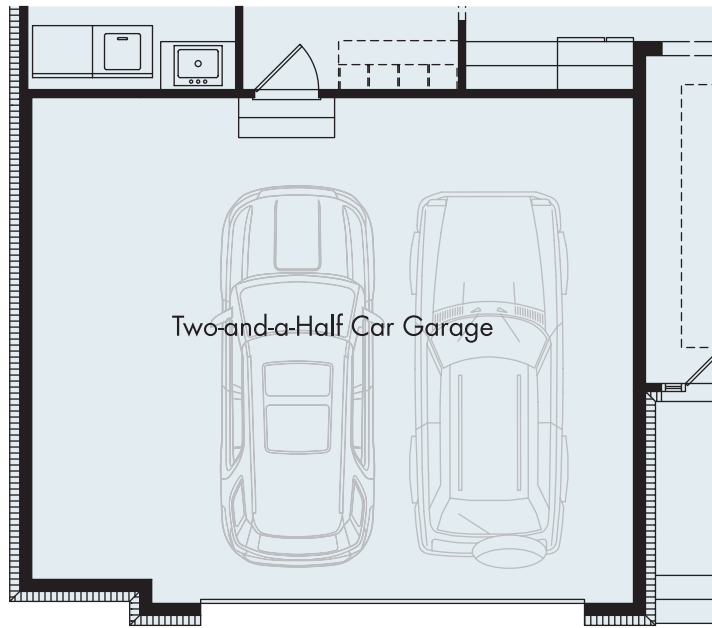
EASTWIND

First Level 1,848 sf

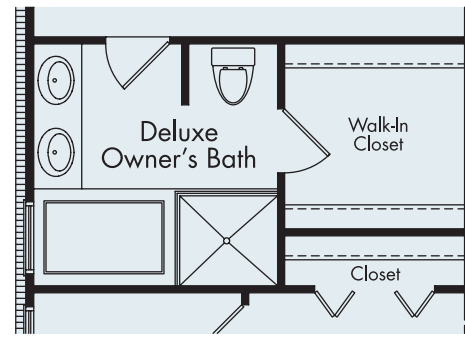


Love the open layouts offered by modern ranch designs, but want more space? The Eastwind is the floor plan for you – with no wasted space. The kitchen, with its oversized island, is the heart of the home with the adjoining dining and family room and a cozy fireplace, abundant windows and stepped ceiling. This creative space will keep your guests well entertained during special occasions.

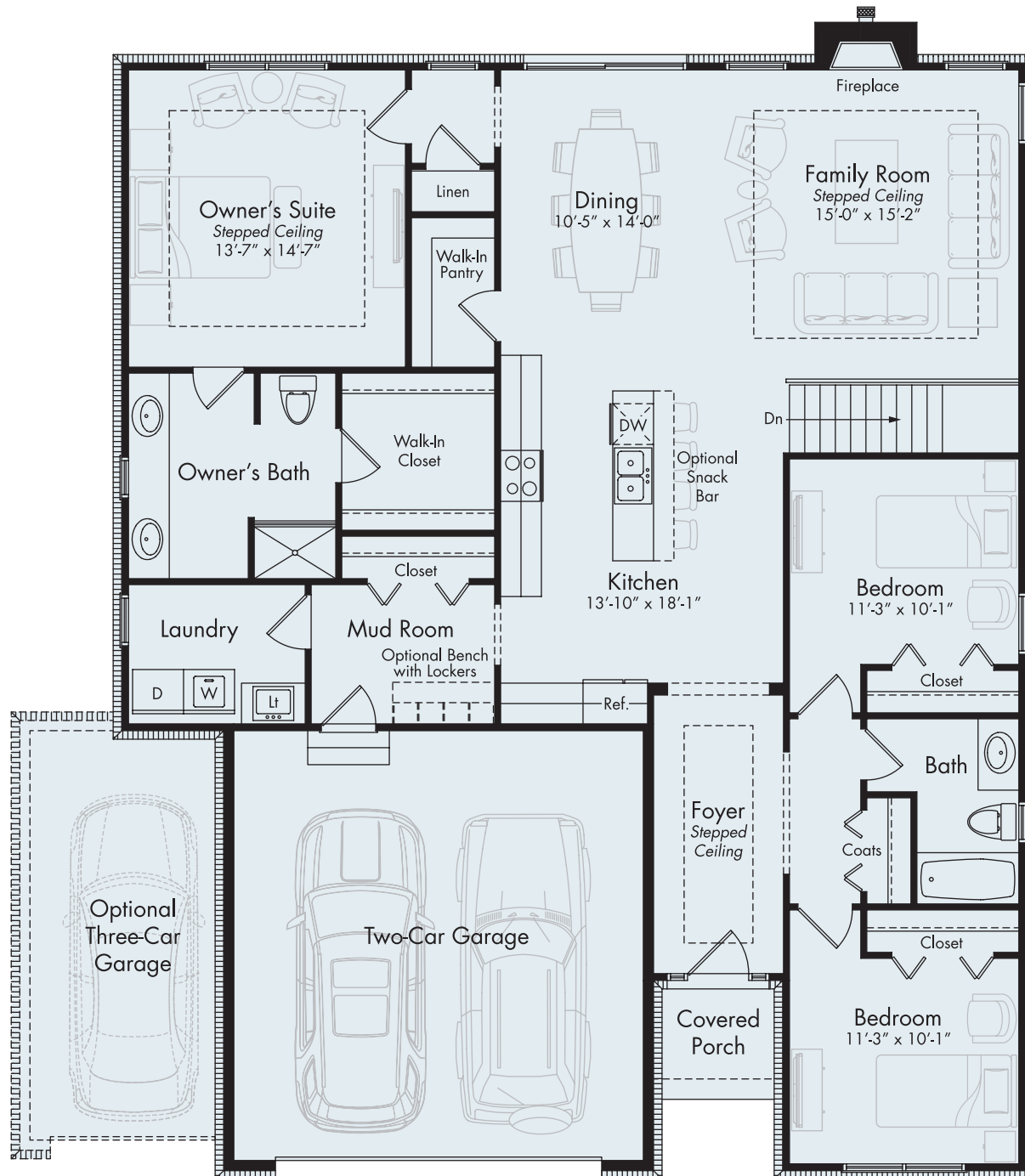
Two bedrooms are tucked away off the foyer with a central bath to share. An owner's suite offers an extra measure of privacy and elegance with its stepped ceiling, spacious bath and an optional soaking tub and large walk-in closet. The garage offers options for 2.5-cars and 3-cars, opens to a mud room with optional bench and lockers and a central laundry room.



• OPTIONAL TWO-AND-A-HALF CAR GARAGE



• OPTIONAL DELUXE OWNER'S BATH



• FIRST LEVEL

The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



MJCompanies.com

All information contained herein was accurate at the time of publication. In order to maintain the high degree of quality and incorporate improvements with greater facilities and economy, we reserve the right to make changes in price, specifications, or materials or to change or discontinue models without notice or obligation. Floor plan dimensions are approximate. Renderings are artist's conception. © 2019 MJC Companies





EVANSTON IV

First Level	797 sf
Second Level	1,139 sf
Total	1,936 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

EVANSTON IV

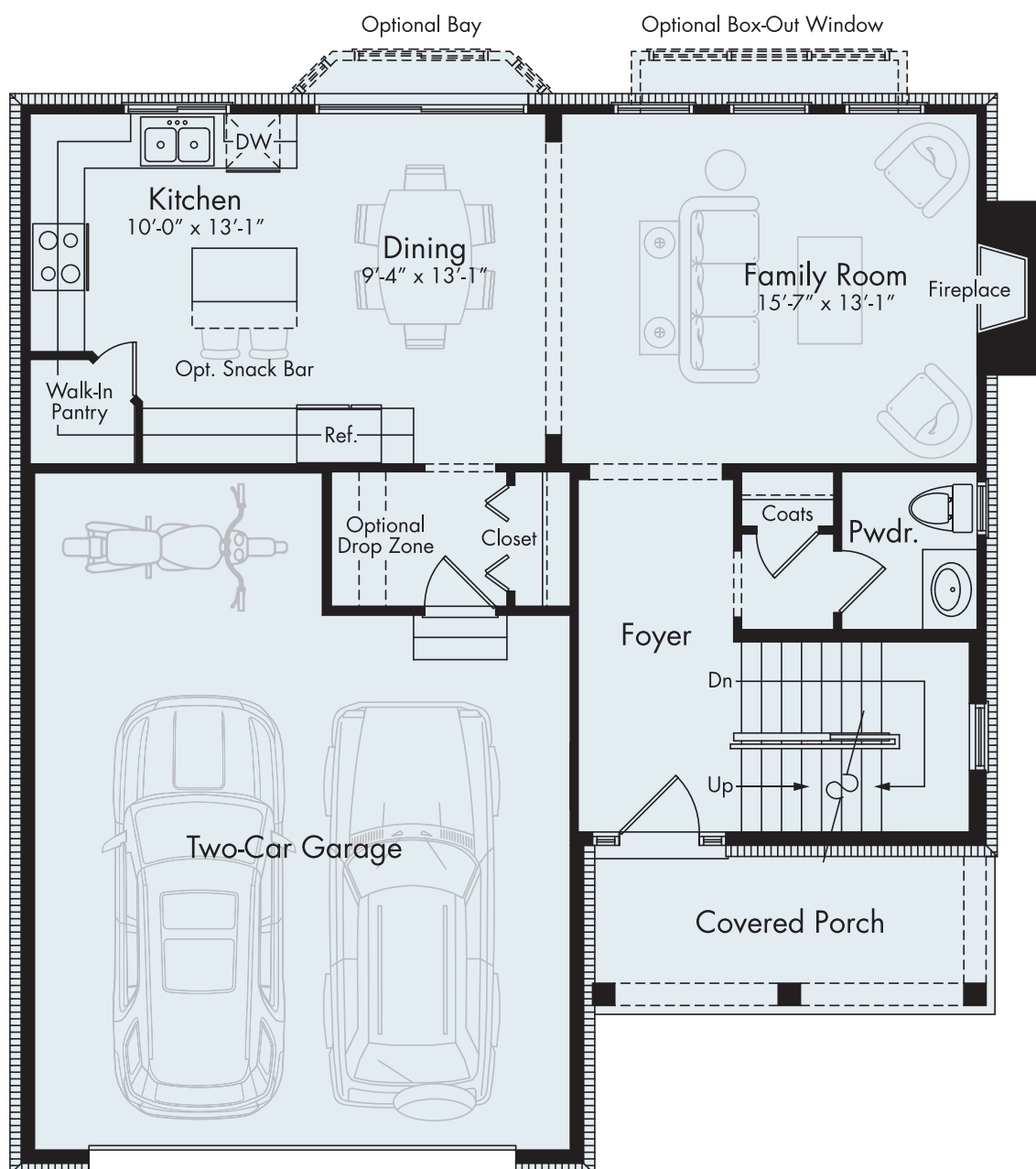
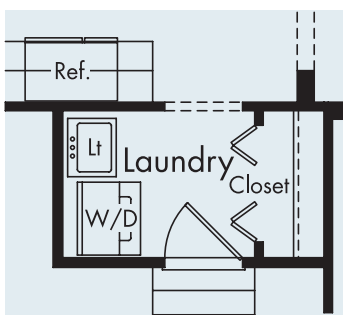
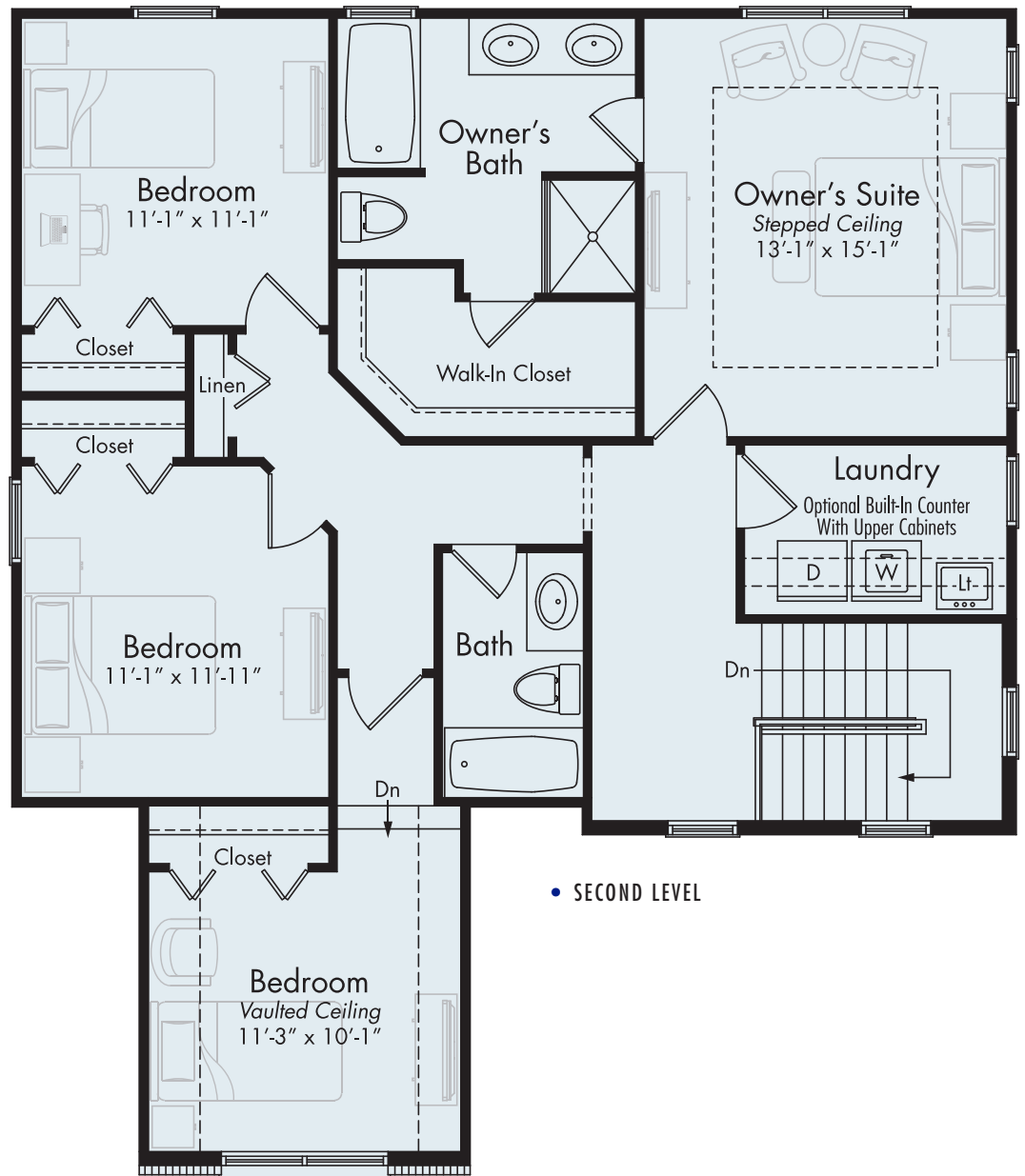
First Level 797 sf
 Second Level 1,139 sf
 Total 1,936 sf



This home is a two-story masterpiece. Featuring a charming front porch with columns, the Evanston IV opens to a large foyer with a guest closet and powder room. The huge U-shaped kitchen, a dining area and family room are bathed in sunlight from lots of windows and sliding glass doorwall with options for a bay and box-out windows to further enhance the open feeling.

Upstairs, the owner's suite boasts a stepped ceiling, elegant bath with separate tub, shower and walk-in closet. There are three more bedrooms on the second floor, along with a central bath and convenient laundry room.

The garage opens to an optional drop zone or second laundry area.



For Information Visit
MJCCompanies.com

The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.



WASHINGTON

First Level	1,147 sf
Second Level	1,092 sf
Total	2,239 sf

THE CRAFTSMAN

Craftsman architecture has been one of America's most iconic styles for decades. The historic design includes an array of distinctive porches, gables, siding materials and stately rooflines.

THE NEXT GENERATION OF STYLE

MJC homes are a lot like custom homes without the expense and added stress of starting with a blank canvas. Begin by browsing our newest collection of modern living designs and personalize the spaces that matter most to your family. Want a special style of cabinets and countertops? Unique flooring options? It's up to you. Personalize one of our award-winning home designs to your heart's content. Then sit back and watch your worry-free building experience unfold. Come explore your options to live better with MJC.

WASHINGTON

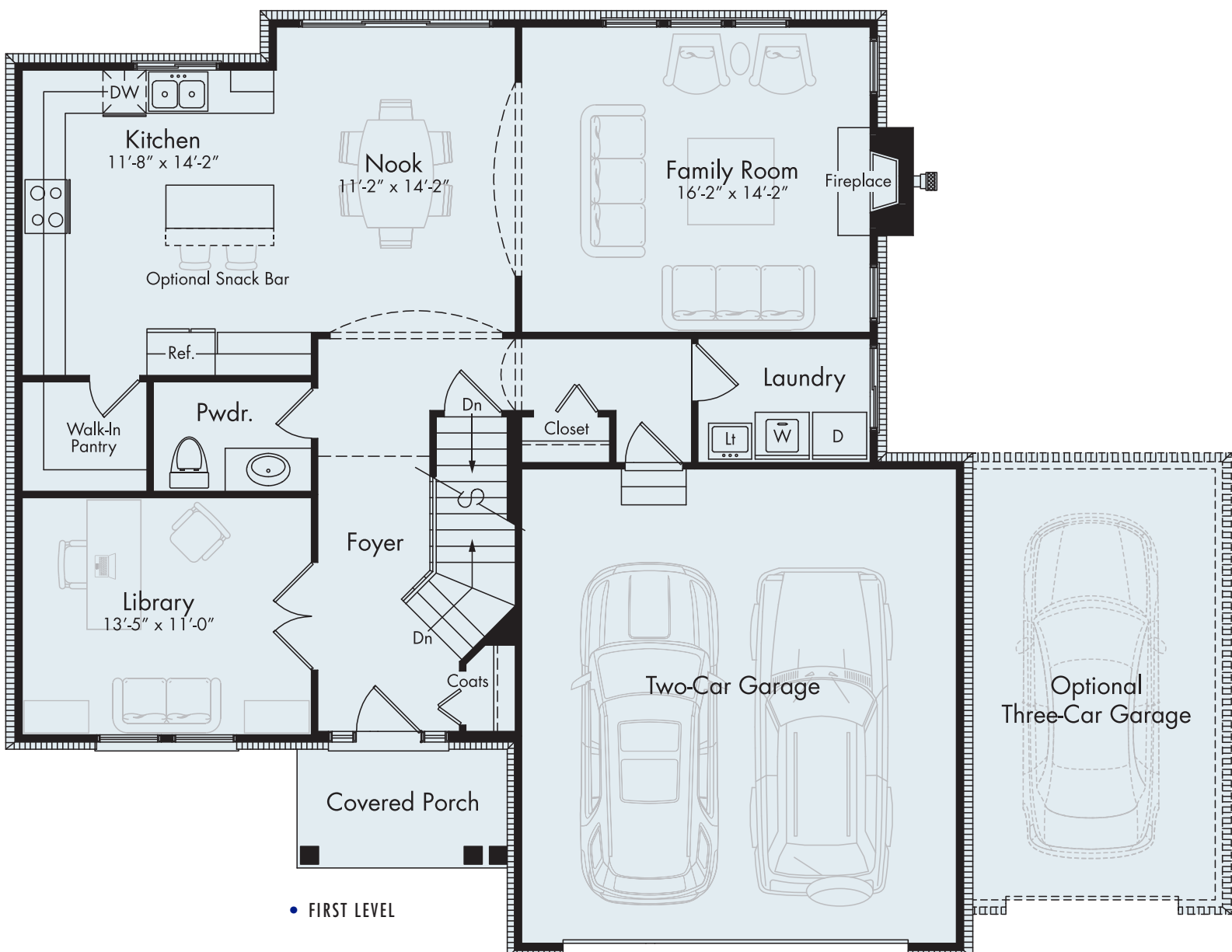
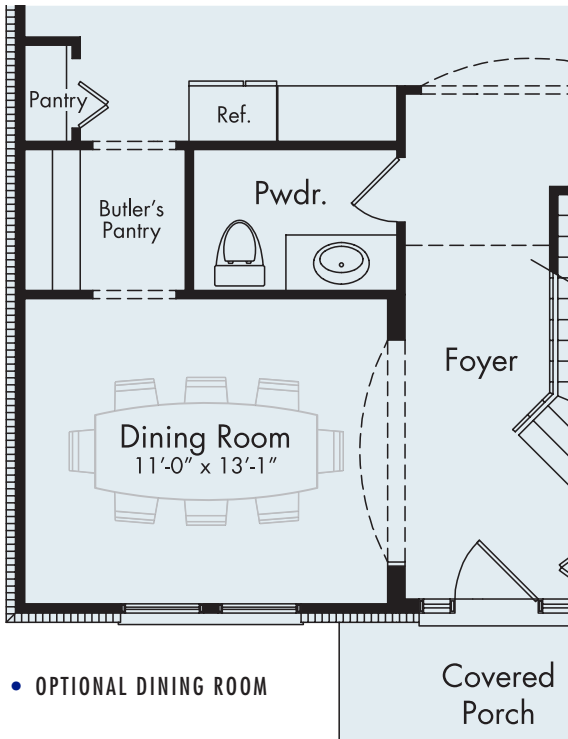
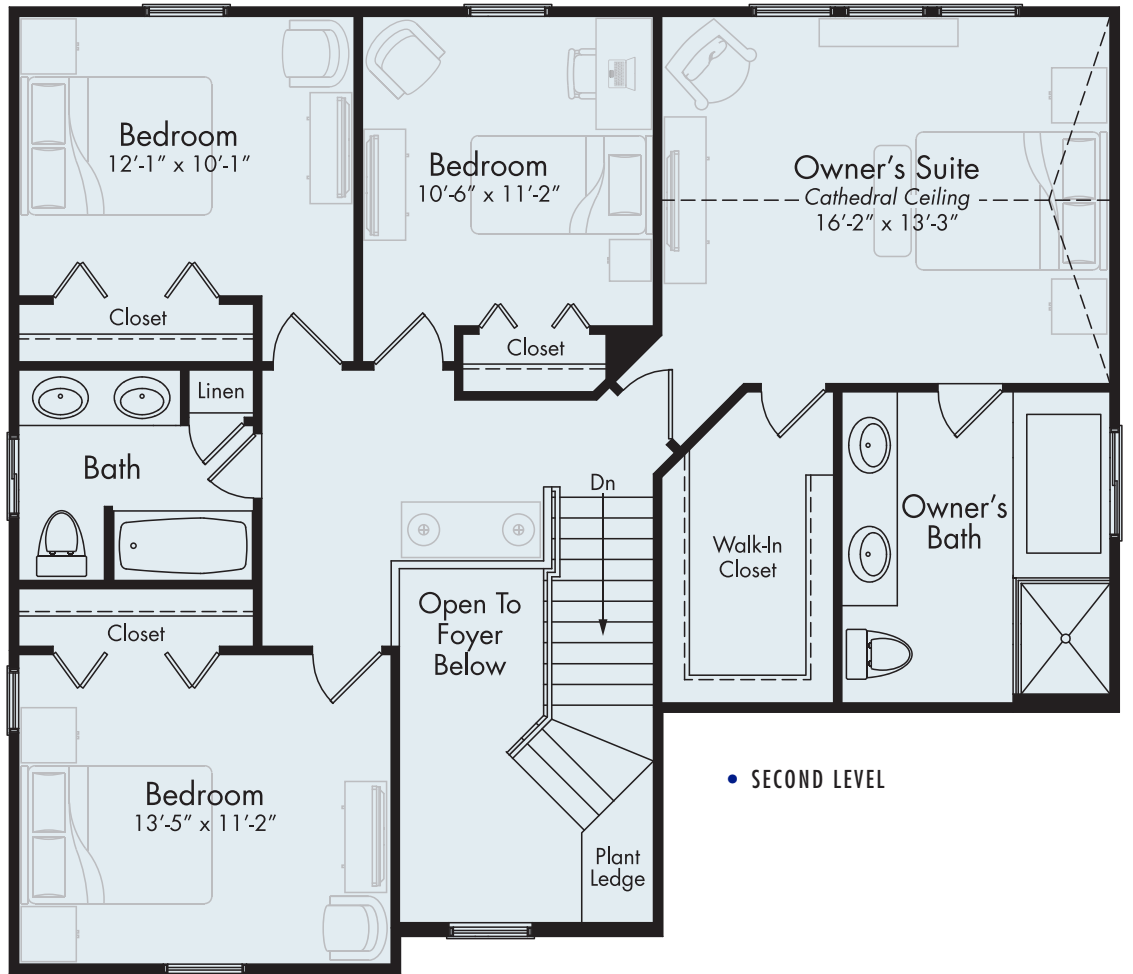
First Level 1,147 sf
 Second Level 1,092 sf
 Total 2,239 sf



The Washington is a very unique floor plan that lives large thanks to its two-story foyer and very open, flowing first floor living area. The foyer opens to a cozy library or optional formal dining room with butler's pantry. The spacious island kitchen, dining nook and family room keep the family connected and engaged.

The second level owner's suite offers a cathedral ceiling, triple windows and an elegant spa bath with separate tub and shower. Three additional bedrooms share a central bath and space for a study station.

A 2-car or optional 3-car garage leads to a mud room and convenient laundry. You'll love this home from the moment you enter from the covered porch.



The Wide Choice of Elevations Create a Varied and Appealing Streetscape in Your Neighborhood



THE FARMHOUSE

Modern farmhouse architecture evokes feelings of warmth and comfort. This historic style combines clean lines with rustic touches to provide a relaxed level of sophistication.



THE TRADITIONAL

MJC's traditional elevation styles are modern interpretations of classic forms that provide an attractive, cohesive look to the community. Our traditional elevations offer eye-pleasing symmetry, brick details and timeless color palettes.

COMMUNITY IMPACT STATEMENT

- 1.0 General Project Information
 - 1.1 Project Overview
 - 1.2 Master Plan Analysis
 - 1.3 Surrounding Uses

- 2.0 Community and Facilities Services
 - 2.1 Police and Fire Demand
 - 2.2 Utilities
 - 2.3 Stormwater Management

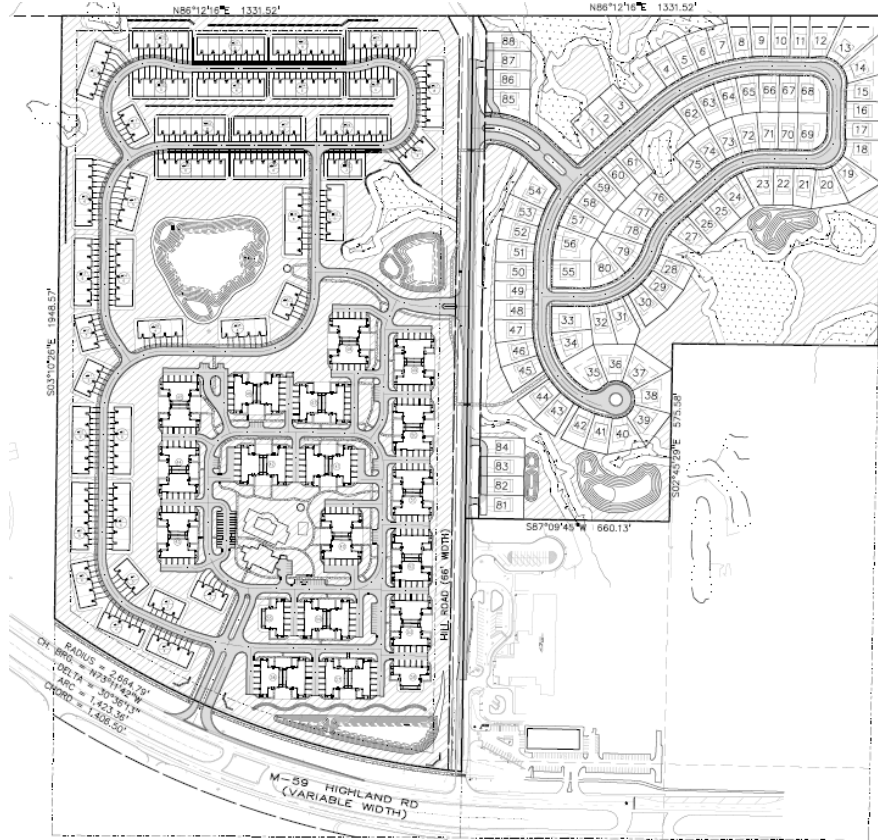
- 3.0 Economics
 - 3.1 Tax Revenues Analysis
 - 3.2 Job Analysis

- 4.0
 - 4.1 Natural resources Analysis
 - 4.2 Hazardous Materials
 - 4.3 Air Quality Impact
 - 4.4 Groundwater Impact
 - 4.5 Noise

- 5.0 Traffic

- 6.0 Development Statement

WHITE HILL LAKE, LLC



The Avalon

APARTMENT HOMES

&

The Residences at Avalon

PRELIMINARY PD SITE PLAN

APPLICATION & COMMUNITY IMPACT STATEMENT

SECTION 1: GENERAL PROJECT INFORMATION

1.1 Project Overview

Avalon is a proposed residential community consisting of 88 single-family homes on the east side of Hill Road and 406 attached apartment units on the west side of Hill Road with an associated clubhouse/pool and other amenities. The project shall include open space and other elements as set forth in the PD plan. The project will include approximately 30.1 acres of total open space. This site is currently designated as vacant and is zoned AG -Agricultural, PB-Planned Business, and R-1A -single-family residential and currently petitioning to be rezoned to PD, Planned Development.

The proposed land use consists of multi-family and single-family residential units. The project total 494 units and will have 4.49 units per acre for the total acreage of the Property.

Unit counts for the proposed The Avalon Apartment Homes and The Residences at Avalon uses are as follows:

Multi-Family Units (64.82 Net Acres):	406 units
<u>Single-Family Units (30.66 Net Acres):</u>	<u>88 units</u>
(95.48 Net Acres)	494 units

The Residences at Avalon Planned Development (PD) proposes single-family condominium homes with a density of 2.8 du/acre, which is consistent with the Township Master Plan for residential densities anticipated to range between 2.0 and 8.0 units per acre. The Township Master Plan for multi-family residential development densities are expected to range between 6.0 and 10.0 units per acre and Avalon's Planned Development (PD) proposes 6.3 du/acre which is also consistent.

1.2 Master Plan Analysis

- **Value communities and neighborhoods** – The Avalon will be an exclusive neighborhood community targeting demographics of all ages. The development will focus on quality building materials and attention to architecture details.
- **Walkable neighborhoods** – In addition to sidewalks proposed on both sides of the planned internal roadways, the development will also have a system of winding pathways within the extensive open space areas.

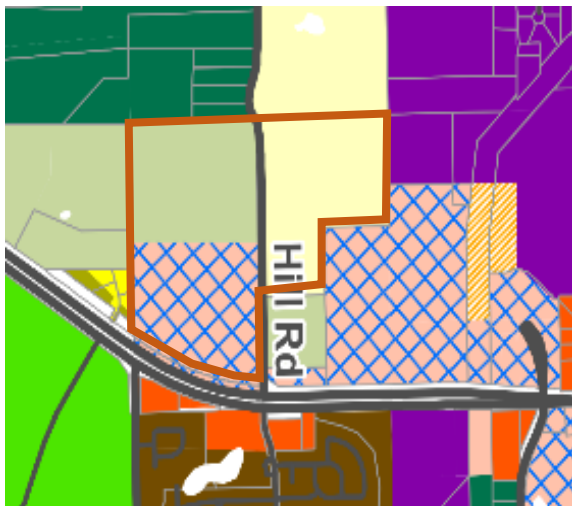
- **Variety of recreational facilities** – The Avalon proposed sidewalks and interconnectivity within the community, dog park, gazebo, benches, clubhouse, pool and fitness center consisting of a Yoga room, business center, dog wash to accommodate residents of all ages, interests, and physical abilities.

Refer to the Preliminary Site Plan for additional information of the neighborhood layout and representative architectural details.

1.3 Existing Surrounding Uses

The existing surrounding uses for the subject site are residential land uses of varying densities. These existing uses are as follows:

Location	Existing Land Use	Master Plan	Existing Zoning
Site	Vacant	Planned Community & Planned Neighborhood	Agricultural and PB Planned Business on the west side of Hill Rd & R-1A, Single Family Residential on the east side of Hill Rd
North	Single-Family Residential	Planned Neighborhood and Rural Estates	SF, Suburban Farm & R-1A Single-Family Residential
East	Vacant School Building	Planned Business	PD, Planned Development, PB, Planned Business and AG, Agricultural
South	Single family residential	Mobile Home	MHP, Mobile Home Park
West	Vacant, public institutional and single-	Planned Neighborhood	AG, Agricultural and R-1B, Single Family Residential



SECTION 2: COMMUNITY AND FACILITY SERVICES

2.1 Police and Fire Demand

This Development has been reviewed by both Public Safety and the Fire Department. A fiscal impact statement is prepared and attached to the CIS to determine the annual tax revenue. The additional annual tax revenue at full buildout will be approximately \$1,760,000.

2.2 Utilities

Utility services will be provided by existing public water and sewer systems in the area. The development proposes a total of 88 single-family homes and 406 attached apartment unit connections to the existing public utilities. We estimate of 36,500 gallons per year per person, based on the 10 States Standards Calculations.

All Utility lines, structures, and trenches shall be constructed in accordance with the standards and requirements of White Lake Township, the County of Oakland and EGLE. All hydrants will be a minimum of 5' from back of curb.

Water main extensions to the existing mains will be constructed on-site to provide for a looped system in accordance with the Township standards and placed within a public easement, with connections to existing proposed 12" watermain to connect to existing stub along Hill Rd. There is a proposed 18" sanitary, 16' water main along Highland Road. There will be 10" sanitary sewer along Hill Road for future connection.

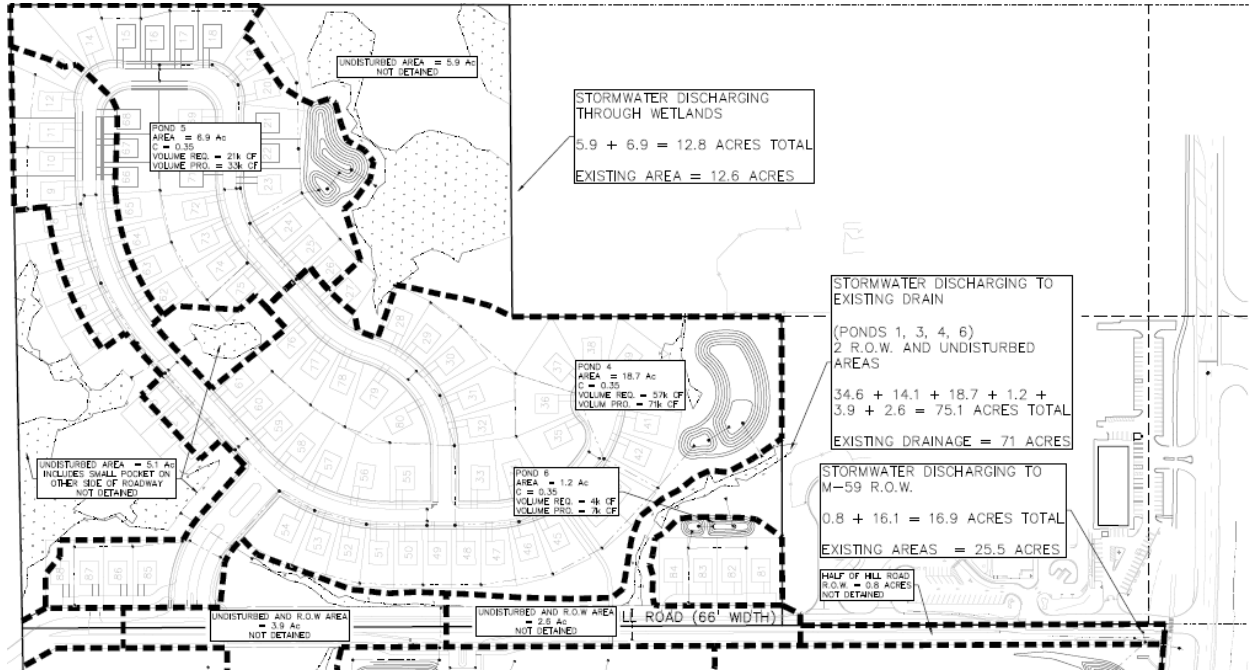
2.3 Stormwater Management

Stormwater management for quality treatment and storage will be provided in proposed detention basin optimally located at the southeast end of Highland Rd. These basins will be designed and approved in accordance with the Township and Oakland County Water Resource Commissioner (OCWRC) standards to accommodate a 100-year frequency storm runoff from the proposed development.

Stormwater management is outlined in the attached site plan. Stormwater runoff is proposed to have three detention ponds in the multi-family site at the northwest corner of Hill Road and M-59 and to discharge to existing storm sewer just south. Three detention ponds on the west side of Hill Road and located centrally in the multi-family portion. (**refer to figure 2.3a and 2.3b*)

The culvert will be removed. A new storm sewer will be constructed which provides an outlet for ponds 1 and 3 of the multi-family development on Hill Road drainage. A new culvert will be constructed at the low point of the road.

Fig. 2.3a

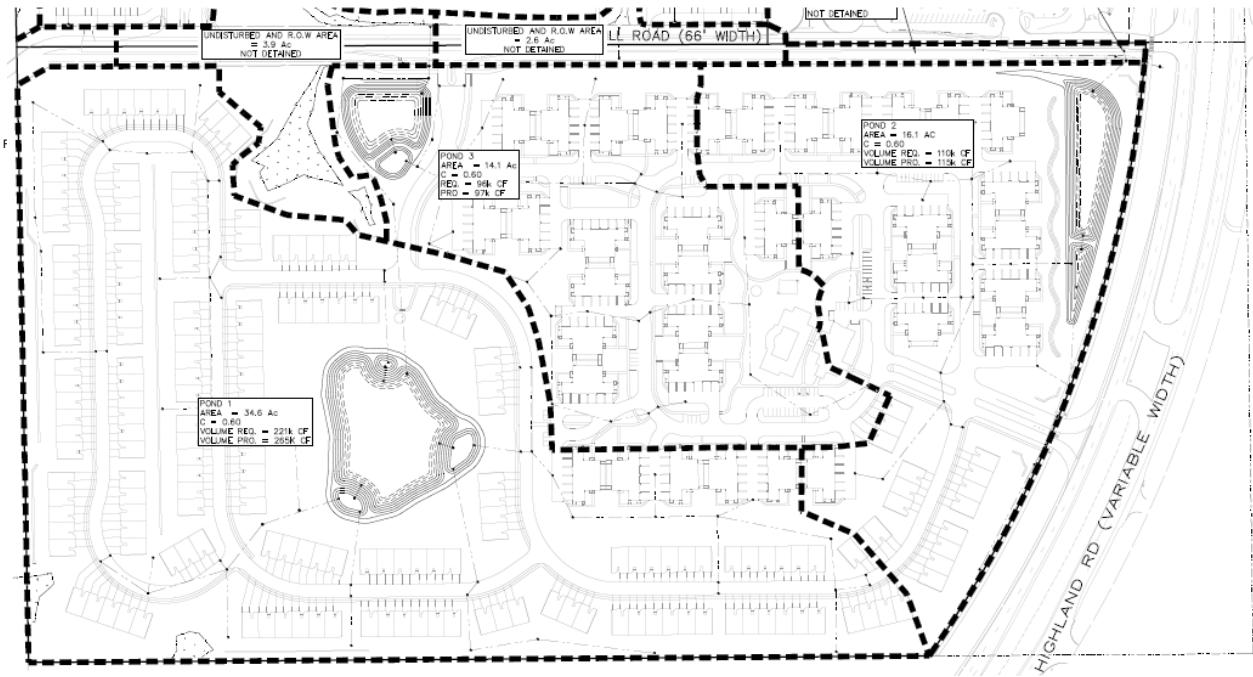


*Drainage calculations -Single Family
*Refer to a clear version on Preliminary Engineering Plan

Pond 4		
Total Area: (A1)	39.48 acre	
Drainage Area (A)	17.20 acre	
Weighted Coefficient of Runoff (C)	0.35	
Pretreatment		
Forebay: V _f = (545)CA	3,281 cf	
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA	28,408 cf	
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)	41,520 cf	
100-Year Allowable Outlet Rate (Q_{allow})		
Since 2<A1<100, Q100all= A1 x (0.207xln(A1)+1.1055)		
Q100all =	0.34 cfs/ac	
100-Year Peak Allowable Discharge (Q_o)		
Q _o =Q _{allow} (A)	5.93 cfs	
Rainfall Intensity		
Time of Concentration (T _c)	20 min	
I100=83.3/(T _c +9.17) ^{0.81}	5.42 in/hr	
100-Year Peak Inflow (Q_i)		
Q _i =C _i (A)	32.63 cfs	
100-Year Runoff Volume (V_r)		
V _r =(18,985)CA	114,260 cf	
Storage Ratio (V_r/V_s)		
V _r /V _s = 0.206-0.15 x ln(Q _o /Q _i)	0.4619	
100-Year Storage Volume (V_s)		
V _s =V _r /Storage Ratio	52,786 cf	

Pond 5		
Total Area: (A1)	39.48 acre	
Drainage Area (A)	8.70 acre	
Weighted Coefficient of Runoff (C)	0.35	
Pretreatment		
Forebay: V _f = (545)CA	1,660 cf	
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA	14,369 cf	
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)	21,001 cf	
100-Year Allowable Outlet Rate (Q_{allow})		
Since 2<A1<100, Q100all= A1 x (0.207xln(A1)+1.1055)		
Q100all =	0.34 cfs/ac	
100-Year Peak Allowable Discharge (Q_o)		
Q _o =Q _{allow} (A)	3.00 cfs	
Rainfall Intensity		
Time of Concentration (T _c)	20 min	
I100=83.3/(T _c +9.17) ^{0.81}	5.42 in/hr	
100-Year Peak Inflow (Q_i)		
Q _i =C _i (A)	16.51 cfs	
100-Year Runoff Volume (V_r)		
V _r =(18,985)CA	57,809 cf	
Storage Ratio (V_r/V_s)		
V _r /V _s = 0.206-0.15 x ln(Q _o /Q _i)	0.4619	
100-Year Storage Volume (V_s)		
V _s =V _r /Storage Ratio	26,200 cf	

Pond 6		
Total Area: (A1)	39.48 acre	
Drainage Area (A)	1.20 acre	
Runoff (C)	0.35	
Pretreatment		
Forebay: V _f = (545)CA	229 cf	
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA	1,982 cf	
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)	2,897 cf	
100-Year Allowable Outlet Rate (Q_{allow})		
Since 2<A1<100, Q100all= A x (0.207xln(A1)+1.1055)		
Q100all =	0.34 cfs/ac	
100-Year Peak Allowable Discharge (Q_o)		
Q _o =Q _{allow} (A)	0.41 cfs	
Rainfall Intensity		
Time of Concentration (T _c)	10 min	
I100=83.3/(T _c +9.17) ^{0.81}	7.62 in/hr	
100-Year Peak Inflow (Q_i)		
Q _i =C _i (A)	3.20 cfs	
100-Year Runoff Volume (V_r)		
V _r =(18,985)CA	7,974 cf	
Storage Ratio (V_r/V_s)		
V _r /V _s = 0.206-0.15 x ln(Q _o /Q _i)	0.5129	
100-Year Storage Volume (V_s)		
V _s =V _r /Storage Ratio	4,089 cf	



*Drainage calculations -Single Family
 *Refer to a clear version on Preliminary Engineering Plan

Pond 1		
Total Area: (A1)	66.52 acre	
Drainage Area (A):	34.60 acre	
Weighted Coefficient of Runoff (C):	0.60	
Pretreatment		
Forebay: V _f = (545)CA		11,314 cf
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA		97,966 cf
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)		143,182 cf
100-Year Allowable Outlet Rate (Qallow)		
Since 2 < A1 < 100, Q100all = A1 x (-0.207xln(A1)+1.1055)		0.24 cfs/ac
Q100all =		
100-Year Peak Allowable Discharge (Qo)		
Qo = Qallow(A)		8.19 cfs
Rainfall Intensity		
Time of Concentration (Tc)	20 min	
100=83.3/(Tc+9.17)^0.81		5.42 in/hr
100-Year Peak Inflow (Qi)		
Qi = C(i)(A)		112.53 cfs
100-Year Runoff Volume (Vr)		
Vr = (18,985)CA		394,129 cf
Storage Ratio (Vr/Vs)		
Vr/Vs = 0.206-0.15 x ln(Qo/Qi)		0.5991
100-Year Storage Volume (Vs)		
Vs = Vr/Storage Ratio		236,124 cf

Pond 2		
Total Area: (A1)	66.52 acre	
Drainage Area (A):	16.10 acre	
Weighted Coefficient of Runoff (C):	0.60	
Pretreatment		
Forebay: V _f = (545)CA		5,265 cf
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA		45,586 cf
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)		66,625 cf
100-Year Allowable Outlet Rate (Qallow)		
Since 2 < A1 < 100, Q100all = A1 x (-0.207xln(A1)+1.1055)		0.24 cfs/ac
Q100all =		
100-Year Peak Allowable Discharge (Qo)		
Qo = Qallow(A)		3.81 cfs
Rainfall Intensity		
Time of Concentration (Tc)	20 min	
100=83.3/(Tc+9.17)^0.81		5.42 in/hr
100-Year Peak Inflow (Qi)		
Qi = C(i)(A)		52.36 cfs
100-Year Runoff Volume (Vr)		
Vr = (18,985)CA		183,395 cf
Storage Ratio (Vr/Vs)		
Vr/Vs = 0.206-0.15 x ln(Qo/Qi)		0.5991
100-Year Storage Volume (Vs)		
Vs = Vr/Storage Ratio		109,873 cf

Pond 3		
Total Area: (A1)	66.52 acre	
Drainage Area (A):	14.10 acre	
Runoff (C):	0.60	
Pretreatment		
Forebay: V _f = (545)CA		4,611 cf
CPVC: Channel Protection Volume		
V _{cpvc} = (4,719)CA		39,923 cf
CPRC: Channel Protection Rate Control Volume		
V _{cpvc} = (6897)CA (Extended Detention)		58,349 cf
100-Year Allowable Outlet Rate (Qallow)		
Since 2 < A1 < 100, Q100all = A1 x (-0.207xln(A1)+1.1055)		0.24 cfs/ac
Q100all =		
100-Year Peak Allowable Discharge (Qo)		
Qo = Qallow(A)		3.34 cfs
Rainfall Intensity		
Time of Concentration (Tc)	20 min	
100=83.3/(Tc+9.17)^0.81		5.42 in/hr
100-Year Peak Inflow (Qi)		
Qi = C(i)(A)		45.86 cfs
100-Year Runoff Volume (Vr)		
Vr = (18,985)CA		160,613 cf
Storage Ratio (Vr/Vs)		
Vr/Vs = 0.206-0.15 x ln(Qo/Qi)		0.5991
100-Year Storage Volume (Vs)		
Vs = Vr/Storage Ratio		96,224 cf

SECTION 3: ECONOMICS

3.1 Tax Revenue Analysis

A fiscal impact analysis was prepared to determine the anticipated annual tax revenue to be generated as a result of the development. Based on this analysis, we anticipate Avalon will have a taxable value of approximately \$70,000,000 and will generate an annual revenue gain to the Township of approximately \$1,760,000.

3.2 Jobs Created

Avalon will be a residential development. Avalon will create construction jobs during the installation of the infrastructure and the construction of the homes on the site. In addition, MJC Homes will employ sales staff. Avalon Apartment Homes will create permanent leasing, management, and maintenance jobs.

SECTION 4: ENVIRONMENT

4.1 Natural Resources Analysis

The site of the proposed development is vacant with existing open areas. The site contains a significant amount of rolling topography with approximately 70 feet of elevation change across the site. There are no adjacent subdivisions to connect to. The topography and natural features would limit the stubbing of future connection to the adjoining property; furthermore, the multi-family site is self-contained.

The site is located in Flood Zone X per FEMA FIRM PANEL 26125C0318F, effective 9/29/2006, and area of minimal flooding. Thus, impact to regulated floodplain or special flood areas are not anticipated to occur with the proposed development.

Storm water runoff for the site will be detained and treated in accordance with applicable Township, County and State requirements prior to discharge from the site. No significant impact or pollution to offsite water bodies is anticipated with the development.

The proposed development will seek to preserve existing wooded areas around the perimeter of the development where grading would allow, to serve as a buffer between the development and neighboring properties. New trees will be planted in the proposed development in accordance with an approved Landscaping Plan.

4.2 Hazardous Materials

No hazardous materials will be manufactured, used, or stored on site.

4.3 Air Quality Impact

Avalon is a residential development and will not plan to have any significant impact to the air quality of the area. No quantifiable type or quantities of pollutants are expected to be released in the air. During construction, special measures will be included within the Soil Erosion and Sedimentation (SESC) Plan to mitigate any potential dust creation during dryer site conditions, including the use of water trucks.

4.4 Groundwater Impact

Avalon is a residential development that will utilize connections to the existing public utilities in the area. The development fits within the master planned unit density for the area and does not plan to have any significant impact to the groundwater levels within the area.

4.5 Noise

Avalon is a residential development that does not plan to have any significant impact to the increased noise in the area. During construction, the development intends to minimize noise as reasonable and follow the Township's ordinance regarding hours of allowed construction operation.

SECTION 5: TRAFFIC

Avalon is a residential project consisting of a multi-family and single-family units that are proposed to have access off Highland Road in addition to Hill Road. The main access to Avalon Apartment Homes will be from a boulevard off Highland Road which is a State Road. In addition to the main access off Highland Road, Avalon Apartment Homes will have a secondary access off of Hill Road.

The Residences at Avalon will have access via a boulevard off of Hill Road which is a County Road. The exiting drive width along Highland Road has been revised to meet the width required by Article 5, Section 11.Q.v. The Developer will pave Hill Road from Highland Road to the north, just prior to the curve on Hill Road.

A Traffic Impact Study (TIS) has been prepared in accordance with the Township Ordinance Section 6.3 to determine if any improvements would be necessary to mitigate any traffic impacts to the adjacent road network.

The proposed development is forecast to generate 215 new trips during the AM peak hour and 283 new trips during the PM peak hour. The report was completed in accordance with the requirements specified by the Michigan Department of Transportation (MDOT), the Road Commission for Oakland County (RCOC), and White Lake Township. The majority, if not all these

trips, would be attributed to small vehicles. Large truck daily trips and axel loading impacts to the existing roads as a result of Avalon and The Residences at Avalon development are not to be anticipated. The operational analysis indicated that most approaches of the study intersections will operate at acceptable levels of service during both the AM and PM peak hours of the future traffic conditions.

Refer to *Appendix G* for the Traffic Impact Statement prepared by Rowe.

DEVELOPER'S STATEMENT

Avalon will be developed by White Lake Hill LLC whose member/managers are Mickey Shapiro and Mike Chirco. White Lake Hill has owned the property since 2005.

Site development will be managed by the M. Shapiro Real Estate Group. MJC Homes will handle the construction of the Avalon Apartment Homes and the Single-Family Homes. MJC Homes will also be responsible for home sales.

The M. Shapiro Real Estate Group will manage the Avalon Apartment Homes.

The Manager/Members of White Lake Hill, LLC have over forty-years in the development and building industry. Recent examples of Apartment Home Communities developed by MJC and the M. Shapiro Real Estate Group are as follows:

- Barrington Apartment Homes -located in Commerce Township consisting of 300 units offering luxury living in a woodland setting, at Pontiac Trail and Martin Parkway.
- ShearWater Apartment Homes -consisting of 200 units nestled in Commerce Township, located at the prominent intersection of Maple and Beck Road.
- Huntley Manor Apartment Homes -privately-gated 200-unit-apartment-homes, located in Novi at Meadowbrook and Grand River.





Mixed Use Residential Development in White Lake Township Traffic Impact Study

Project No. 220895
June 7, 2022

Mixed Use Residential Development in White Lake Township Traffic Impact Study

**Prepared For:
Lautrec Ltd.
Farmington Hills, MI**

**June 7, 2022
Project No. 220895**

Executive Summary1

1.0 Introduction.....2

 1.1 Project Overview.....2

 1.2 Study Methodology.....2

 1.3 Intersection Characteristics3

 1.4 Existing Traffic Volumes.....5

2.0 Existing Conditions Analysis7

 2.1 Traffic Operations Analysis Methodology7

 2.2 Existing Conditions Traffic Analysis7

3.0 Background Conditions Analysis8

 3.1 Background Conditions Traffic Analysis10

4.0 Site Traffic Characteristics.....10

 4.1 Trip Generation.....11

 4.2 Trip Distribution12

5.0 Future Conditions Analysis.....15

 5.1 Turn Lane Warrants15

 5.2 Future Conditions Traffic Analysis.....15

 5.3 Future Improvement Conditions Traffic Analysis.....16

 5.4 Signal Warrant Analysis18

6.0 Findings and Recommendations.....19

List of Figures

Figure 1 – Project Location and Study Network2

Figure 2 – Existing Lane Configurations4

Figure 3 – Existing Traffic Volumes6

Figure 4 – Background Traffic Volumes9

Figure 5 – Conceptual Site Plan.....11

Figure 6 – Trip Generation Volumes13

Figure 7 – Pass-By Volumes.....14

List of Tables

Table 1 – Proposed Improvements1

Table 2 – LOS Criteria7

Table 3 – LOS Analysis for Existing Conditions.....7

Table 4 – LOS Analysis for Background Conditions.....10

Table 5 – Trip Generation for Proposed Development11

Table 6 – Trip Distribution12

Table 7 – Turn Lane Warrants15

Table 8 – LOS Analysis for Future Conditions15

Table 9 – LOS Analysis for Future Improvement Conditions.....17

Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road.....18

Table 11 – Proposed Improvements19

List of Appendices

- Appendix 1 – Traffic Volume Data
- Appendix 2 – Existing LOS Output Reports
- Appendix 3 – Background LOS Output Reports
- Appendix 4 – Trip Generation Calculations
- Appendix 5 – Turn Lane Warrant
- Appendix 6 – Future LOS Output Reports
- Appendix 7 – Future Improvement LOS Output Reports
- Appendix 8 – Signal Warrants

List of Abbreviations/Acronyms

AASHTO	American Association of State Highway and Transportation Officials
DU	Dwelling Units
EB	Eastbound
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
LUC	Land Use Code
M-59	Highland Road
MDOT	Michigan Department of Transportation
MMUTCD	Michigan Manual on Uniform Traffic Control Devices
mph	Miles per Hour
NB	Northbound
RCOC	Road Commission for Oakland County
RIRO	Right-In/Right-Out (driveway)
SB	Southbound
SEMCOG	Southeast Michigan Council of Governments
TIS	Traffic Impact Study
TMC	Turning Movement Count
TCDS	Traffic Count Database System
Township	White Lake Township
WB	Westbound

References

- The Highway Capacity Manual, 6th Edition.* (2016). Washington, DC.
- The Highway Capacity Manual: 2000.* (2000). Washington, DC.
- Trip Generation Handbook, 3rd Edition.* (2017). Washington DC.
- Trip Generation Manual, 11th Edition.* (2021). Washington DC.

Executive Summary

Fishbeck has completed a traffic impact study (TIS) related to the development of a mixed-use residential development located on the northeast and northwest side of Hill Road near Highland Road (M-59) in White Lake Township (Township), Michigan. The existing land is vacant. The proposed site presents 88 single family condominiums and 406 multifamily housing (low-rise) units. The development is assumed to be open and fully operational in 2027.

All the access points to the development are proposed. There will be three access points on Hill Road and one access point on M-59. The accesses on Hill Road will be full movement (left and right turn movements allowed, ingress and egress). The access on M-59 will be right-in/right-out (RIRO).

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Michigan Department of Transportation (MDOT), Road Commission for Oakland County (RCOC), and the Township.

Vehicular, pedestrian, and cyclist Turning Movement Count (TMC)s were collected at the study intersection on Thursday, September 30, 2021, during the weekday a.m. (7 a.m. to 9 a.m.) and p.m. (4 p.m. to 6 p.m.) peak periods of the roadway network. Based on this review of 2021 traffic counts from Southeast Michigan Council of Governments (SEMCOG)'s Traffic Count Database System (TCDS), there was no compelling evidence to apply a COVID adjustment factor to the collected TMCs.

Site-generated traffic was forecast using the information and methodologies specified in the latest version of Trip Generation, Trip Generation Manual, 11th Edition, 2021. The existing traffic volumes, site layout, and engineering judgement were used to develop a trip distribution model for the a.m. and p.m. peak hours for the new traffic that will be generated by the proposed development. Additionally, directions of origin, surrounding residential densities, and commuting patterns were considered.

Capacity analyses were conducted for existing, background, and total future conditions based on Highway Capacity Manual (HCM) 6th Edition methodologies using Synchro traffic analysis software. Synchro network models were also simulated using SimTraffic to evaluate network operations including intersection queuing.

Based on the findings of the HCM operational analyses, crash data, and site traffic generation, Table 1 – Proposed Improvements has the recommended existing, background, and future improvements to the study intersections to mitigate traffic impacts.

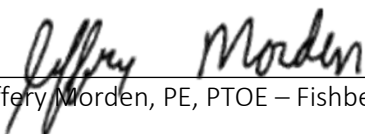
Table 1 – Proposed Improvements

Intersection	Existing	Background	Future
WB M-59 and crossover east of Hill Road	No improvements	No improvements	Traffic signal warranted.
WB M-59 and Driveway 4	No improvements	No improvements	Right turn lane warranted.

Westbound (WB)

The opinions, findings, and conclusions expressed in this TIS are those of Fishbeck and not necessarily those of the Owner/Applicant, MDOT, RCOC, or the Township.

Prepared By:


 Jeffrey Morden, PE, PTOE – Fishbeck


 Jill Bauer, PE, PTOE – Fishbeck
 Project Manager

1.0 Introduction

1.1 Project Overview

On behalf of Lautrec Ltd., Fishbeck has conducted a traffic impact study (TIS) related to the development of a mixed-use residential development located on the northeast and northwest side of Hill Road near Highland Road (M-59) in White Lake Township (Township), Michigan. The existing land is vacant. The proposed site presents 88 single family condominiums and 406 multifamily housing (low-rise) units. The development is assumed to be open and fully operational in 2027.

All the access points to the development are proposed. There will be three access points on Hill Road and one access point on M-59. The accesses on Hill Road will be full movement (left and right turn movements allowed, ingress and egress). The access on M-59 will be right-in/right-out (RIRO).

The project location and study intersections are indicated in Figure 1 – Project Location and Study Network.

Figure 1 – Project Location and Study Network



1.2 Study Methodology

The objectives of this TIS were to determine what impacts, if any, the proposed project will have on adjacent roadway traffic operations, and to develop recommendations for any improvements necessary to mitigate the project impacts on the studied intersections. Study analyses were completed relative to typical weekday a.m. and p.m. peak periods.

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Michigan Department of Transportation (MDOT), Road Commission for Oakland County (RCOC), and the Township.

1.3 Intersection Characteristics

Based on the type and size of the proposed development and the likely area of influence for the site trips, traffic operations were analyzed for the following intersections:

1. Westbound (WB) M-59 and Hill Road (unsignalized).
2. Eastbound (EB) M-59 and Le Grand Court (unsignalized).
3. WB M-59 and crossover east of Hill Road (unsignalized).
4. EB M-59 and crossover west of Hill Road (unsignalized).
5. WB M-59 and crossover west of Hill Road (unsignalized).
6. EB M-59 and Haven Road (unsignalized).
7. Hill Road and Driveway 1 (proposed unsignalized driveway approximately 2,300 feet north of M-59).
8. Hill Road and Driveway 2 (proposed unsignalized driveway approximately 1,600 feet north of M-59).
9. Hill Road and Driveway 3 (proposed unsignalized driveway approximately 1,150 feet north of M-59).
10. WB M-59 and Driveway 4 (proposed unsignalized driveway approximately 950 feet west of Hill Road).

The existing intersection lane configurations, traffic controls, and posted speed limits are indicated in Figure 2 – Existing Lane Configurations.

1.4 Existing Traffic Volumes

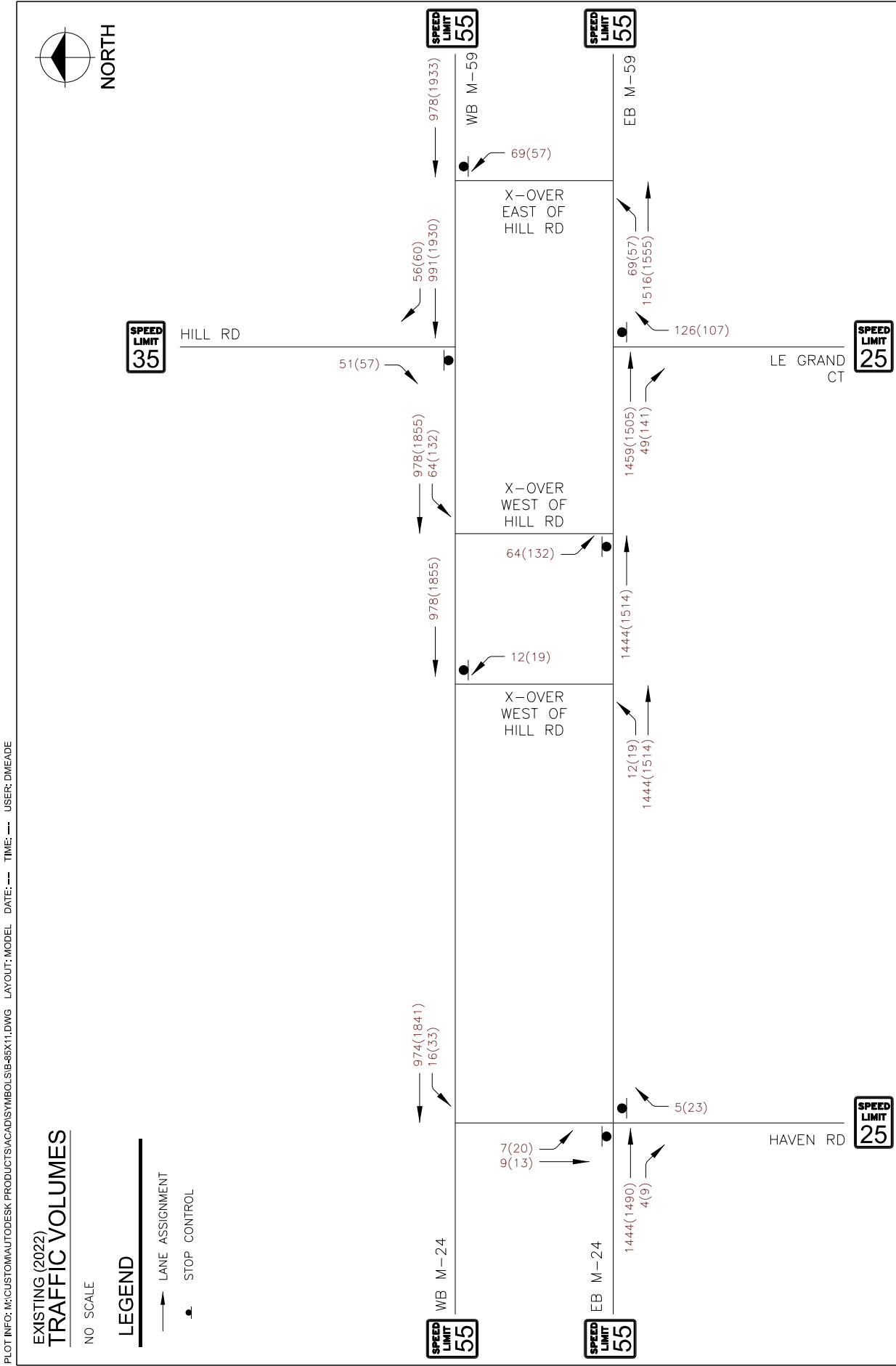
Vehicular Turning Movement Count (TMC)'s was collected at the following study intersection during the weekday a.m. (7 to 9 a.m.) and p.m. (4 to 6 p.m.) peak periods of the road network on Thursday, September 30, 2021:

- WB M-59 and Hill Road.
- EB M-59 and Le Grand Court.
- WB M-59 and crossover east of Hill Road.
- EB M-59 and crossover west of Hill Road.
- WB M-59 and crossover west of Hill Road.
- EB M-59 and Haven Road.

Due to the impact of COVID-19, current traffic volume data may not be representative of typical operations. Historical traffic data from the Southeast Michigan Council of Governments (SEMCOG) Traffic Count Database System (TCDS) TMC's website was reviewed. Based on this review of 2021 traffic counts, there was no compelling evidence to apply a COVID adjustment factor to the collected TMCs.

Traffic volume information can be found in Appendix 1 – Traffic Volume Data, which includes heavy vehicle data. The adjusted existing traffic volumes used in this study are indicated in Figure 3– Existing Traffic Volumes.

Figure 3 – Existing Traffic Volumes



PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-35X11.DWG LAYOUT; MODEL DATE: --- TIME: --- USER: DMEADE

fishbeck
Engineers | Architects | Scientists | Constructors

Hard copy is Intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Mixed-Use Residential Development
White Lake Township, MI 48383

Traffic Impact Study

PROJECT NO.	220895
FIGURE NO.	3

2.0 Existing Conditions Analysis

2.1 Traffic Operations Analysis Methodology

Synchro was used to perform Highway Capacity Manual (HCM) operational analyses during the a.m. and p.m. peak hours for all the intersections within this study. According to the most recent editions of the HCM, level of service (LOS) is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is generally considered acceptable for most areas. Table 2 – LOS Criteria presents the HCM criteria for various LOS for unsignalized and signalized intersections.

Table 2 – LOS Criteria

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

2.2 Existing Conditions Traffic Analysis

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field were entered in the models. The traffic signal timing permit for the signalized intersections of M-59 and Bogie Lake Road and EB M-59 and crossover west of Ormond Road were provided by RCOC for use in the models. These signalized intersections were added to the models to provide traffic progression through the study corridor.

The resulting LOS and delay for the existing conditions are indicated in Table 3 – LOS Analysis for Existing Conditions.

Table 3 – LOS Analysis for Existing Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 14.8	D 29.1
Overall	A 1.5	A 1.1
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 26.3	C 24.4
Overall	A 2.3	A 1.9
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	B 13.9	D 27.9
Overall	A 1.0	A 1.0

Table 3 – LOS Analysis for Existing Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	C 21.2	D 26.8
Overall	A 1.1	A 2.5
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 12.9	C 22.9
Overall	A 0.2	A 0.4
EB M-59 Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.1	C 16.9
SB crossover at Haven Road	E 36.7	E 36.5
Overall	A 0.6	A 1.5

Northbound (NB)

Southbound (SB)

Further analysis of the LOS results for existing conditions revealed that most movements, approaches, and intersections are expected to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For existing conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 2 – Existing LOS Output Reports for the existing conditions LOS reports and queuing analysis reports.

3.0 Background Conditions Analysis

Historical traffic data on the SEMCOG TCDS website was referenced in order to determine the applicable growth rate for the existing traffic volumes to the project build-out year in 2027. Based on this review, a background growth rate of 0.5% was utilized. There were no background developments identified and included in the background traffic conditions.

The total background traffic volumes are indicated in Figure 4 – Background Traffic Volumes.

3.1 Background Conditions Traffic Analysis

The resulting LOS and delay for the background conditions are indicated in Table 4 – LOS Analysis for Background Conditions.

Table 4 – LOS Analysis for Background Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 14.1	D 31.3
Overall	A 1.0	A 1.2
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-5	A 0.0	A 0.0
NB Le Grand Court	D 28.6	D 26.2
Overall	A 2.5	A 2.0
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	B 14.2	D 30.1
Overall	A 1.0	A 1.1
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	C 22.3	D 29.1
Overall	A 1.1	A 2.7
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 13.1	C 24.1
Overall	A 0.2	A 0.4
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.6	C 17.5
SB crossover at Haven Road	E 39.5	D 34.6
Overall	A 0.6	A 1.1

Further analysis of the LOS results for background conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. peak hour.

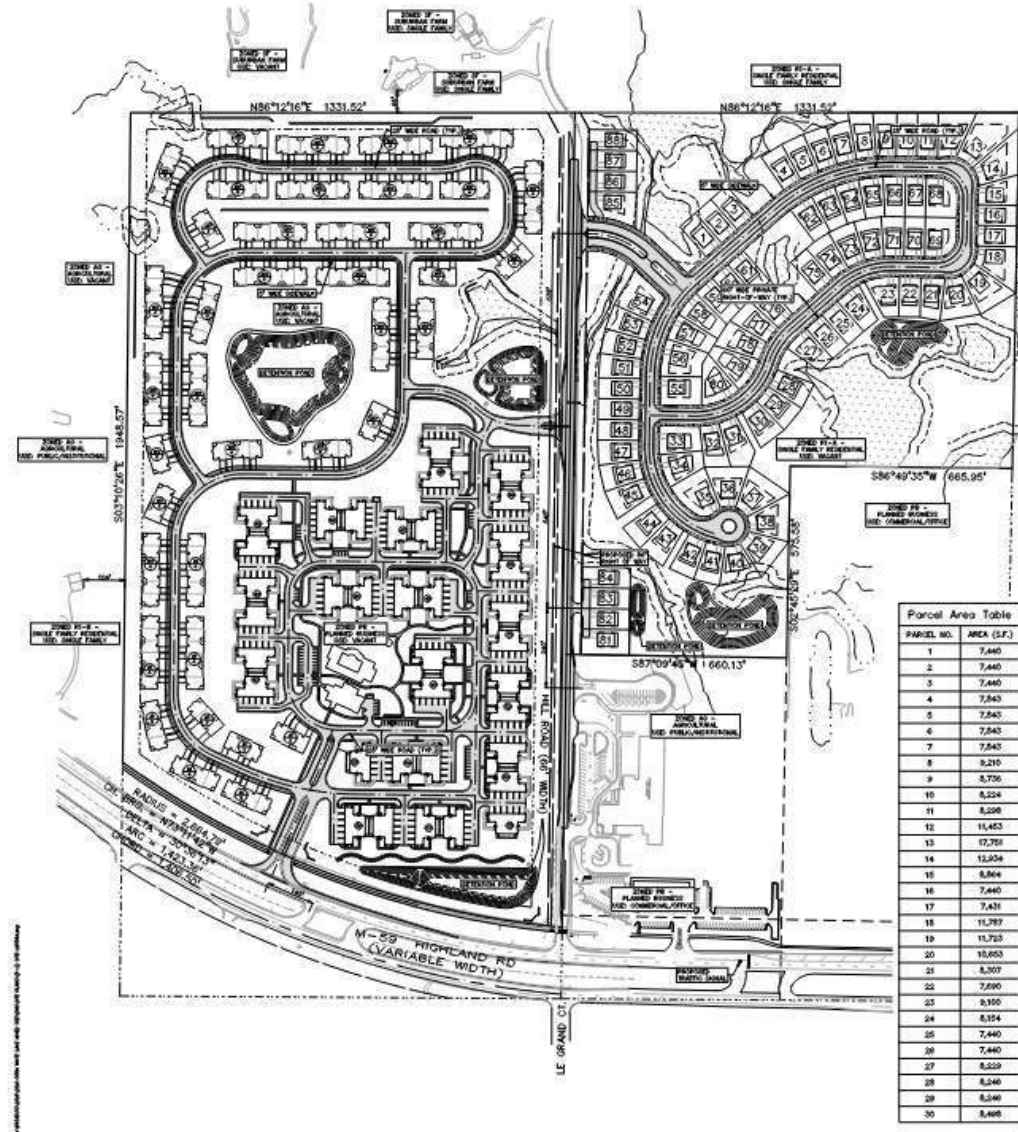
The LOS/delay for the p.m. peak hour became acceptable due to an increase in vehicles due to growth and the average delay decreased.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For background conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length, see Appendix 3 – Background LOS Output Reports.

4.0 Site Traffic Characteristics

A representation of the current conceptual site plan is provided in Figure 5 – Conceptual Site Plan.

Figure 5 – Conceptual Site Plan



4.1 Trip Generation

Using the information and methodologies specified in the latest version of Trip Generation, Fishbeck forecast the weekday a.m. and p.m. peak hour trips associated with the proposed development.

Table 5 – Trip Generation for Proposed Development presents the resulting trip generation for the development. Refer to Appendix 4 – Trip Generation Calculations.

Table 5 – Trip Generation for Proposed Development

ITE Land Use	LUC	Units	a.m. Peak Hour			p.m. Peak Hour			Weekday
			In	Out	Total	In	Out	Total	
Single-family Detached Housing	210	88 DU	17	49	66	55	33	88	897
Multi-family Housing (Low-Rise)	220	406 DU	36	113	149	123	72	195	2,678
Total			53	162	215	178	105	283	3,575

Dwelling Units (DU)
Land Use Code(LUC)

4.2 Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the a.m. and p.m. peak hours. The existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the proposed trips would be coming from and going to.

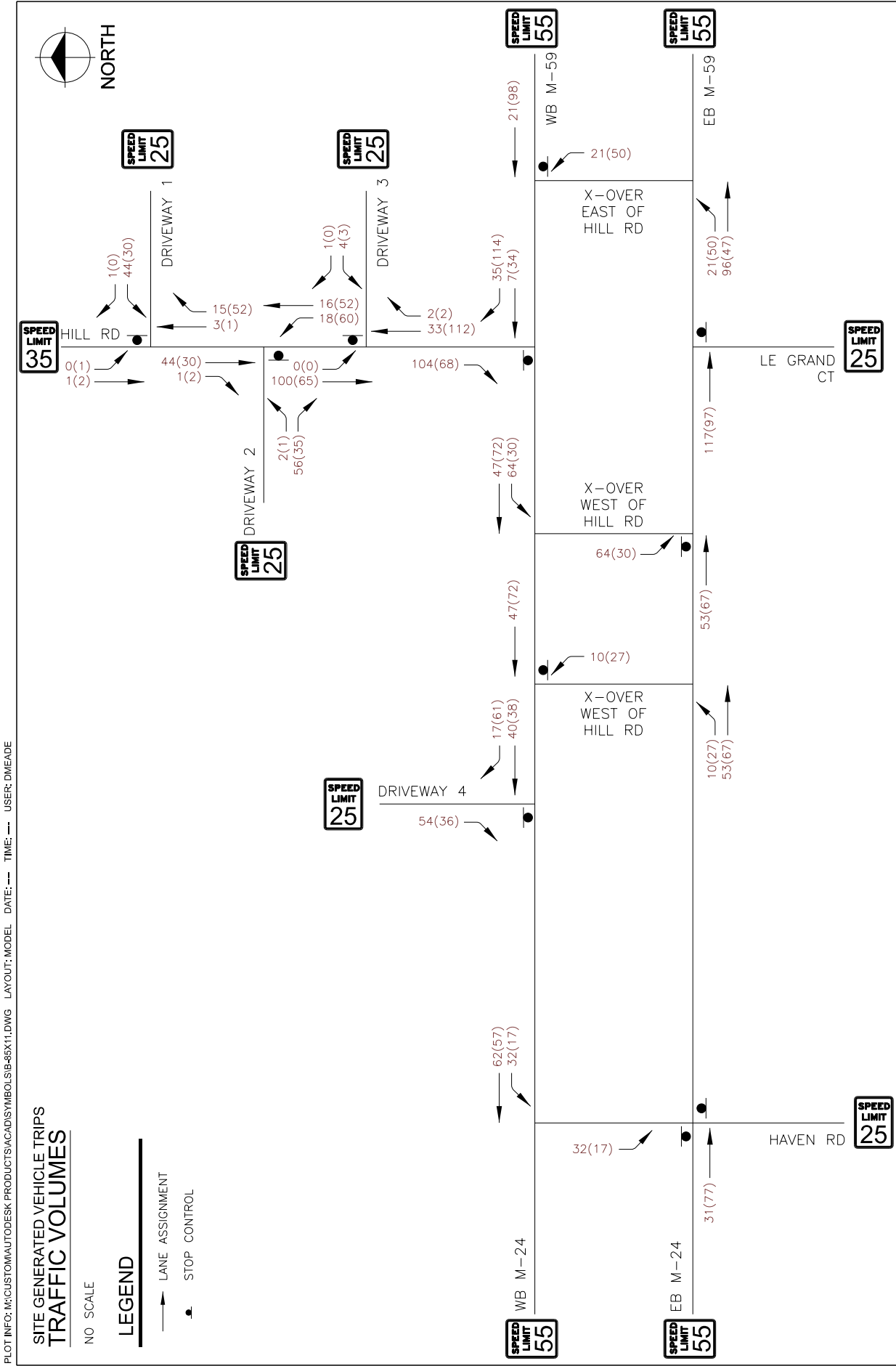
Table 6 – Trip Distribution provides the probable distribution based on the existing traffic patterns.

Table 6 – Trip Distribution

Direction	Via	a.m. peak hour		p.m. peak hour	
		To	From	To	From
North	Hill Road	2% (4)	2% (1)	1% (1)	2% (3)
East	M-59	60% (96)	40% (21)	45% (47)	55% (98)
West	M-59	38% (62)	58% (31)	54% (57)	43% (77)
Total		100% (162)	100% (53)	100% (105)	100% (178)

The trip distribution for the site is indicated in Figure 6 – Trip Generation Volumes, see below. These trips were added to the background volumes (Figure 4) to result in the future conditions volumes in Figure 7– Future Conditions Volumes.

Figure 6 – Trip Generation Volumes



PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-35X11.DWG LAYOUT: MODEL DATE: --- TIME: --- USER: DMEADE



Engineers | Architects | Scientists | Constructors

Hard copy is Intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

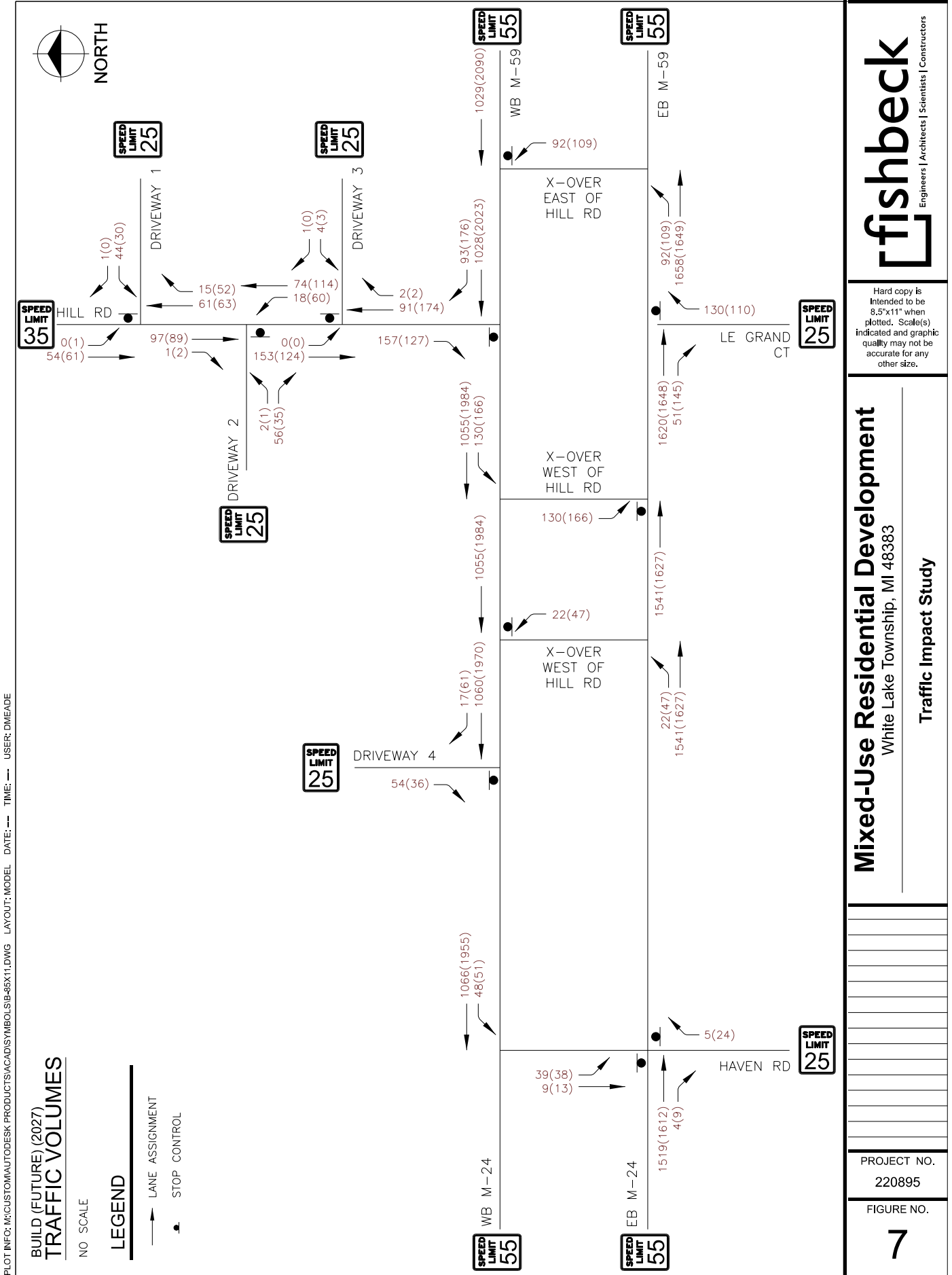
Mixed-Use Residential Development
White Lake Township, MI 48383

Traffic Impact Study

PROJECT NO.
220895

FIGURE NO.
6

Figure 7 – Future Conditions Volumes



5.0 Future Conditions Analysis

5.1 Turn Lane Warrants

An evaluation was performed in accordance with MDOT requirements to determine if right turn deceleration lanes are required at the site driveway on WB M-59. The results of the analysis indicated that a full width right turn lane is warranted at Driveway 4. All turn lane warrant charts are in Appendix 5 – Turn Lane Warrants. The results of the analysis are presented in Table 7 – Turn Lane Warrants.

Table 7 – Turn Lane Warrants

Intersection	Movement	Result
WB M-59 and Driveway 4	WB Right-turn	Full width right turn lane warranted

5.2 Future Conditions Traffic Analysis

The resulting LOS and delay for the future conditions are shown in Table 8 – LOS Analysis for Future Conditions.

Table 8 – LOS Analysis for Future Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 16.7	F 63.7
Overall	A 2.1	A 4.2
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 33.8	D 29.4
Overall	A 2.8	A 2.1
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	C 21.3	F 68.2
Overall	A 3.8	A 4.9
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	E 36.6	E 40.6
Overall	A 3.4	A 4.3
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 11.8	C 18.0
Overall	A 0.4	A 0.7
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.9	C 18.4
SB crossover at Haven Road	E 36.8	E 46.4
Overall	A 1.6	A 2.3
Hill Road and Driveway 1 (Stop-Controlled)		
WB Driveway 1	A 9.4	A 9.5
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.1
Overall	A 2.4	A 1.4

Table 8 – LOS Analysis for Future Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
Hill Road and Driveway 2 (Stop-Controlled)		
WB Driveway 2	A 9.1	A 9.0
NB Hill Road	A 1.5	A 2.6
SB Hill Road	A 0.0	A 0.0
Overall	A 2.7	A 2.6
Hill Road and Driveway 3 (Stop-Controlled)		
WB Driveway 3	A 9.8	B 10.4
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.0
Overall	A 0.2	A 0.1
WB M-59 and Driveway 4 (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Driveway 4	B 13.7	D 25.2
Overall	A 0.7	A 0.5

Further analysis of the LOS results for future conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- WB M-59 and crossover east of Hill Road:
 - The NB crossover approach operates at LOS F in the p.m. peak hour.
- WB M-59 and Hill Road:
 - The SB approach operates at LOS F in the p.m. peak hour.
- EB M-59 and crossover west of Hill Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours
- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 6 – Future LOS Output Reports for the future conditions LOS reports and queueing analysis reports.

The 95th percentile queue lengths were reviewed for the development driveways. During the a.m. and p.m. peak hours, the queue lengths are less than 55 feet (two vehicles).

5.3 Future Improvement Conditions Traffic Analysis

The following observations were made, and improvements were recommended, if applicable, at the following intersections due to Future traffic conditions:

- WB M-59 and crossover east of Hill Road:
 - Due to unacceptable LOS/delay during the future condition, a traffic signal warrant was investigated to determine if a traffic signal could alleviate delay. The traffic signal is warranted for Warrants 1B, 2 (70%), and 3B. For more information on the traffic signal warrant, see section 5.4. The addition of this traffic signal is also providing additional vehicular gaps for SB Hill Road vehicles to enter WB M-59. The resulting LOS and delay for the future improvement conditions are indicated in Table 9 – LOS Analysis for Future Improvement Conditions.

Table 9 – Future with Improvements Conditions LOS/Delay

Approach/Lane Group	LOS/Delay(s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Signalized)		
WB M-59	B 16.6	C 33.3
NB crossover east of Hill Road	D 45.0	E 60.5
Overall	C 20.1	D 35.1
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 33.8	D 29.4
Overall	A 2.8	A 2.1
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	C 21.3	F 68.2
Overall	A 3.8	A 4.9
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	E 36.6	E 40.6
Overall	A 3.4	A 4.3
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 11.8	C 18.0
Overall	A 0.4	A 0.7
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.9	C 18.4
SB crossover at Haven Road	E 36.8	E 46.4
Overall	A 1.6	A 2.3
Hill Road and Driveway 1 (Stop-Controlled)		
WB Driveway 1	A 9.4	A 9.5
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.1
Overall	A 2.4	A 1.4
Hill Road and Driveway 2 (Stop-Controlled)		
WB Driveway 2	A 9.1	A 9.0
NB Hill Road	A 1.5	A 2.6
SB Hill Road	A 0.0	A 0.0
Overall	A 2.7	A 2.6
Hill Road and Driveway 3 (Stop-Controlled)		
WB Driveway 3	A 9.8	B 10.4
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.0
Overall	A 0.2	A 0.1
WB M-59 and Driveway 4 (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Driveway 4	B 13.7	D 25.2
Overall	A 0.7	A 0.5

Further analysis of the LOS a result for future improvement conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- WB M-59 and crossover east of Hill Road:
 - The NB crossover approach operates at LOS E in the p.m. peak hour.
- WB M-59 and Hill Road:
 - The SB approach operates at LOS F in the p.m. peak hour.
- EB M-59 and crossover west of Hill Road.
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.
- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future improvement conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length, see Appendix 7 – Future Improvement LOS Output.

The addition of the traffic signal at WB M-59 and the crossover east of Hill Road provides some delay relief. It benefits the minor streets’ approaches on WB M-59 operationally. The traffic signal provides additional gaps for vehicles from Hill Road to turn onto WB M-59. For the p.m. peak hour, the SB queue reduced from 314 feet (13 vehicles) to 203 feet (eight vehicles). For the a.m. peak hour, the queue increased 13 feet with the traffic signal. The queue lengths for the crossover for the a.m. and p.m. peak hours is relatively the same with or without the traffic signal.

5.4 Signal Warrant Analysis

Signal warrants were completed at the intersection of WB M-59 and crossover east of Hill Road in accordance with Michigan Manual on Uniform Traffic Control Devices (MMUTCD) requirements. The results of this analysis revealed that several warrants are met at the intersection. The results of this analysis are presented in Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road, all signal warrant charts are included in Appendix 8 – Signal Warrants.

Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road

Warrant		Is Warrant Met?	Comments
1 – Eight Hour Vehicular Volume	Overall	Yes	
	Condition A	No	Hours Met: 3
	Condition B	Yes	Hours Met: 12
	Condition A and B	N/A	Hours Met: N/A
2 – Four Hour Vehicular Volume (70%)		Yes	Hours Met: 12
3 – Peak Hour Vehicular Volume (70%)	Overall	Yes	
	Condition A	No	
	Condition B	Yes	Hours Met: 8
4 – Four Hour Pedestrian Volume (70%)		No	Hours Met:
5 – School Crossing		Not Evaluated	
6 – Coordinated Signal System		Not Evaluated	
7 – Crash Experience	Overall	Not Evaluated	Crashes in five-year period:
	Condition A	Not Evaluated	
	Condition B	Not Evaluated	
8 – Roadway Network		Not Evaluated	
9 – Intersection Near at Grade Railroad Crossing		N/A	

6.0 Findings and Recommendations

The analyses conducted for this TIS indicate the proposed development will not result in any significant impact to the adjacent road network with improvements. The proposed site access configuration is appropriate and will acceptably facilitate site ingress and egress. These conclusions are supported by the following key findings:

1. Existing storage lengths are adequate for all movements in existing and future conditions.
2. Lane configurations and physical capacity are appropriate within the study area.
3. Existing nor planned transit or non-motorized facilities in the site vicinity would not be impacted by the project.

Based on the findings of the HCM operational analyses and site traffic generation, Table 11 – Proposed Improvements includes the recommended existing, background, and future improvements to the study intersections to mitigate traffic impacts.

Table 11 – Proposed Improvements

Intersection	Existing	Background	Future
WB M-59 and crossover east of Hill Road	No improvements	No improvements	Traffic signal warranted.
WB M-59 and Driveway 4	No improvements	No improvements	Right turn lane warranted.

Appendix 1

Traffic Volume Data

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 7:00AM	357	12	369	164	0	164	533
7:15AM	354	8	362	188	0	188	550
7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
Hourly Total	1440	69	1509	844	0	844	2353
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
8:30AM	306	4	310	225	0	225	535
8:45AM	362	8	370	229	0	229	599
Hourly Total	1356	32	1388	940	0	940	2328
4:00PM	297	9	306	423	0	423	729
4:15PM	372	8	380	463	0	463	843
4:30PM	345	9	354	497	0	497	851
4:45PM	348	14	362	466	0	466	828
Hourly Total	1362	40	1402	1849	0	1849	3251
5:00PM	416	9	425	478	0	478	903
5:15PM	396	20	416	490	0	490	906
5:30PM	377	14	391	499	0	499	890
5:45PM	364	15	379	426	0	426	805
Hourly Total	1553	58	1611	1893	0	1893	3504
Total	5711	199	5910	5526	0	5526	11436
% Approach	96.6%	3.4%	-	100%	0%	-	-
% Total	49.9%	1.7%	51.7%	48.3%	0%	48.3%	-
Lights	5547	188	5735	5345	0	5345	11080
% Lights	97.1%	94.5%	97.0%	96.7%	0%	96.7%	96.9%
Articulated Trucks	60	1	61	61	0	61	122
% Articulated Trucks	1.1%	0.5%	1.0%	1.1%	0%	1.1%	1.1%
Buses and Single-Unit Trucks	104	10	114	120	0	120	234
% Buses and Single-Unit Trucks	1.8%	5.0%	1.9%	2.2%	0%	2.2%	2.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877566, Location: 42.648859, -83.535424

GHA GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
Total	1417	69	1486	978	0	978	2464
% Approach	95.4%	4.6%	-	100%	0%	-	-
% Total	57.5%	2.8%	60.3%	39.7%	0%	39.7%	-
PHF	0.945	0.575	0.917	0.955	-	0.955	0.932
Lights	1354	65	1419	923	0	923	2342
% Lights	95.6%	94.2%	95.5%	94.4%	0%	94.4%	95.0%
Articulated Trucks	27	0	27	20	0	20	47
% Articulated Trucks	1.9%	0%	1.8%	2.0%	0%	2.0%	1.9%
Buses and Single-Unit Trucks	36	4	40	35	0	35	75
% Buses and Single-Unit Trucks	2.5%	5.8%	2.7%	3.6%	0%	3.6%	3.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877566, Location: 42.648859, -83.535424



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 4:45PM	348	14	362	466	0	466	828
	5:00PM	416	9	425	478	0	478	903
	5:15PM	396	20	416	490	0	490	906
	5:30PM	377	14	391	499	0	499	890
	Total	1537	57	1594	1933	0	1933	3527
	% Approach	96.4%	3.6%	-	100%	0%	-	-
	% Total	43.6%	1.6%	45.2%	54.8%	0%	54.8%	-
	PHF	0.924	0.713	0.938	0.968	-	0.968	0.973
	Lights	1506	54	1560	1897	0	1897	3457
	% Lights	98.0%	94.7%	97.9%	98.1%	0%	98.1%	98.0%
	Articulated Trucks	11	1	12	16	0	16	28
	% Articulated Trucks	0.7%	1.8%	0.8%	0.8%	0%	0.8%	0.8%
	Buses and Single-Unit Trucks	20	2	22	20	0	20	42
	% Buses and Single-Unit Trucks	1.3%	3.5%	1.4%	1.0%	0%	1.0%	1.2%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.

625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:00AM	346	5	0	351	0	0	0	0	0	31	0	31	382
7:15AM	336	11	0	347	0	0	0	0	0	29	0	29	376
7:30AM	342	20	0	362	0	0	0	0	0	40	0	40	402
7:45AM	399	8	0	407	0	0	0	0	0	26	0	26	433
Hourly Total	1423	44	0	1467	0	0	0	0	0	126	0	126	1593
8:00AM	352	10	0	362	0	0	0	0	0	31	0	31	393
8:15AM	332	12	0	344	0	0	0	0	0	19	0	19	363
8:30AM	313	8	0	321	0	0	0	0	0	24	0	24	345
8:45AM	340	14	0	354	0	0	0	0	0	40	0	40	394
Hourly Total	1337	44	0	1381	0	0	0	0	0	114	0	114	1495
4:00PM	319	27	0	346	0	0	0	0	0	14	0	14	360
4:15PM	382	40	0	422	0	0	0	0	0	17	0	17	439
4:30PM	365	34	0	399	0	0	0	0	0	19	0	19	418
4:45PM	366	32	0	398	0	0	0	0	0	23	0	23	421
Hourly Total	1432	133	0	1565	0	0	0	0	0	73	0	73	1638
5:00PM	394	39	0	433	0	0	0	0	0	36	0	36	469
5:15PM	367	36	0	403	0	0	0	0	0	26	0	26	429
5:30PM	384	34	0	418	0	0	0	0	0	22	0	22	440
5:45PM	360	35	0	395	0	0	0	0	0	20	0	20	415
Hourly Total	1505	144	0	1649	0	0	0	0	0	104	0	104	1753
Total	5697	365	0	6062	0	0	0	0	0	417	0	417	6479
% Approach	94.0%	6.0%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	87.9%	5.6%	0%	93.6%	0%	0%	0%	0%	0%	6.4%	0%	6.4%	-
Lights	5517	352	0	5869	0	0	0	0	0	403	0	403	6272
% Lights	96.8%	96.4%	0%	96.8%	0%	0%	0%	-	0%	96.6%	0%	96.6%	96.8%
Articulated Trucks	60	0	0	60	0	0	0	0	0	0	0	0	60
% Articulated Trucks	1.1%	0%	0%	1.0%	0%	0%	0%	-	0%	0%	0%	0%	0.9%
Buses and Single-Unit Trucks	120	13	0	133	0	0	0	0	0	14	0	14	147
% Buses and Single-Unit Trucks	2.1%	3.6%	0%	2.2%	0%	0%	0%	-	0%	3.4%	0%	3.4%	2.3%

*L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

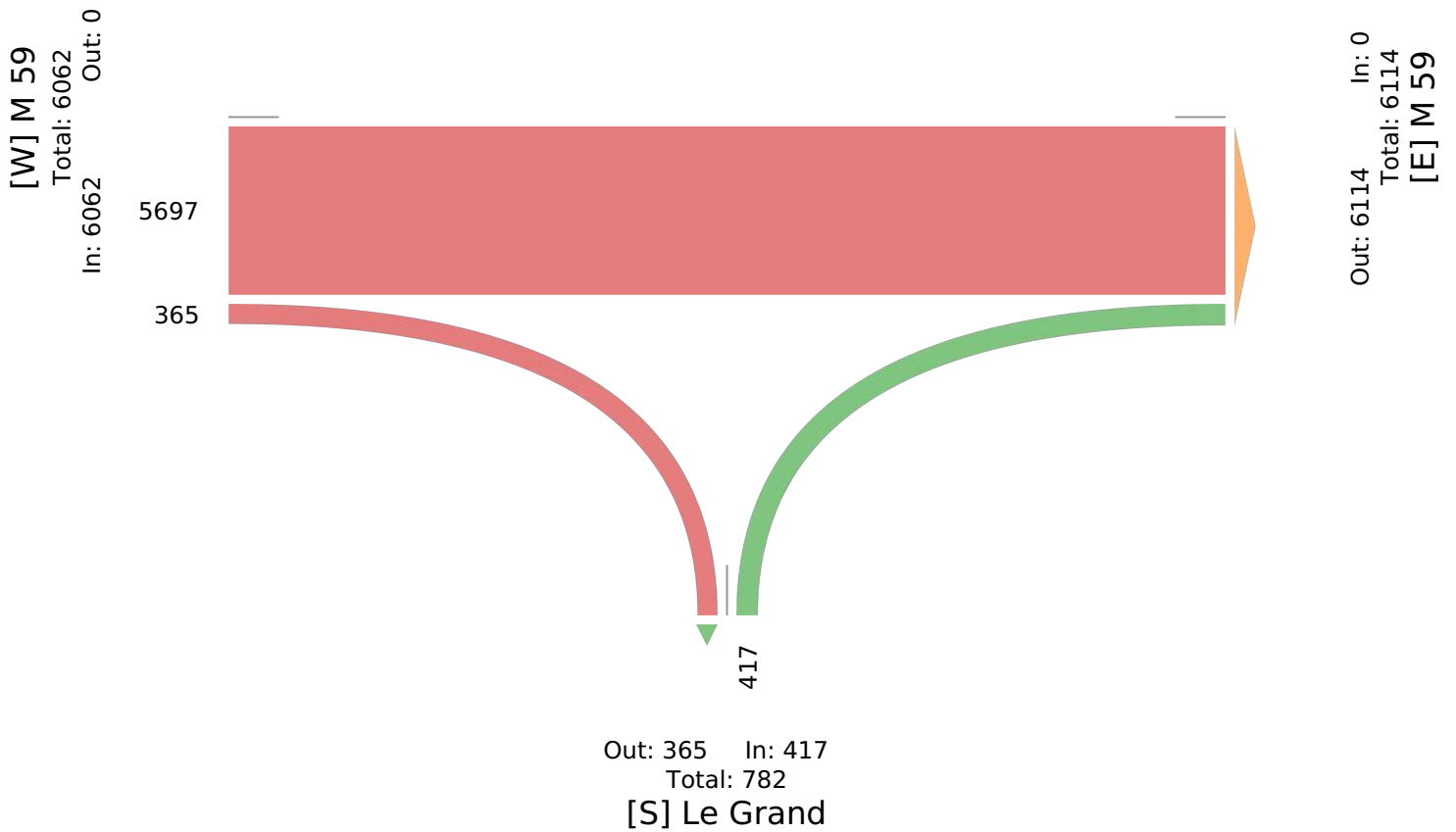
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



M-59 (Highland Road) and Le Grand Ct - TMC
 Thu Sep 30, 2021
 AM Peak (7:15 AM - 8:15 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:15AM	336	11	0	347	0	0	0	0	0	29	0	29	376
7:30AM	342	20	0	362	0	0	0	0	0	40	0	40	402
7:45AM	399	8	0	407	0	0	0	0	0	26	0	26	433
8:00AM	352	10	0	362	0	0	0	0	0	31	0	31	393
Total	1429	49	0	1478	0	0	0	0	0	126	0	126	1604
% Approach	96.7%	3.3%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	89.1%	3.1%	0%	92.1%	0%	0%	0%	0%	0%	7.9%	0%	7.9%	-
PHF	0.895	0.613	-	0.908	-	-	-	-	-	0.788	-	0.788	0.926
Lights	1369	46	0	1415	0	0	0	0	0	122	0	122	1537
% Lights	95.8%	93.9%	0%	95.7%	0%	0%	0%	-	0%	96.8%	0%	96.8%	95.8%
Articulated Trucks	26	0	0	26	0	0	0	0	0	0	0	0	26
% Articulated Trucks	1.8%	0%	0%	1.8%	0%	0%	0%	-	0%	0%	0%	0%	1.6%
Buses and Single-Unit Trucks	34	3	0	37	0	0	0	0	0	4	0	4	41
% Buses and Single-Unit Trucks	2.4%	6.1%	0%	2.5%	0%	0%	0%	-	0%	3.2%	0%	3.2%	2.6%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

AM Peak (7:15 AM - 8:15 AM)

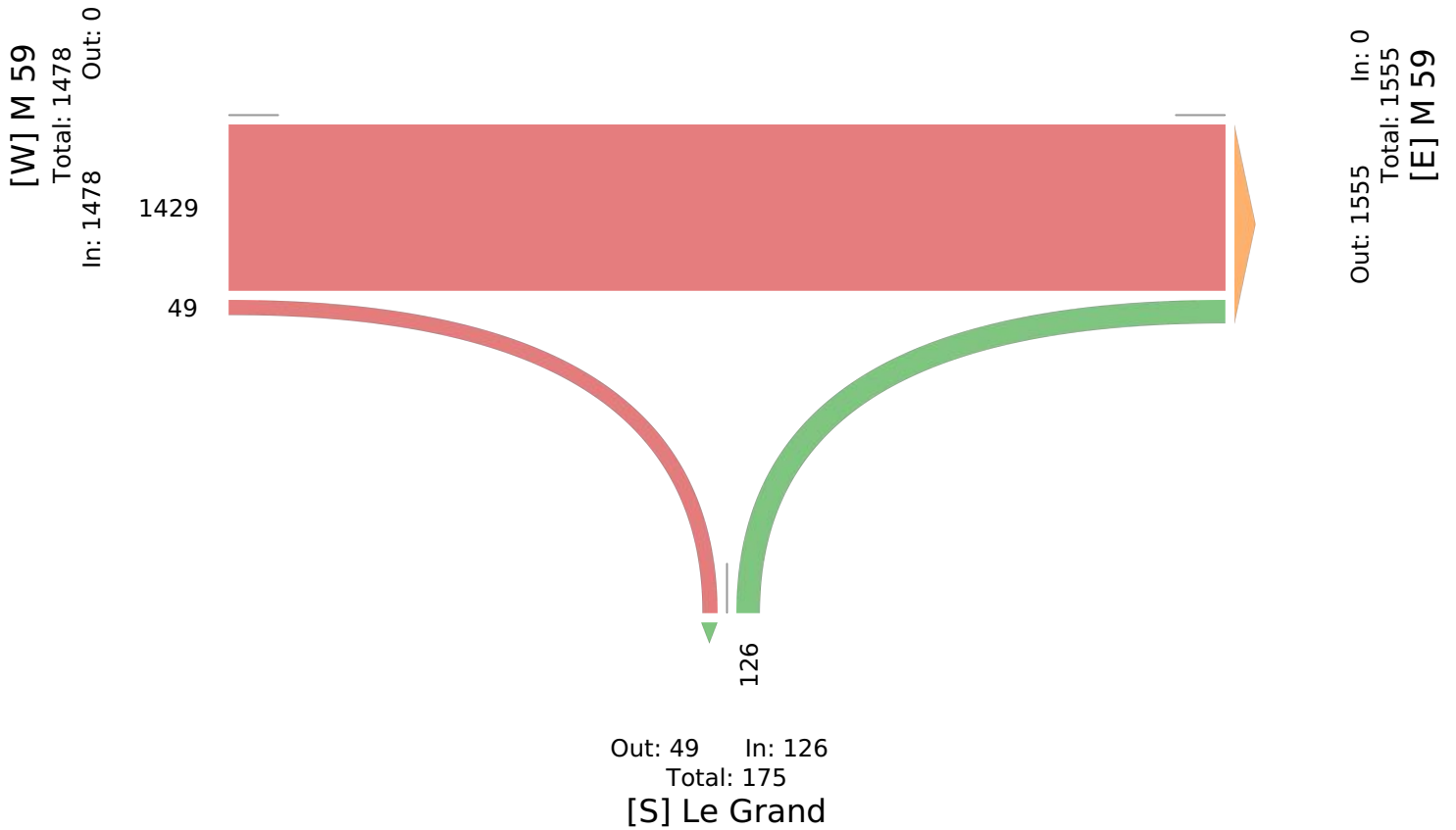
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



M-59 (Highland Road) and Le Grand Ct - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877562, Location: 42.64847, -83.537354

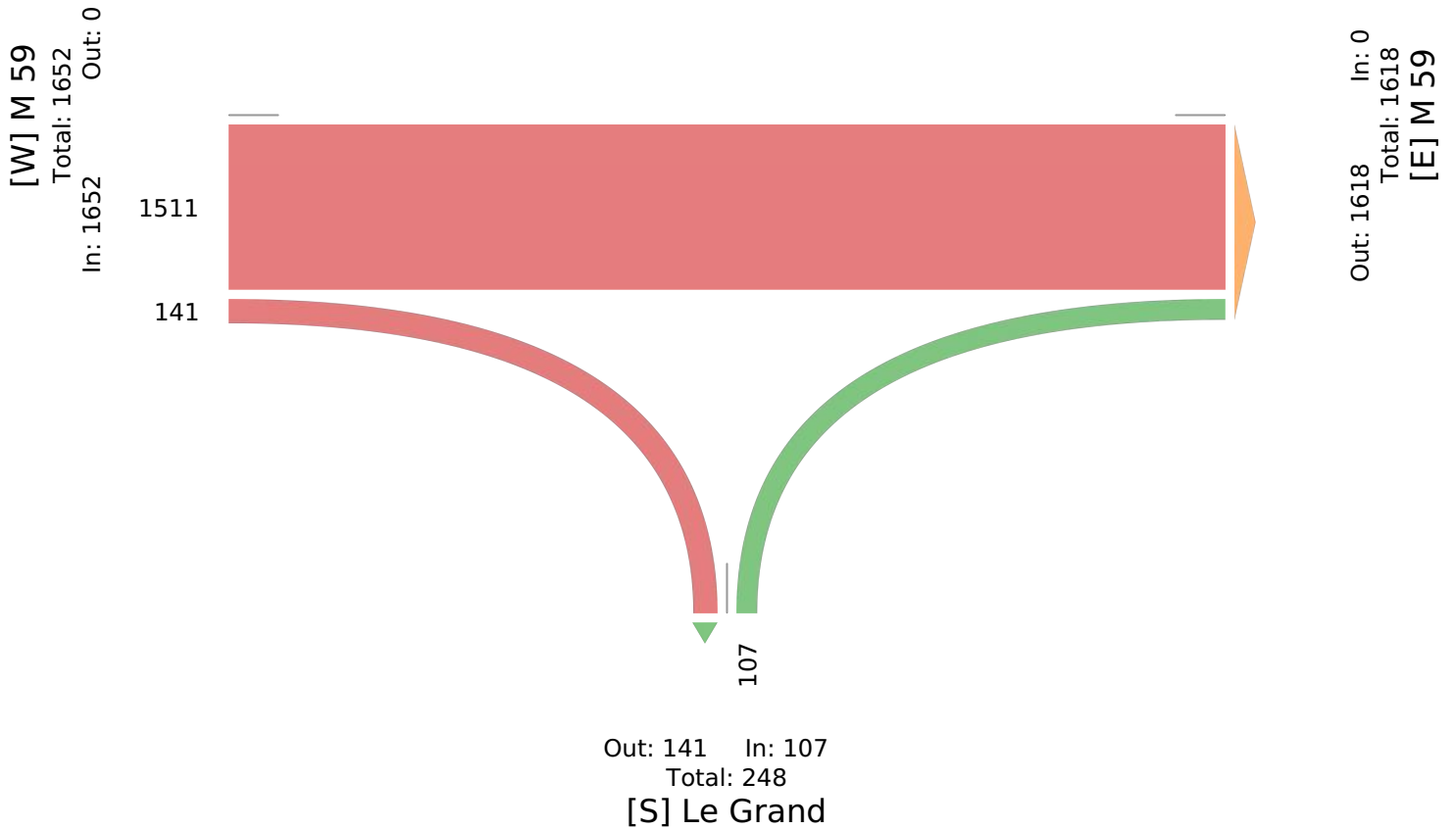


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 4:45PM	366	32	0	398	0	0	0	0	0	23	0	23	421
5:00PM	394	39	0	433	0	0	0	0	0	36	0	36	469
5:15PM	367	36	0	403	0	0	0	0	0	26	0	26	429
5:30PM	384	34	0	418	0	0	0	0	0	22	0	22	440
Total	1511	141	0	1652	0	0	0	0	0	107	0	107	1759
% Approach	91.5%	8.5%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	85.9%	8.0%	0%	93.9%	0%	0%	0%	0%	0%	6.1%	0%	6.1%	-
PHF	0.959	0.904	-	0.954	-	-	-	-	-	0.743	-	0.743	0.938
Lights	1476	138	0	1614	0	0	0	0	0	103	0	103	1717
% Lights	97.7%	97.9%	0%	97.7%	0%	0%	0%	-	0%	96.3%	0%	96.3%	97.6%
Articulated Trucks	9	0	0	9	0	0	0	0	0	0	0	0	9
% Articulated Trucks	0.6%	0%	0%	0.5%	0%	0%	0%	-	0%	0%	0%	0%	0.5%
Buses and Single-Unit Trucks	26	3	0	29	0	0	0	0	0	4	0	4	33
% Buses and Single-Unit Trucks	1.7%	2.1%	0%	1.8%	0%	0%	0%	-	0%	3.7%	0%	3.7%	1.9%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877562, Location: 42.64847, -83.537354



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 7:00AM	0	0	0	0	177	1	0	178	0	8	0	8	186
7:15AM	0	0	0	0	193	4	0	197	0	4	0	4	201
7:30AM	0	0	0	0	245	12	0	257	0	8	0	8	265
7:45AM	0	0	0	0	250	31	0	281	0	26	0	26	307
Hourly Total	0	0	0	0	865	48	0	913	0	46	0	46	959
8:00AM	0	0	0	0	242	7	0	249	0	13	0	13	262
8:15AM	0	0	0	0	254	6	0	260	0	4	0	4	264
8:30AM	0	0	0	0	232	0	0	232	0	8	0	8	240
8:45AM	0	0	0	0	232	2	0	234	0	4	0	4	238
Hourly Total	0	0	0	0	960	15	0	975	0	29	0	29	1004
4:00PM	0	0	0	0	423	8	0	431	0	7	0	7	438
4:15PM	0	0	0	0	463	5	0	468	0	10	0	10	478
4:30PM	0	0	0	0	490	5	0	495	0	8	0	8	503
4:45PM	0	0	0	0	473	8	0	481	0	9	0	9	490
Hourly Total	0	0	0	0	1849	26	0	1875	0	34	0	34	1909
5:00PM	0	0	0	0	473	11	0	484	0	11	0	11	495
5:15PM	0	0	0	0	480	11	0	491	0	17	0	17	508
5:30PM	0	0	0	0	494	15	0	509	0	9	0	9	518
5:45PM	0	0	0	0	462	23	0	485	0	20	0	20	505
Hourly Total	0	0	0	0	1909	60	0	1969	0	57	0	57	2026
Total	0	0	0	0	5583	149	0	5732	0	166	0	166	5898
% Approach	0%	0%	0%	-	97.4%	2.6%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	94.7%	2.5%	0%	97.2%	0%	2.8%	0%	2.8%	-
Lights	0	0	0	0	5389	141	0	5530	0	162	0	162	5692
% Lights	0%	0%	0%	-	96.5%	94.6%	0%	96.5%	0%	97.6%	0%	97.6%	96.5%
Articulated Trucks	0	0	0	0	47	2	0	49	0	0	0	0	49
% Articulated Trucks	0%	0%	0%	-	0.8%	1.3%	0%	0.9%	0%	0%	0%	0%	0.8%
Buses and Single-Unit Trucks	0	0	0	0	147	6	0	153	0	4	0	4	157
% Buses and Single-Unit Trucks	0%	0%	0%	-	2.6%	4.0%	0%	2.7%	0%	2.4%	0%	2.4%	2.7%

*L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 315

In: 166 Out: 149

166

149

5583

[W] MI 59

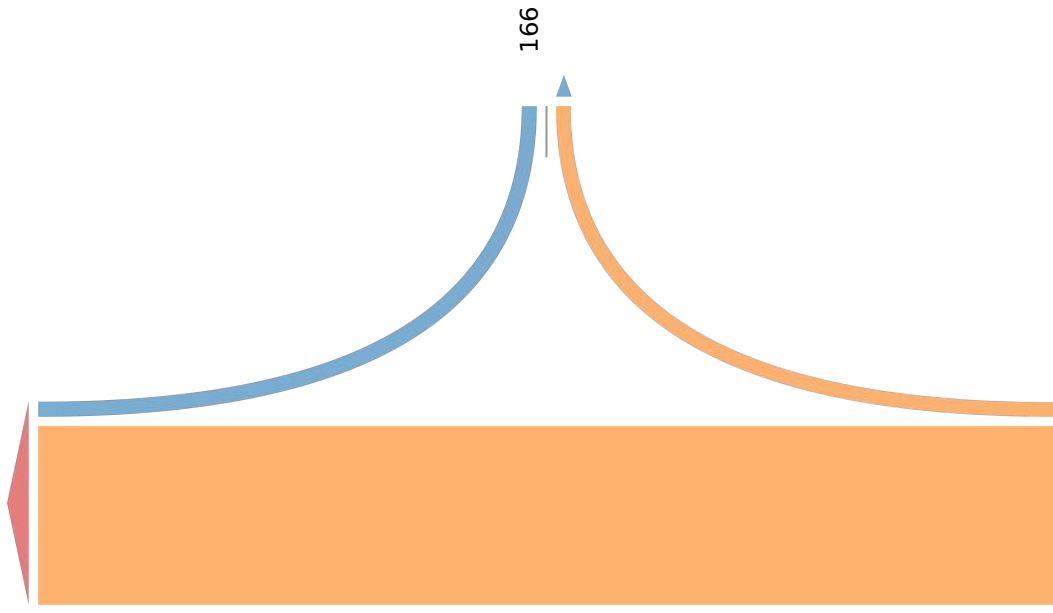
Total: 5749

In: 0 Out: 5749

Out: 0 In: 5732

Total: 5732

[E] MI 59



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 7:30AM	0	0	0	0	245	12	0	257	0	8	0	8	265
7:45AM	0	0	0	0	250	31	0	281	0	26	0	26	307
8:00AM	0	0	0	0	242	7	0	249	0	13	0	13	262
8:15AM	0	0	0	0	254	6	0	260	0	4	0	4	264
Total	0	0	0	0	991	56	0	1047	0	51	0	51	1098
% Approach	0%	0%	0%	-	94.7%	5.3%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	90.3%	5.1%	0%	95.4%	0%	4.6%	0%	4.6%	-
PHF	-	-	-	-	0.975	0.452	-	0.931	-	0.490	-	0.490	0.894
Lights	0	0	0	0	934	52	0	986	0	50	0	50	1036
% Lights	0%	0%	0%	-	94.2%	92.9%	0%	94.2%	0%	98.0%	0%	98.0%	94.4%
Articulated Trucks	0	0	0	0	17	0	0	17	0	0	0	0	17
% Articulated Trucks	0%	0%	0%	-	1.7%	0%	0%	1.6%	0%	0%	0%	0%	1.5%
Buses and Single-Unit Trucks	0	0	0	0	40	4	0	44	0	1	0	1	45
% Buses and Single-Unit Trucks	0%	0%	0%	-	4.0%	7.1%	0%	4.2%	0%	2.0%	0%	2.0%	4.1%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 107

In: 51 Out: 56

51

56

991

[W] MI 59

Total: 1042

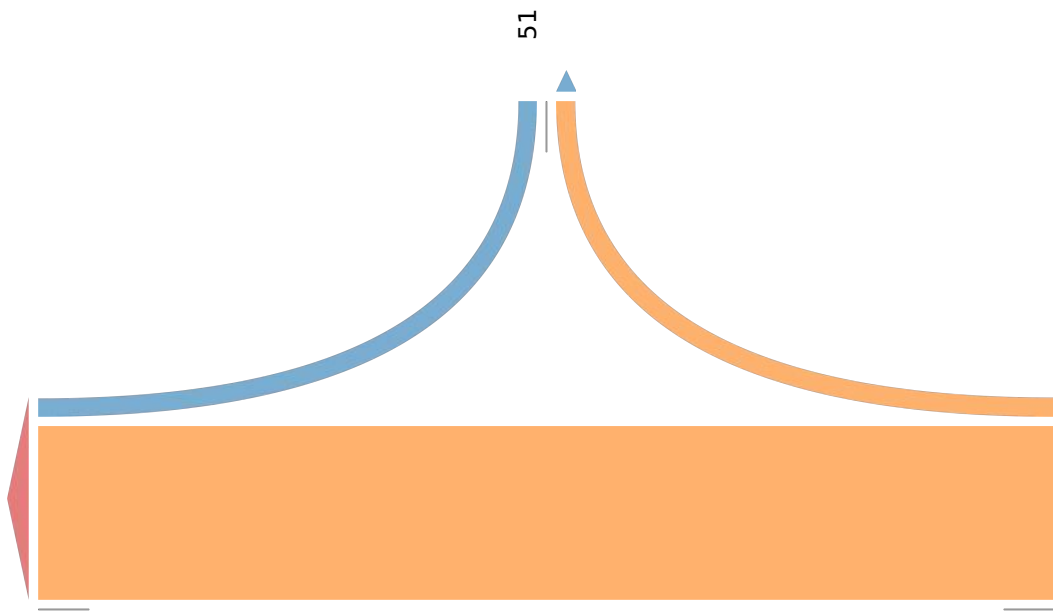
In: 0

Out: 1042

Out: 0 In: 1047

Total: 1047

[E] MI 59



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 5:00PM	0	0	0	0	473	11	0	484	0	11	0	11	495
5:15PM	0	0	0	0	480	11	0	491	0	17	0	17	508
5:30PM	0	0	0	0	494	15	0	509	0	9	0	9	518
5:45PM	0	0	0	0	462	23	0	485	0	20	0	20	505
Total	0	0	0	0	1909	60	0	1969	0	57	0	57	2026
% Approach	0%	0%	0%	-	97.0%	3.0%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	94.2%	3.0%	0%	97.2%	0%	2.8%	0%	2.8%	-
PHF	-	-	-	-	0.966	0.652	-	0.967	-	0.713	-	0.713	0.978
Lights	0	0	0	0	1878	58	0	1936	0	56	0	56	1992
% Lights	0%	0%	0%	-	98.4%	96.7%	0%	98.3%	0%	98.2%	0%	98.2%	98.3%
Articulated Trucks	0	0	0	0	9	1	0	10	0	0	0	0	10
% Articulated Trucks	0%	0%	0%	-	0.5%	1.7%	0%	0.5%	0%	0%	0%	0%	0.5%
Buses and Single-Unit Trucks	0	0	0	0	22	1	0	23	0	1	0	1	24
% Buses and Single-Unit Trucks	0%	0%	0%	-	1.2%	1.7%	0%	1.2%	0%	1.8%	0%	1.8%	1.2%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 117

In: 57 Out: 60

57

60

1909

[W] MI 59

Total: 1966

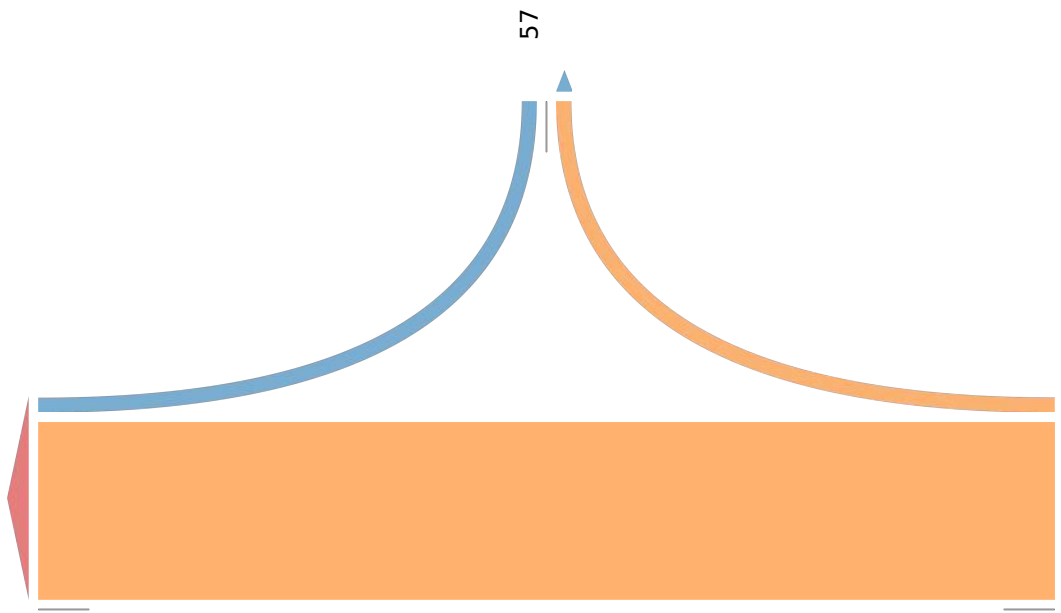
In: 0

Out: 1966

Out: 0 In: 1969

Total: 1969

[E] MI 59



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 7:00AM	344	0	344	172	10	182	526
7:15AM	328	0	328	185	13	198	526
7:30AM	340	0	340	224	22	246	586
7:45AM	397	0	397	254	15	269	666
Hourly Total	1409	0	1409	835	60	895	2304
8:00AM	345	0	345	243	14	257	602
8:15AM	327	0	327	243	13	256	583
8:30AM	312	0	312	232	9	241	553
8:45AM	342	0	342	221	16	237	579
Hourly Total	1326	0	1326	939	52	991	2317
4:00PM	319	0	319	397	25	422	741
4:15PM	382	0	382	425	40	465	847
4:30PM	374	0	374	465	23	488	862
4:45PM	372	0	372	454	28	482	854
Hourly Total	1447	0	1447	1741	116	1857	3304
5:00PM	378	0	378	420	41	461	839
5:15PM	370	0	370	444	40	484	854
5:30PM	376	0	376	447	35	482	858
5:45PM	357	0	357	426	41	467	824
Hourly Total	1481	0	1481	1737	157	1894	3375
Total	5663	0	5663	5252	385	5637	11300
% Approach	100%	0%	-	93.2%	6.8%	-	-
% Total	50.1%	0%	50.1%	46.5%	3.4%	49.9%	-
Lights	5490	0	5490	5078	374	5452	10942
% Lights	96.9%	0%	96.9%	96.7%	97.1%	96.7%	96.8%
Articulated Trucks	65	0	65	56	0	56	121
% Articulated Trucks	1.1%	0%	1.1%	1.1%	0%	1.0%	1.1%
Buses and Single-Unit Trucks	108	0	108	118	11	129	237
% Buses and Single-Unit Trucks	1.9%	0%	1.9%	2.2%	2.9%	2.3%	2.1%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	340	0	340	224	22	246	586
7:45AM	397	0	397	254	15	269	666
8:00AM	345	0	345	243	14	257	602
8:15AM	327	0	327	243	13	256	583
Total	1409	0	1409	964	64	1028	2437
% Approach	100%	0%	-	93.8%	6.2%	-	-
% Total	57.8%	0%	57.8%	39.6%	2.6%	42.2%	-
PHF	0.887	-	0.887	0.949	0.727	0.955	0.915
Lights	1346	0	1346	912	60	972	2318
% Lights	95.5%	0%	95.5%	94.6%	93.8%	94.6%	95.1%
Articulated Trucks	30	0	30	17	0	17	47
% Articulated Trucks	2.1%	0%	2.1%	1.8%	0%	1.7%	1.9%
Buses and Single-Unit Trucks	33	0	33	35	4	39	72
% Buses and Single-Unit Trucks	2.3%	0%	2.3%	3.6%	6.3%	3.8%	3.0%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 4:30PM	374	0	374	465	23	488	862
4:45PM	372	0	372	454	28	482	854
5:00PM	378	0	378	420	41	461	839
5:15PM	370	0	370	444	40	484	854
Total	1494	0	1494	1783	132	1915	3409
% Approach	100%	0%	-	93.1%	6.9%	-	-
% Total	43.8%	0%	43.8%	52.3%	3.9%	56.2%	-
PHF	0.988	-	0.988	0.959	0.805	0.981	0.989
Lights	1468	0	1468	1737	129	1866	3334
% Lights	98.3%	0%	98.3%	97.4%	97.7%	97.4%	97.8%
Articulated Trucks	10	0	10	17	0	17	27
% Articulated Trucks	0.7%	0%	0.7%	1.0%	0%	0.9%	0.8%
Buses and Single-Unit Trucks	16	0	16	29	3	32	48
% Buses and Single-Unit Trucks	1.1%	0%	1.1%	1.6%	2.3%	1.7%	1.4%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



WB M-59 (Highland Road) and EB to WB crossov... - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:00AM	339	1	340	175	10	185	525
7:15AM	339	2	341	185	13	198	539
7:30AM	353	2	355	230	22	252	607
7:45AM	407	5	412	257	15	272	684
Hourly Total	1438	10	1448	847	60	907	2355
8:00AM	344	3	347	243	13	256	603
8:15AM	340	2	342	246	13	259	601
8:30AM	309	4	313	233	9	242	555
8:45AM	341	3	344	220	16	236	580
Hourly Total	1334	12	1346	942	51	993	2339
4:00PM	322	2	324	401	25	426	750
4:15PM	378	2	380	437	40	477	857
4:30PM	370	8	378	469	23	492	870
4:45PM	368	3	371	458	27	485	856
Hourly Total	1438	15	1453	1765	115	1880	3333
5:00PM	387	4	391	438	42	480	871
5:15PM	368	9	377	459	40	499	876
5:30PM	380	3	383	463	34	497	880
5:45PM	350	4	354	446	41	487	841
Hourly Total	1485	20	1505	1806	157	1963	3468
Total	5695	57	5752	5360	383	5743	11495
% Approach	99.0%	1.0%	-	93.3%	6.7%	-	-
% Total	49.5%	0.5%	50.0%	46.6%	3.3%	50.0%	-
Lights	5541	53	5594	5183	373	5556	11150
% Lights	97.3%	93.0%	97.3%	96.7%	97.4%	96.7%	97.0%
Articulated Trucks	64	0	64	46	0	46	110
% Articulated Trucks	1.1%	0%	1.1%	0.9%	0%	0.8%	1.0%
Buses and Single-Unit Trucks	90	4	94	131	10	141	235
% Buses and Single-Unit Trucks	1.6%	7.0%	1.6%	2.4%	2.6%	2.5%	2.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	353	2	355	230	22	252	607
7:45AM	407	5	412	257	15	272	684
8:00AM	344	3	347	243	13	256	603
8:15AM	340	2	342	246	13	259	601
Total	1444	12	1456	976	63	1039	2495
% Approach	99.2%	0.8%	-	93.9%	6.1%	-	-
% Total	57.9%	0.5%	58.4%	39.1%	2.5%	41.6%	-
PHF	0.887	0.600	0.883	0.949	0.716	0.955	0.912
Lights	1392	11	1403	927	59	986	2389
% Lights	96.4%	91.7%	96.4%	95.0%	93.7%	94.9%	95.8%
Articulated Trucks	27	0	27	11	0	11	38
% Articulated Trucks	1.9%	0%	1.9%	1.1%	0%	1.1%	1.5%
Buses and Single-Unit Trucks	25	1	26	38	4	42	68
% Buses and Single-Unit Trucks	1.7%	8.3%	1.8%	3.9%	6.3%	4.0%	2.7%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 4:45PM	368	3	371	458	27	485	856
	5:00PM	387	4	391	438	42	480	871
	5:15PM	368	9	377	459	40	499	876
	5:30PM	380	3	383	463	34	497	880
Total		1503	19	1522	1818	143	1961	3483
% Approach		98.8%	1.2%	-	92.7%	7.3%	-	-
% Total		43.2%	0.5%	43.7%	52.2%	4.1%	56.3%	-
PHF		0.971	0.528	0.973	0.982	0.851	0.982	0.989
Lights		1472	17	1489	1781	141	1922	3411
% Lights		97.9%	89.5%	97.8%	98.0%	98.6%	98.0%	97.9%
Articulated Trucks		12	0	12	14	0	14	26
% Articulated Trucks		0.8%	0%	0.8%	0.8%	0%	0.7%	0.7%
Buses and Single-Unit Trucks		19	2	21	23	2	25	46
% Buses and Single-Unit Trucks		1.3%	10.5%	1.4%	1.3%	1.4%	1.3%	1.3%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877564, Location: 42.64915, -83.540201



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

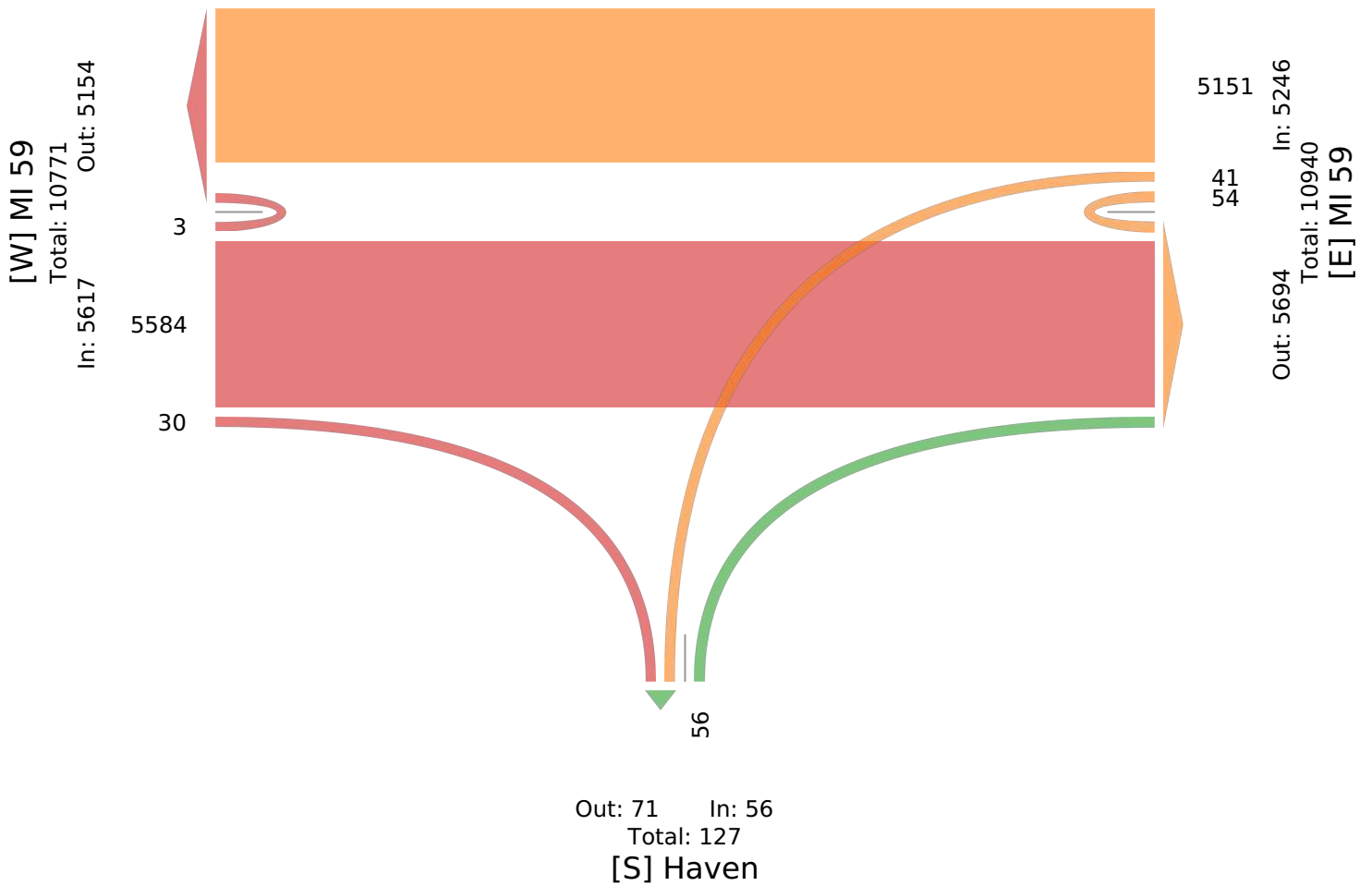


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:00AM	327	1	0	328	2	170	2	174	0	1	0	1	503
7:15AM	332	1	0	333	1	185	2	188	0	0	0	0	521
7:30AM	335	1	0	336	3	226	0	229	0	1	0	1	566
7:45AM	384	1	1	386	1	256	3	260	0	1	0	1	647
Hourly Total	1378	4	1	1383	7	837	7	851	0	3	0	3	2237
8:00AM	346	2	0	348	3	235	3	241	0	1	0	1	590
8:15AM	321	0	0	321	2	230	1	233	0	2	0	2	556
8:30AM	314	2	0	316	1	225	4	230	0	1	0	1	547
8:45AM	335	2	0	337	1	216	2	219	0	3	0	3	559
Hourly Total	1316	6	0	1322	7	906	10	923	0	7	0	7	2252
4:00PM	317	0	0	317	3	371	7	381	0	6	0	6	704
4:15PM	378	3	0	381	2	428	2	432	0	3	0	3	816
4:30PM	376	3	2	381	4	432	2	438	0	8	0	8	827
4:45PM	364	1	0	365	3	445	3	451	0	1	0	1	817
Hourly Total	1435	7	2	1444	12	1676	14	1702	0	18	0	18	3164
5:00PM	382	2	0	384	2	427	5	434	0	3	0	3	821
5:15PM	350	1	0	351	3	451	5	459	0	13	0	13	823
5:30PM	386	5	0	391	5	438	7	450	0	6	0	6	847
5:45PM	337	5	0	342	5	416	6	427	0	6	0	6	775
Hourly Total	1455	13	0	1468	15	1732	23	1770	0	28	0	28	3266
Total	5584	30	3	5617	41	5151	54	5246	0	56	0	56	10919
% Approach	99.4%	0.5%	0.1%	-	0.8%	98.2%	1.0%	-	0%	100%	0%	-	-
% Total	51.1%	0.3%	0%	51.4%	0.4%	47.2%	0.5%	48.0%	0%	0.5%	0%	0.5%	-
Lights	5412	30	3	5445	40	4979	51	5070	0	55	0	55	10570
% Lights	96.9%	100%	100%	96.9%	97.6%	96.7%	94.4%	96.6%	0%	98.2%	0%	98.2%	96.8%
Articulated Trucks	64	0	0	64	1	53	1	55	0	0	0	0	119
% Articulated Trucks	1.1%	0%	0%	1.1%	2.4%	1.0%	1.9%	1.0%	0%	0%	0%	0%	1.1%
Buses and Single-Unit Trucks	108	0	0	108	0	119	2	121	0	1	0	1	230
% Buses and Single-Unit Trucks	1.9%	0%	0%	1.9%	0%	2.3%	3.7%	2.3%	0%	1.8%	0%	1.8%	2.1%

*L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

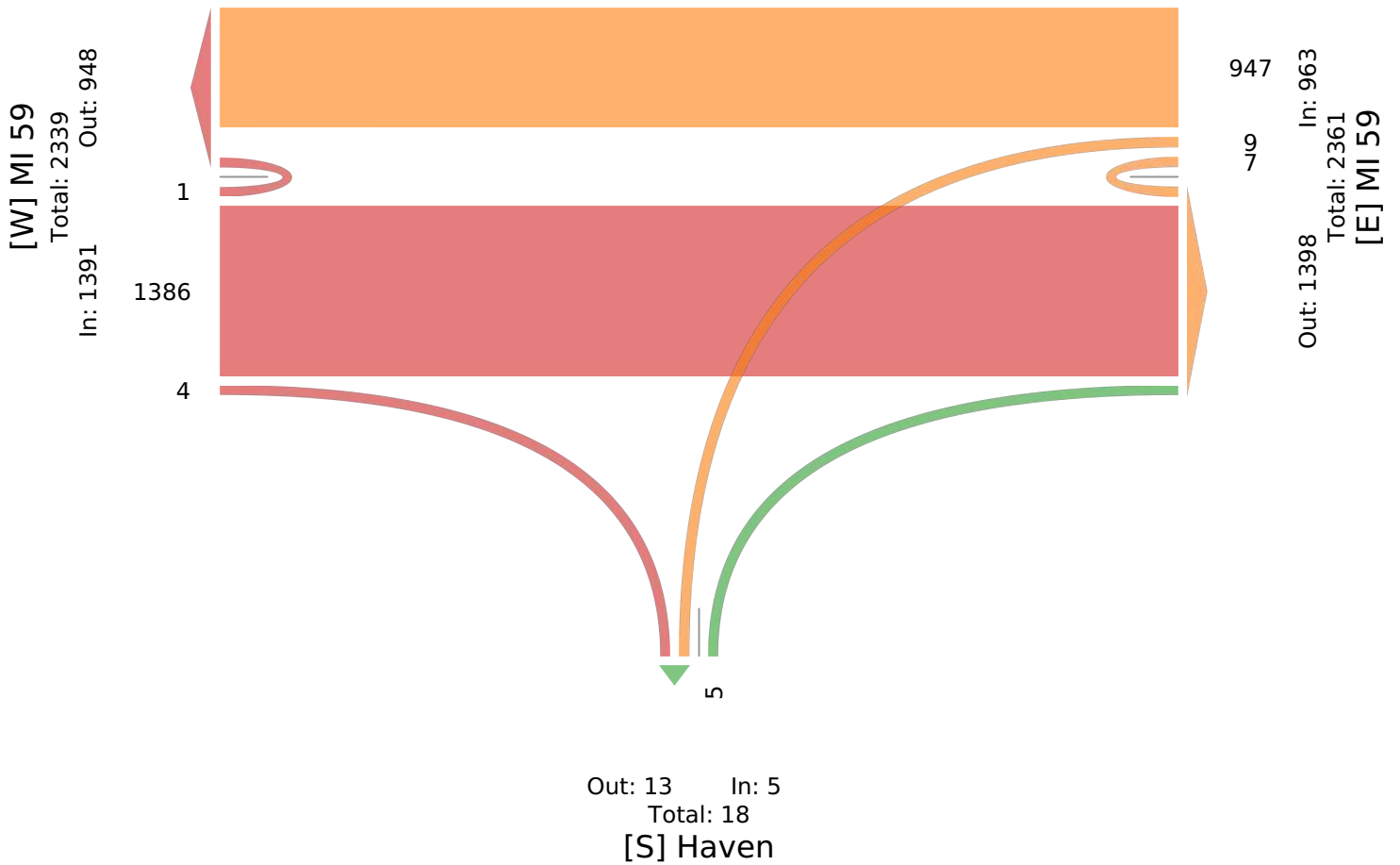


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:30AM	335	1	0	336	3	226	0	229	0	1	0	1	566
7:45AM	384	1	1	386	1	256	3	260	0	1	0	1	647
8:00AM	346	2	0	348	3	235	3	241	0	1	0	1	590
8:15AM	321	0	0	321	2	230	1	233	0	2	0	2	556
Total	1386	4	1	1391	9	947	7	963	0	5	0	5	2359
% Approach	99.6%	0.3%	0.1%	-	0.9%	98.3%	0.7%	-	0%	100%	0%	-	-
% Total	58.8%	0.2%	0%	59.0%	0.4%	40.1%	0.3%	40.8%	0%	0.2%	0%	0.2%	-
PHF	0.902	0.500	0.250	0.901	0.750	0.925	0.583	0.926	-	0.625	-	0.625	0.912
Lights	1321	4	1	1326	9	899	6	914	0	5	0	5	2245
% Lights	95.3%	100%	100%	95.3%	100%	94.9%	85.7%	94.9%	0%	100%	0%	100%	95.2%
Articulated Trucks	32	0	0	32	0	15	0	15	0	0	0	0	47
% Articulated Trucks	2.3%	0%	0%	2.3%	0%	1.6%	0%	1.6%	0%	0%	0%	0%	2.0%
Buses and Single-Unit Trucks	33	0	0	33	0	33	1	34	0	0	0	0	67
% Buses and Single-Unit Trucks	2.4%	0%	0%	2.4%	0%	3.5%	14.3%	3.5%	0%	0%	0%	0%	2.8%

* L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

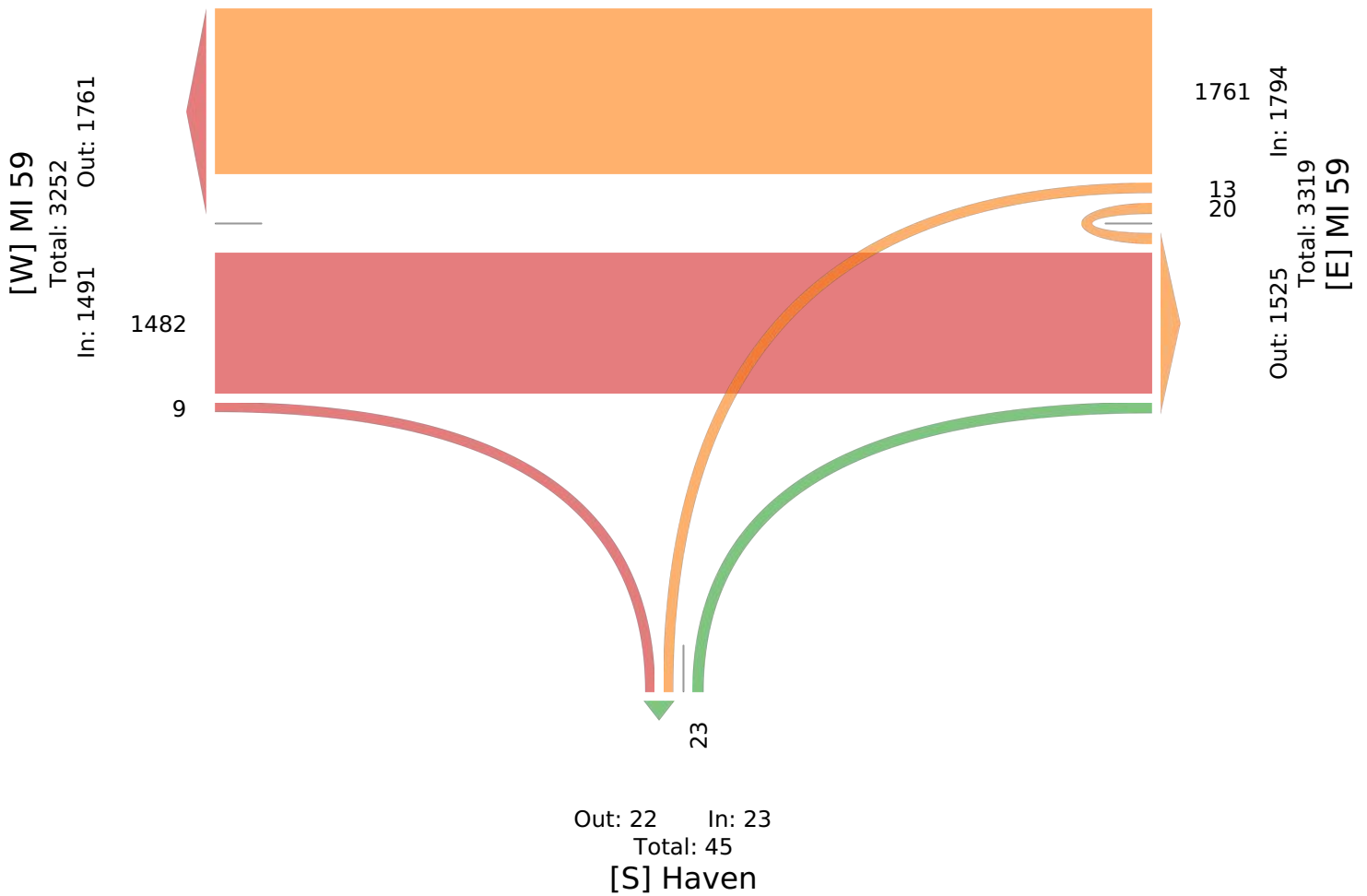


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 4:45PM	364	1	0	365	3	445	3	451	0	1	0	1	817
5:00PM	382	2	0	384	2	427	5	434	0	3	0	3	821
5:15PM	350	1	0	351	3	451	5	459	0	13	0	13	823
5:30PM	386	5	0	391	5	438	7	450	0	6	0	6	847
Total	1482	9	0	1491	13	1761	20	1794	0	23	0	23	3308
% Approach	99.4%	0.6%	0%	-	0.7%	98.2%	1.1%	-	0%	100%	0%	-	-
% Total	44.8%	0.3%	0%	45.1%	0.4%	53.2%	0.6%	54.2%	0%	0.7%	0%	0.7%	-
PHF	0.960	0.450	-	0.953	0.650	0.976	0.714	0.977	-	0.442	-	0.442	0.976
Lights	1451	9	0	1460	13	1725	19	1757	0	23	0	23	3240
% Lights	97.9%	100%	0%	97.9%	100%	98.0%	95.0%	97.9%	0%	100%	0%	100%	97.9%
Articulated Trucks	10	0	0	10	0	14	1	15	0	0	0	0	25
% Articulated Trucks	0.7%	0%	0%	0.7%	0%	0.8%	5.0%	0.8%	0%	0%	0%	0%	0.8%
Buses and Single-Unit Trucks	21	0	0	21	0	22	0	22	0	0	0	0	43
% Buses and Single-Unit Trucks	1.4%	0%	0%	1.4%	0%	1.2%	0%	1.2%	0%	0%	0%	0%	1.3%

* L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#1 - WB M-59 & EB Crossover (East of Hill Rd)	AM Peak 09/30/21		PHF	0.92			0.95			0.60											
			% Heavy	5%			6%			6%											
		2021	Existing	1516	0	0	978	0	69	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1516	0	0	978	0	69	0	0	0	0	0	0	0				
		2027	Background	0	1562	0	0	1008	0	71	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1562	0	0	1008	0	71	0	0	0	0	0	0	0				
			Site Generated		96			21		21											
			Pass By																		
			Total Site Gen	0	96	0	0	21	0	21	0	0	0	0	0	0	0				
			Total Future	0	1658	0	0	1029	0	92	0	0	0	0	0	0	0				

Count Date: 9/30/2021
Count Year: 2021
Existing Adj. Year: 2021

Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2027
Scenario: AM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#2 - EB M-59 & Le Grand Court	AM Peak 09/30/21		PHF	0.91			0.79														
			% Heavy	4%			3%														
		2021	Existing	1459	49	0	0	0	0	126	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1459	49	0	0	0	126	0	0	0	0	0	0	0				
		2027	Background	0	1503	50	0	0	0	130	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1503	51	0	0	0	130	0	0	0	0	0	0	0				
			Site Generated		117																
			Pass By																		
			Total Site Gen	0	117	0	0	0	0	0	0	0	0	0	0	0	0				
			Total Future	0	1620	51	0	0	0	130	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#3 - WB M-59 & Hill Road	AM Peak 09/30/21		PHF	0.93			0.60														
			% Heavy	6%			2%														
		2021	Existing	991	56	0	0	0	0	51	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	991	56	0	0	0	51	0	0	0	0	0	0	0				
		2027	Background	0	1021	58	0	0	0	53	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1021	58	0	0	0	53	0	0	0	0	0	0	0				
			Site Generated		7	35				104											
			Pass By																		
			Total Site Gen	0	7	35	0	0	0	104	0	0	0	0	0	0	0				
			Total Future	0	1028	93	0	0	0	157	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#4 - EB M-59 & WB Crossover (West of Hill Rd)	AM Peak 09/30/21		PHF	0.89			0.73														
			% Heavy	4%			6%														
		2021	Existing	1444	0	0	978	0	64	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	0	0	978	0	64	0	0	0	0	0	0	0				
		2027	Background	0	1488	0	0	1008	0	66	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	0	0	1008	0	66	0	0	0	0	0	0	0				
			Site Generated		53	47			64												
			Pass By																		
			Total Site Gen	0	53	47	0	0	64	0	0	0	0	0	0	0	0				
			Total Future	0	1541	0	0	1055	0	130	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#5 - WB M-59 & EB Crossover (West of Hill Rd)	AM Peak 09/30/21		PHF	0.89			0.60														
			% Heavy	4%			8%														
		2021	Existing	1444	0	0	978	12	0	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	0	0	978	12	0	0	0	0	0	0	0	0				
		2027	Background	0	1488	0	0	1008	12	0	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	0	0	1008	12	0	0	0	0	0	0	0	0				
			Site Generated		53	47	10														
			Pass By																		
			Total Site Gen	0	53	47	10	0	0	0	0	0	0	0	0	0	0				
			Total Future	0	1541	0	0	1055	22	0	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#6 - EB M-59 & Haven Road / WB Crossover	AM Peak 09/30/21		PHF	0.90			0.63			0.67											
			% Heavy	5%			0%			6%											
		2021	Existing	1444	4	0	947	5	7	9	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	4	0	947	5	7	9	0	0	0	0	0	0				
		2027	Background	0	1488	4	0	976	5	7	9	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	4	0	976	5	7	9	0	0	0	0	0	0				
			Site Generated		31	62	32														
			Pass By																		
			Total Site Gen	0	31	62	32	0	0	0	32	0	0	0	0	0	0				
			Total Future	0	1519	4	0	1038	5	39	9	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#7 - Hill Rd & Driveway 1	AM Peak 09/30/21		PHF	0.92			0.92			0.92										
			% Heavy	2%			2%			2%										
			Existing								56				51					
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0					
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Site Generated				44			1		3	15		1					
			Pass By																	
			Total Site Gen	0	0	0	44	0	1	0	3	15	0	1	0					
			Total Future	0	0	0	44	0	1	0	61	15	0	54	0					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#8 - Hill Rd & Driveway 2	AM Peak 09/30/21		PHF	0.92			0.92			0.92									
			% Heavy	2%			2%			2%									
			Existing								56				51				
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0				
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0				
			Site Generated	2		56				18	16				44	1			
			Pass By																
			Total Site Gen	2	0	56	0	0	0	18	16	0	0	44	1				
			Total Future	2	0	56	0	0	0	18	74	0	0	97	1				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#9 - Hill Rd & Driveway 3	AM Peak 09/30/21		PHF	0.92			0.92			0.92									
			% Heavy	2%			2%			2%									
			Existing								56				51				
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0				
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0				
			Site Generated				4			1	33	2		100					
			Pass By																
			Total Site Gen	0	0	0	4	0	1	0	33	2	0	100	0				
			Total Future	0	0	0	4	0	1	0	91	2	0	153	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#10 - WB M-59 & Driveway 4	AM Peak 09/30/21		PHF	0.92			0.95			0.92									
			% Heavy	5%			6%			2%									
			Existing					990											
		2021	Existing Adj.	0	0	0	0	990	0	0	0	0	0	0	0	0			
		2027	Background	0	0	0	0	1020	0	0	0	0	0	0	0	0			
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	1020	0	0	0	0	0	0	0	0			
			Site Generated				40		17						54				
			Pass By																
			Total Site Gen	0	0	0	40	17	0	0	0	0	0	54	0				
			Total Future	0	0	0	40	17	0	0	0	0	0	54	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#11 - M-59 & Bogie Lake Road	AM Peak 09/30/21		PHF	0.92			0.95			0.92									
			% Heavy	5%			6%			2%									
			Existing		1516			795	166		55	200		61	183				
		2021	Existing Adj.	0	1516	0	0	795	166	0	55	200	0	61	183				
		2027	Background	0	1562	0	0	819	171	0	57	206	0	63	189				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1562	0	0	819	171	0	57	206	0	63	189				
			Site Generated		96			21											
			Pass By																
			Total Site Gen	0	96	0	0	21	0	0	0	0	0	63	189				
			Total Future	0	1658	0	0	840	171	0	57	206	0	63	189				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.92			0.95			0.71												
				% Heavy			2%			2%			5%										
#1 - WB M-59 & EB Crossover (East of Hill Rd)	PM Peak 09/30/21	2021	Existing	1555			1933			57													
		2021	Existing Adj.	0	1555	0	0	1933	0	57	0	0	0	0	0	0							
		2027	Background	0	1602	0	0	1992	0	59	0	0	0	0	0	0							
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	1602	0	0	1992	0	59	0	0	0	0	0						
		Site Generated					47			98		50											
		Pass By																					
		Total Site Gen				0	47	0	0	98	0	50	0	0	0	0	0						
Total Future				0	1649	0	0	2090	0	109	0	0	0	0	0								

Count Date: 9/30/2021
Count Year: 2021
Existing Adj. Year: 2021
Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2027
Scenario: PM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.95			0.74			4%												
				% Heavy			2%			4%													
#2 - EB M-59 & Le Grand Court	PM Peak 09/30/21	2021	Existing	1505	141								107										
		2021	Existing Adj.	0	1505	141	0	0	0	0	0	0	0	107	0	0	0						
		2027	Background	0	1551	145	0	0	0	0	0	0	0	110	0	0	0						
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	1551	145	0	0	0	0	0	0	0	110	0	0	0				
		Site Generated					97																
		Pass By																					
		Total Site Gen				0	97	0	0	0	0	0	0	0	0	0	0	0					
Total Future				0	1648	145	0	0	0	0	0	0	110	0	0	0							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.95			0.71			2%												
				% Heavy			2%			2%													
#3 - WB M-59 & Hill Road	PM Peak 09/30/21	2021	Existing				1930		60						57								
		2021	Existing Adj.	0	0	0	0	1930	60	0	0	0	0	0	0	57							
		2027	Background	0	0	0	0	1989	62	0	0	0	0	0	0	59							
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	0	0	0	1989	62	0	0	0	0	0	59						
		Site Generated							34	114						68							
		Pass By																					
		Total Site Gen				0	0	0	0	34	114	0	0	0	0	68							
Total Future				0	0	0	0	2023	176	0	0	0	0	127									

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.95			0.81			2%												
				% Heavy			2%			3%			2%										
#4 - EB M-59 & WB Crossover (West of Hill Rd)	PM Peak 09/30/21	2021	Existing	1514			1855						132										
		2021	Existing Adj.	0	1514	0	0	1855	0	0	0	0	0	132	0	0							
		2027	Background	0	1560	0	0	1911	0	0	0	0	0	136	0	0							
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	1560	0	0	1912	0	0	0	0	136	0	0						
		Site Generated					67			72					30								
		Pass By																					
		Total Site Gen				0	67	0	0	72	0	0	0	0	30	0	0						
Total Future				0	1627	0	0	1984	0	0	0	0	166	0	0								

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.95			0.60			11%			0.81									
				% Heavy			2%			2%			11%										
#5 - WB M-59 & EB Crossover (West of Hill Rd)	PM Peak 09/30/21	2021	Existing	1514			1855		19														
		2021	Existing Adj.	0	1514	0	0	1855	0	19	0	0	0	0	0	0							
		2027	Background	0	1560	0	0	1911	0	20	0	0	0	0	0	0							
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	1560	0	0	1912	0	20	0	0	0	0	0						
		Site Generated					67			72		27											
		Pass By																					
		Total Site Gen				0	67	0	0	72	0	27	0	0	0	0	0						
Total Future				0	1627	0	0	1984	0	47	0	0	0	0	0								

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR				
				PHF	0.95			0.60			0.68			4%									
				% Heavy			2%			0%			4%										
#6 - EB M-59 & Haven Road / WB Crossover	PM Peak 09/30/21	2021	Existing	1490	9		1841					23	20	13									
		2021	Existing Adj.	0	1490	9	0	1841	0	0	0	23	20	13	0								
		2027	Background	0	1535	9	0	1897	0	0	0	24	21	13	0								
		Bckgrd. Dev. A																					
		Bckgrd. Dev. B																					
		Bckgrd. Dev. C																					
		Total Background				0	1535	9	0	1898	0	0	0	24	21	13	0						
		Site Generated					77			57					17								
		Pass By																					
		Total Site Gen				0	77	0	0	57	0	0	0	0	17	0	0						
Total Future				0	1612	9	0	1955	0	0	0	24	38	13	0								

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#7 - Hill Rd & Driveway 1	PM Peak 09/30/21		PHF				0.92			0.92			0.92								
			% Heavy	2%			2%			2%			2%								
			Existing							60			57								
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0					
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0					
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0					
			Site Generated				30			1			52			1			2		
			Pass By																		
			Total Site Gen	0	0	0	30	0	0	0	0	1	52	1	2	0					
			Total Future	0	0	0	30	0	0	0	0	63	52	1	61	0					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR			
#8 - Hill Rd & Driveway 2	PM Peak 09/30/21		PHF	0.92						0.92			0.92									
			% Heavy	2%						2%			2%									
			Existing							60			57									
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0						
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0						
			Bckgrd. Dev. A																			
			Bckgrd. Dev. B																			
			Bckgrd. Dev. C																			
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0						
			Site Generated	1	35						60			52			30			2		
			Pass By																			
			Total Site Gen	1	0	35	0	0	0	0	0	60	52	0	30	2						
			Total Future	1	0	35	0	0	0	0	0	60	114	0	89	2						

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR			
#9 - Hill Rd & Driveway 3	PM Peak 09/30/21		PHF				0.92			0.92			0.92									
			% Heavy	2%			2%			2%			2%									
			Existing							60			57									
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0						
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0						
			Bckgrd. Dev. A																			
			Bckgrd. Dev. B																			
			Bckgrd. Dev. C																			
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0						
			Site Generated				3			112			2			65						
			Pass By																			
			Total Site Gen	0	0	0	3	0	0	0	0	112	2	0	65	0						
			Total Future	0	0	0	3	0	0	0	0	174	2	0	124	0						

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR			
#10 - WB M-59 & Driveway 4	PM Peak 09/30/21		PHF				0.92			0.92			0.92									
			% Heavy	2%			2%			2%			2%									
			Existing				1874															
		2021	Existing Adj.	0	0	0	0	1874	0	0	0	0	0	0	0	0						
		2027	Background	0	0	0	0	1931	0	0	0	0	0	0	0	0						
			Bckgrd. Dev. A																			
			Bckgrd. Dev. B																			
			Bckgrd. Dev. C																			
			Total Background	0	0	0	0	1932	0	0	0	0	0	0	0	0						
			Site Generated				38			61						36						
			Pass By																			
			Total Site Gen	0	0	0	0	38	61	0	0	0	0	0	36							
			Total Future	0	0	0	0	1970	61	0	0	0	0	0	36							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#11 - M-59 & Bogie Lake Road	PM Peak 09/30/21		PHF	0.94			0.95			0.92			0.92								
			% Heavy	2%			2%			2%			2%								
			Existing	1555			1715			225			75			200					
		2021	Existing Adj.	0	1555	0	0	1715	225	0	75	200	0	75	218						
		2027	Background	0	1602	0	0	1767	232	0	77	206	0	75	225						
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1602	0	0	1767	232	0	77	206	0	75	225						
			Site Generated	47			98														
			Pass By																		
			Total Site Gen	0	47	0	0	98	0	0	0	0	0	0	0						
			Total Future	0	1649	0	0	1865	232	0	77	206	0	75	225						

OAKLAND COUNTY ROAD COMMISSION
 TRAFFIC - SAFETY DEPARTMENT
 SIGNAL WORK ORDER

JAN 23 2017

1-17-17

LOCATION: Bogie LK & M-59 DATE: 12/9/16
 CITY/TOWNSHIP: White Lake BY: E Labiano
 COUNTY#: 4110 STATE#: 63041-01-029 CHARGES: WO 168612

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

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

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: 5am - Midnight
 NEW: 5:30am - 11pm
 REPROGRAM TBC (Traffic Events)
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER: Rev 23 Change

MDOT RETIMING - FINAL

APPROVED BY: [Signature] DATE: 1/17/17
 DATE INSTALLED: 1/21/17
 INSTALLED BY: Richardson

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

INTERSECTION: BOGIE LAKE & M-59

CITY/VILLAGE/TOWNSHIP: WHITE LAKE

COUNTY#: 4110 MDOT#: 63041-01-029 REV#: 23 DETROIT EDISON#: 1043

DRAWN BY: E Labiano APPROVED BY: [Signature] DATE DRAWN: 1/17/17

INSTALLED BY: _____ DATE INSTLD: 1/1

HOURS OF OPERATION: 7 DAYS: 5:30AM - 11:00PM

HOURS OF FLASHING: 7 DAYS: 11:00PM - 5:30AM

2. UTILITIES - 1. ACCESS

CODE: _____: 1642 CODE: Four digits (0000 - 9999)

4. UNIT DATA - 5. RING STRUCTURE

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

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED						
PHASE 1:			1																							
PHASE 2:	1	4		1																					2	9
PHASE 3:					1																					
PHASE 4:	1	2				1																			4	10
PHASE 5:							1																			
PHASE 6:								1																		
PHASE 7:									1																	
PHASE 8:										1																
PHASE 9:											1															
PHASE 10:												1														
PHASE 11:													1													
PHASE 12:														1												
PHASE 13:															1											
PHASE 14:																1										
PHASE 15:																	1									
PHASE 16:																										1

CODES:

RING Ring Number for Phase (1-4)
 PHNXT Phase Next In Ring (1-16)
 CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

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

3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green		10		7													00-99
Passage																	0.0-9.9
Maximum #1		9.2		2.9													000-999
Maximum #2																	000-999
Yellow Clearance		4.7		4.3													3.0-9.9
Red Clearance		2.0		6.6													0.0-9.9

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

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk		7		7													00-99
Pedest Clearance		20		12													00-99
Flashing Walk																	
Extend Ped Clear		0		0													
Act Rest in Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																
CODES:	0		1		2		3		4							
Initial	none		inactive		red		yellow		green							
NA Response	none		to 1		to 2		both		-----							

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall		0		0												
CODES:	0		1		2		3		4							
Vehicle	none		1 call		min		max		soft							
Pedestrian	none		1 call		ped		bot N.A.		-----							

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																
CODES:	0 = NO				1 = YES											

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

Detector # on Print	1	2	3	4	5	6	7	8
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet for D-connector pin assignments

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

Detector # on Print	1	2	3	4	5	6	7	8
2070 "D" Connector	9	10	11	12	13	14	15	16
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet for D-connector pin assignments

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

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC							
1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6 ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A				1					13
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green	4															
Trail yellow	4.3															
Trail red	2.6															
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

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

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

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

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

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

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>2</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG END OF GREEN					
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD: _____					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

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

Sequence: 00 - 15 (Unit data has definition)

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

Time: 00 - 99 seconds.

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: *110 sccs* *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		80		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 sccs* *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		60		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	42		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	56		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 SECS PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		90		28				
MODE		1		3				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH: *110 SECS*

PHASE	1	2	3	4	5	6	7	8
TIME		75		35				
MODE		1		3				

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	93		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	36		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4	
MIN GREEN/WALK					
OVERRIDE	FL	1/2	2/3	3/4	4/5
STATUS					
CODES	0 = NO, 1 = YES				

7. PREEMPT DATA - PREEMPT 1

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

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

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR: _____ TRK YEL CHG: _____
 SEL YEL CHG: _____ TRK RED CLR: _____
 SEL RED CLR: _____ DWELL GREEN: _____
 TRACK GREEN: _____ RET PED CLR: _____
 TRK PED CLR: _____ RET YEL CHG: _____
 RET YEL CLR: _____

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

(0=no, 1=act, 2=min recall, 3=max recall)

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

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

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

(0 = no, 1 = act)

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

TEST..: _____ N-LOCK.: _____ SKIP.....: _____
 DELAY: _____ EXTEND: _____ DURATION: _____
 DWELL: _____ MXCALL: _____ LOCK OUT: _____

RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	M-59	A	2	A
3				
4	BOGIE LAKE (NEAR)	B	4	R
5				
6				
7				
8				
OLA	BOGIE LAKE (FAR)	C	5	R
OLB				
OLC				
OLD				
1PED				
2PED	M-59 PED	WA	6	
3PED				
4PED	BOGIE LAKE PED	WB	8	
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
For 4 Phase EPAC
Pole Mount Cabinet

Intersection: M-59 and Bogie Lake Rd
County No: 04110
State No: 63041-01-029
Prepared By: Rachel Jones
Date: 11-30-11

Phasing:

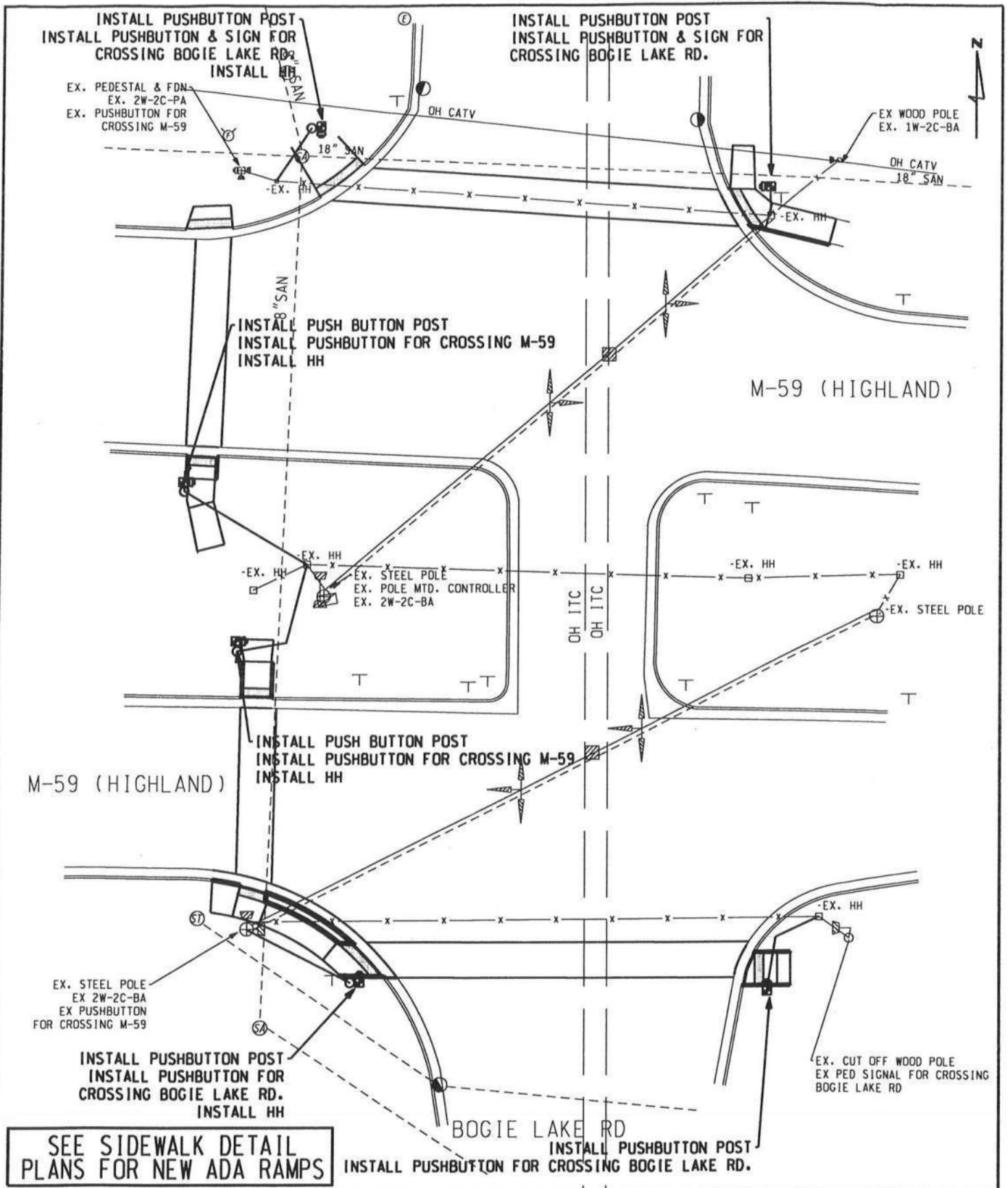
Load Switch 2:	M-59	A	FLA
Load Switch 4:	Bogie Lake Near	B	FLR
Load Switch 5:(OLA)	Bogie Lake Far	C	FLR
Load Switch 6:	M-59 Peds	WA	
Load Switch 8:	Bogie Lake Ped West	WB	

Jumpers:

121-213, 151-152, 153-154, 155-156, 158-159, 161-162, 164-165, 173-174,
175-176, 177-178, 179-180, 185-186, 223-224, 229-230, 233-PB1, 237-PB1,
241-242, 243-244, 245-246, 255-256, 257-258, 259-260, 261-262, 263-PB1,
268-269, 273-274.

Conflict Monitor: 4-5.

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



AUTH. NO.	DRAWN DJP
CONT. SEC. 63041	DATE 03-08-11
REF. 110761	SCALE N.T.S.
PLAN 63041-01-029	SHEET 3 OF 4

M-59 (HIGHLAND) AT BOGIE LAKE RD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

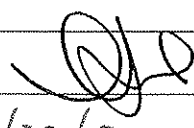
LOCATION: M-59 & X/O W/O Ormond DATE: 07/28/20
 CITY/TOWNSHIP: White Lake BY: Dawn Bierlein
 COUNTY#: 4132 STATE#: 63041-01-113 CHARGES: X00058

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

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

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: _____ JUL 30 2020
 NEW: _____
 REPROGRAM TBC
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER 3.5 Veh recalls-phase 4

(Rev 2) _____ (LOOPS HOOKED UP & WORKING)
 APPROVED BY:  DATE: 7/28/20
 DATE INSTALLED: 7/29/20
 INSTALLED BY: D-8

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk																	00-99
Pedest Clearance																	00-99
Flashing Walk																	
Extend Ped Clear																	(0-no, 1-Y+R, 2-Y)
Act Rest-in-Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

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

CODES: 0 1 2 3 4

Initial none inactive red yellow green

NA Response none to 1 to 2 both ---

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		0												
Pedestrian Recall																

CODES: 0 1 2 3 4

Vehicle none 1 call min max soft

Pedestrian none 1 call ped bot N. A. ---

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

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

CODES: 0 = NO 1 = YES

3. PHASE DATA - 7. SPECIAL SEQUENCE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Omit																
-Yel																
Ocal																

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (TS1 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8
Assigned Phase	4	4						
EPAC M52 D-CONNECTOR	1	6	7	8	4	5	2	3

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 1. VEH 1-8 OR 2.VEH 9-16 (TS2 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Assigned Phase																

CODES: 0 1 2 3 4

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

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

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

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC							
1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6. ALT SEQ. 08-15
EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A									
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

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

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

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

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Solo Detection:

EPAC300/M52 enter "1" under D Conn Input

2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>0</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG END OF GREEN					
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD:					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

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

Sequence: 00 - 15 (Unit data has definition)

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

Time: 00 - 99 seconds.

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

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

PHASE	1	2	3	4	5	6	7	8
TIME		85		25				
MODE		1		0				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 Secs*

PHASE	1	2	3	4	5	6	7	8
TIME		60		30				
MODE		1		0				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	40		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	31		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		96		24				
MODE		1		0				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	82		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4	
MIN GREEN/WALK					
OVERRIDE	FL	1/2	2/3	3/4	4/5 5/6
STATUS					
CODES	0 = NO, 1 = YES				

7. PREEMPT DATA - PREEMPT 1

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

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

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR : ___ TRK YEL CHG : ___
 SEL YEL CHG : ___ TRK RED CLR : ___
 SEL RED CLR : ___ DWELL GREEN: ___
 TRACK GREEN: ___ RET PED CLR : ___
 TRK PED CLR : ___ RET YEL CHG : ___
 RET YEL CLR : ___

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)								
CYCLE								
(0=no, 1=act, 2=min recall, 3=max recall)								

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)								
CYCLE								
(0 = no, 1 = act, 2 = recall)								

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)				
CYCLE				
(0 = no, 1 = act)				

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

TEST..: ___	N-LOCK.: ___	SKIP.....: ___						
DELAY: ___	EXTEND: ___	DURATION: ___						
DWELL: ___	MXCALL: ___	LOCK OUT: ___						
RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	EB M-59	A	2	A
3				
4	X10 W10 ORMOND	B	4	R
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED				
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
4 Phase EPAC

Intersection : EB M-59 & X/O W/O Ormond
City/Twp : White Lake
State No. : 63041-01-113
County No. : 4132
Prepared By : Dawn Bierlein
Date : 07/28/20

Phasing:

Load Switch 2: EB M-59	A	FLA
Load Switch 4: X/O W/O Ormond	B	FLR

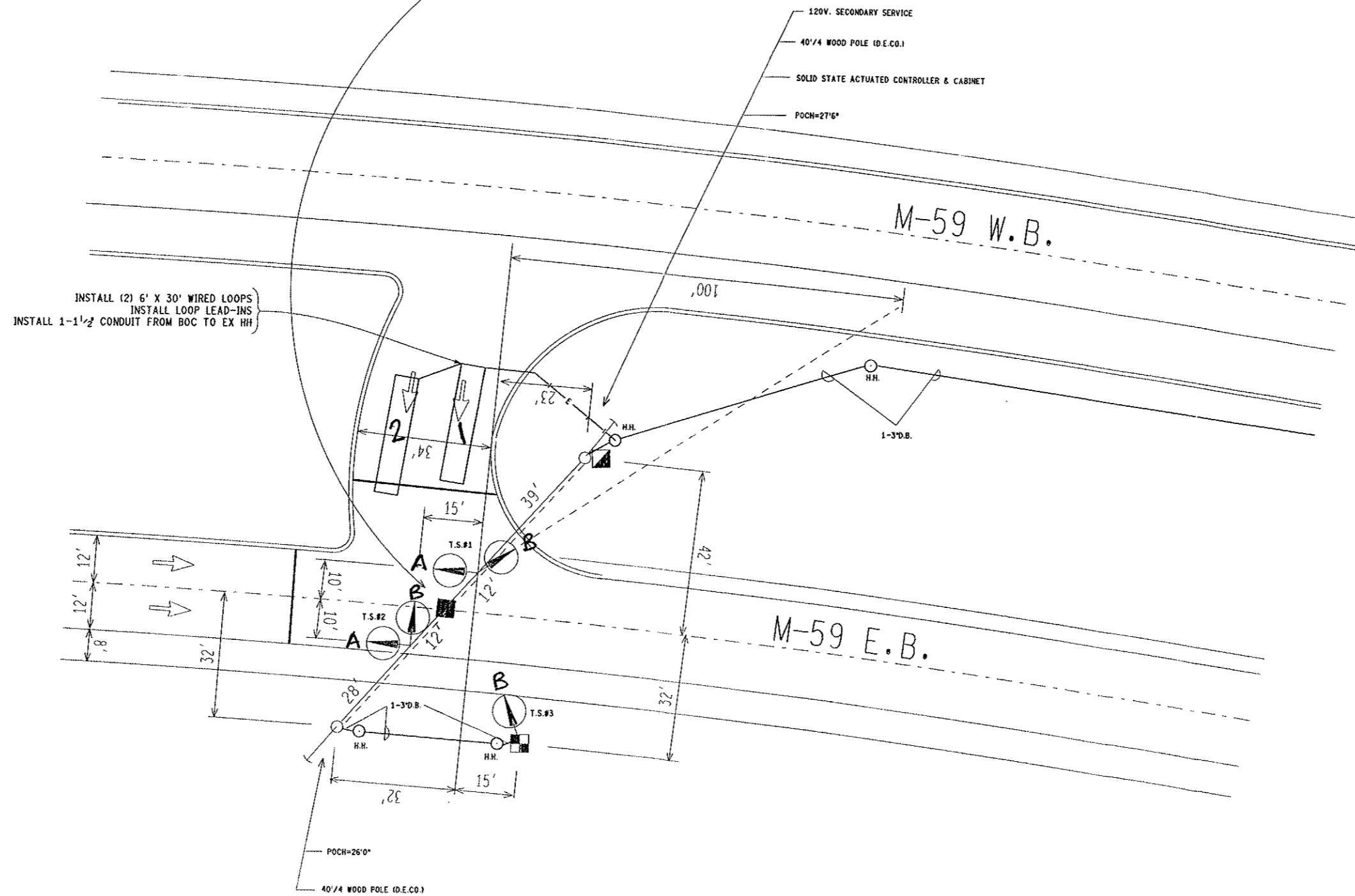
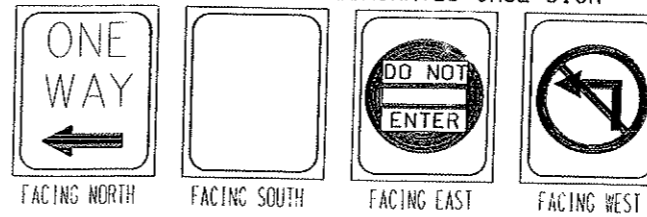
Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 233-PB1, 237-PB1, 241-PB1,
255-256, 257-258, 259-260, 261-262, 263-PB1.

MMU: (MENU : SET/VIEW CONFIG)

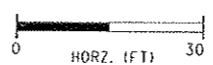
Dual Indication Enable:	R+G: Channel 2, 4 R+Y: Channel 2, 4 G+Y: Channel 2, 4
Red Fail Enable:	Enable: Channel 2 & 4
Y & R Clearance Disable:	Channel 2 & 4 Enabled
Unit Options:	All OFF except: Recurrent pulse Program Memory Card
Program Card:	Compatible Channels: None Min Flash Time : 4+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: NONE

24"X30" 4-WAY ILLUMINATED CASE SIGN



64132

FINAL ROW PLAN REVISIONS		SUBMITTAL DATE:	
NO.	DATE	NO.	DATE



DATE: 2/27/20	CS: 63041
DESIGN UNIT: SIGNALS	JN:
TSC: OAKLAND	TWA#17774
FILE: xxxxxx_6304101113_CON001.dgn	

SIGNALS	
OPENINGS:	19
CYCLIC WATTS:	2250
STEADY WATTS:	300
PLAN:	63041-01-113
DRAWING	SHEET
SIGNAL	SECT 1
M-59	
CON001	

TRAFFIC SIGNAL CONSTRUCTION SHEET
M-59 (HIGHLAND) EB @ X-OVER W OF ORMOND RD
WHITE LAKE TWP, OAKLAND COUNTY

Appendix 2

Existing LOS Output Reports

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	978	69	0
Future Vol, veh/h	0	0	0	978	69	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	92
Heavy Vehicles, %	2	2	6	6	6	5
Mvmt Flow	0	0	0	1029	115	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 515
Stage 1	-	- 0
Stage 2	-	- 515
Critical Hdwy	-	- 6.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	- 5.92
Follow-up Hdwy	-	- 3.56
Pot Cap-1 Maneuver	0	- 480
Stage 1	0	-
Stage 2	0	- 553
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 480
Mov Cap-2 Maneuver	-	- 480
Stage 1	-	-
Stage 2	-	- 553

Approach	WB	NB
HCM Control Delay, s	0	14.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	480	-
HCM Lane V/C Ratio	0.24	-
HCM Control Delay (s)	14.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.9	-

Intersection						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1459	49	0	0	0	126
Future Vol, veh/h	1459	49	0	0	0	126
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1603	54	0	0	0	159

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	802
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	325
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	325
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	26.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	325	-	-
HCM Lane V/C Ratio	0.491	-	-
HCM Control Delay (s)	26.3	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.6	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	991	56	0	51
Future Vol, veh/h	0	0	991	56	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	6	6	2	2
Mvmt Flow	0	0	1066	60	0	85

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.9
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	491
HCM Lane V/C Ratio	-	-	0.173
HCM Control Delay (s)	-	-	13.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2021 Existing Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1444	0	0	64	0
Future Vol, veh/h	0	1444	0	0	64	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	92	92	73	95
Heavy Vehicles, %	4	4	2	2	6	6
Mvmt Flow	0	1622	0	0	88	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	811	-
Stage 1	-	-	0	-
Stage 2	-	-	811	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	309	0
Stage 1	0	-	-	0
Stage 2	0	-	387	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	309	-
Mov Cap-2 Maneuver	-	-	309	-
Stage 1	-	-	-	-
Stage 2	-	-	387	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	309
HCM Lane V/C Ratio	-	0.284
HCM Control Delay (s)	-	21.2
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	1.1

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↑	
Traffic Vol, veh/h	0	0	0	978	12	0
Future Vol, veh/h	0	0	0	978	12	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1029	20	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 515
Stage 1	-	- 0
Stage 2	-	- 515
Critical Hdwy	-	- 6.96
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.96
Follow-up Hdwy	-	- 3.58
Pot Cap-1 Maneuver	0	- 475 0
Stage 1	0	- - 0
Stage 2	0	- 548 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 475 -
Mov Cap-2 Maneuver	-	- 475 -
Stage 1	-	- - -
Stage 2	-	- 548 -

Approach	WB	NB
HCM Control Delay, s	0	12.9
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	475	-
HCM Lane V/C Ratio	0.042	-
HCM Control Delay (s)	12.9	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.1	-

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1444	4	0	0	0	0	0	5	7	9	0
Future Vol, veh/h	0	1444	4	0	0	0	0	0	5	7	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	14688	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1604	4	0	0	0	0	0	8	10	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	802	802	1608	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	802	1608	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	331	268	100	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	335	156	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	331	262	100	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	262	100	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	327	156	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.1	36.7
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	331	-	-	137
HCM Lane V/C Ratio	0.024	-	-	0.174
HCM Control Delay (s)	16.1	-	-	36.7
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	76
Average Queue (ft)	34
95th Queue (ft)	63
Link Distance (ft)	32
Upstream Blk Time (%)	13
Queuing Penalty (veh)	10
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	127
Average Queue (ft)	44
95th Queue (ft)	92
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	71
Average Queue (ft)	20
95th Queue (ft)	46
Link Distance (ft)	450
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	82
Average Queue (ft)	33
95th Queue (ft)	66
Link Distance (ft)	34
Upstream Blk Time (%)	13
Queuing Penalty (veh)	9
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	44
Average Queue (ft)	9
95th Queue (ft)	34
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	29	56
Average Queue (ft)	4	15
95th Queue (ft)	18	44
Link Distance (ft)	507	51
Upstream Blk Time (%)		1
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	10
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	12
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	10
Average Queue (ft)	0
95th Queue (ft)	7
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 19

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1933	57	0
Future Vol, veh/h	0	0	0	1933	57	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	94
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2035	80	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1018
Stage 1	-	- 0
Stage 2	-	- 1018
Critical Hdwy	-	- 6.9
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.9
Follow-up Hdwy	-	- 3.55
Pot Cap-1 Maneuver	0	- 228
Stage 1	0	- - 0
Stage 2	0	- 303
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 228
Mov Cap-2 Maneuver	-	- 228
Stage 1	-	- -
Stage 2	-	- 303

Approach	WB	NB
HCM Control Delay, s	0	29.1
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	228	-
HCM Lane V/C Ratio	0.352	-
HCM Control Delay (s)	29.1	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	1.5	-

Intersection						
Int Delay, s/veh	1.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1505	141	0	0	0	107
Future Vol, veh/h	1505	141	0	0	0	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1584	148	0	0	0	145

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	792
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	328
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	328
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	24.4
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	328	-	-
HCM Lane V/C Ratio	0.441	-	-
HCM Control Delay (s)	24.4	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	2.2	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1930	60	0	57
Future Vol, veh/h	0	0	1930	60	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	0	0	2032	63	0	80

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1016
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 236
Stage 1	-	0 -
Stage 2	-	0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 236
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	27.9
HCM LOS		D

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	236
HCM Lane V/C Ratio	-	-	0.34
HCM Control Delay (s)	-	-	27.9
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.4

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2021 Existing Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1514	0	0	132	0
Future Vol, veh/h	0	1514	0	0	132	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	95
Heavy Vehicles, %	2	2	2	2	2	3
Mvmt Flow	0	1594	0	0	163	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	797	-
Stage 1	-	-	0	-
Stage 2	-	-	797	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	324	0
Stage 1	0	-	-	0
Stage 2	0	-	404	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	324	-
Mov Cap-2 Maneuver	-	-	324	-
Stage 1	-	-	-	-
Stage 2	-	-	404	-

Approach	EB	SB
HCM Control Delay, s	0	26.8
HCM LOS		D

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	324
HCM Lane V/C Ratio	-	0.503
HCM Control Delay (s)	-	26.8
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	2.7

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1855	19	0
Future Vol, veh/h	0	0	0	1855	19	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	95
Heavy Vehicles, %	2	2	2	2	11	2
Mvmt Flow	0	0	0	1953	32	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 977
Stage 1	-	- 0
Stage 2	-	- 977
Critical Hdwy	-	- 7.02
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.02
Follow-up Hdwy	-	- 3.61
Pot Cap-1 Maneuver	0	- 233
Stage 1	0	- - 0
Stage 2	0	- 305
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 233
Mov Cap-2 Maneuver	-	- 233
Stage 1	-	- -
Stage 2	-	- 305

Approach	WB	NB
HCM Control Delay, s	0	22.9
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	233	-
HCM Lane V/C Ratio	0.136	-
HCM Control Delay (s)	22.9	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.5	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1490	9	0	0	0	0	0	23	20	13	0
Future Vol, veh/h	0	1490	9	0	0	0	0	0	23	20	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	16224	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	60	60	60	68	68	92
Heavy Vehicles, %	2	2	2	2	2	2	0	0	0	4	4	2
Mvmt Flow	0	1568	9	0	0	0	0	0	38	29	19	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	784	784	1577	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	784	1577	-
Critical Hdwy	-	-	-	-	-	6.9	7.58	6.58	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.58	5.58	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.54	4.04	-
Pot Cap-1 Maneuver	0	-	-	0	0	340	280	106	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	348	165	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	340	248	106	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	248	106	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	309	165	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.5
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	340	-	-	162
HCM Lane V/C Ratio	0.113	-	-	0.3
HCM Control Delay (s)	16.9	-	-	36.5
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	1.2

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	90
Average Queue (ft)	43
95th Queue (ft)	83
Link Distance (ft)	32
Upstream Blk Time (%)	38
Queuing Penalty (veh)	22
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	128
Average Queue (ft)	39
95th Queue (ft)	85
Link Distance (ft)	270
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	127
Average Queue (ft)	35
95th Queue (ft)	88
Link Distance (ft)	941
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	55
95th Queue (ft)	88
Link Distance (ft)	34
Upstream Blk Time (%)	41
Queuing Penalty (veh)	55
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	58
Average Queue (ft)	16
95th Queue (ft)	47
Link Distance (ft)	48
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	EB	NB	SB
Directions Served	R	R	LT
Maximum Queue (ft)	4	41	56
Average Queue (ft)	0	14	23
95th Queue (ft)	3	38	51
Link Distance (ft)		507	51
Upstream Blk Time (%)			2
Queuing Penalty (veh)			1
Storage Bay Dist (ft)	280		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	4
95th Queue (ft)	23
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	84
Average Queue (ft)	7
95th Queue (ft)	41
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	37
Average Queue (ft)	2
95th Queue (ft)	18
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	1
95th Queue (ft)	13
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 79

Appendix 3

Background LOS Output Reports

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Background Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗	
Traffic Vol, veh/h	0	0	0	1008	71	0
Future Vol, veh/h	0	0	0	1008	71	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	2	6	5	5
Mvmt Flow	0	0	0	1061	77	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	531
Stage 1	-	0
Stage 2	-	531
Critical Hdwy	-	6.9
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.9
Follow-up Hdwy	-	3.55
Pot Cap-1 Maneuver	0	471
Stage 1	0	0
Stage 2	0	546
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	471
Mov Cap-2 Maneuver	-	471
Stage 1	-	-
Stage 2	-	546

Approach	WB	NB
HCM Control Delay, s	0	14.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	471	-
HCM Lane V/C Ratio	0.164	-
HCM Control Delay (s)	14.1	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.6	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Background Condition
AM Peak Hour

Intersection						
Int Delay, s/veh	2.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1503	51	0	0	0	130
Future Vol, veh/h	1503	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1652	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	826
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	313
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	313
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	28.6
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	313	-	-
HCM Lane V/C Ratio	0.526	-	-
HCM Control Delay (s)	28.6	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.9	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1021	58	0	53
Future Vol, veh/h	0	0	1021	58	0	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	6	6	2	2
Mvmt Flow	0	0	1098	62	0	88

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	14.2
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	480
HCM Lane V/C Ratio	-	-	0.184
HCM Control Delay (s)	-	-	14.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.7

Intersection

Int Delay, s/veh 1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1488	0	0	66	0
Future Vol, veh/h	0	1488	0	0	66	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1672	0	0	90	0

Major/Minor	Major1	Minor2
Conflicting Flow All	- 0	836 -
Stage 1	- -	0 -
Stage 2	- -	836 -
Critical Hdwy	- -	6.92 -
Critical Hdwy Stg 1	- -	- -
Critical Hdwy Stg 2	- -	5.92 -
Follow-up Hdwy	- -	3.56 -
Pot Cap-1 Maneuver	0 -	298 0
Stage 1	0 -	- 0
Stage 2	0 -	376 0
Platoon blocked, %	-	
Mov Cap-1 Maneuver	- -	298 -
Mov Cap-2 Maneuver	- -	298 -
Stage 1	- -	- -
Stage 2	- -	376 -

Approach	EB	SB
HCM Control Delay, s	0	22.3
HCM LOS		C

Minor Lane/Major Mvmt	EBT SBLn1
Capacity (veh/h)	- 298
HCM Lane V/C Ratio	- 0.303
HCM Control Delay (s)	- 22.3
HCM Lane LOS	- C
HCM 95th %tile Q(veh)	- 1.2

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1008	12	0
Future Vol, veh/h	0	0	0	1008	12	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1061	20	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 531
Stage 1	-	- 0
Stage 2	-	- 531
Critical Hdwy	-	- 6.96
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.96
Follow-up Hdwy	-	- 3.58
Pot Cap-1 Maneuver	0	- 464 0
Stage 1	0	- - 0
Stage 2	0	- 537 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 464 -
Mov Cap-2 Maneuver	-	- 464 -
Stage 1	-	- - -
Stage 2	-	- 537 -

Approach	WB	NB
HCM Control Delay, s	0	13.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	464	-
HCM Lane V/C Ratio	0.043	-
HCM Control Delay (s)	13.1	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.1	-

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1488	4	0	0	0	0	0	5	7	9	0
Future Vol, veh/h	0	1488	4	0	0	0	0	0	5	7	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084909568	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	92
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	2
Mvmt Flow	0	1653	4	0	0	0	0	0	8	10	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	827	827	1657	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	827	1657	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	319	257	93	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	324	147	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	319	251	93	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	251	93	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	316	147	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.6	39.5
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	319	-	-	128
HCM Lane V/C Ratio	0.025	-	-	0.187
HCM Control Delay (s)	16.6	-	-	39.5
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	0.7

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	36
95th Queue (ft)	68
Link Distance (ft)	32
Upstream Blk Time (%)	15
Queuing Penalty (veh)	11
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	136
Average Queue (ft)	52
95th Queue (ft)	104
Link Distance (ft)	270
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	89
Average Queue (ft)	22
95th Queue (ft)	59
Link Distance (ft)	449
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	EB	SB
Directions Served	T	L
Maximum Queue (ft)	7	81
Average Queue (ft)	0	36
95th Queue (ft)	5	63
Link Distance (ft)	133	33
Upstream Blk Time (%)		18
Queuing Penalty (veh)		13
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	40
Average Queue (ft)	8
95th Queue (ft)	32
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	28	54
Average Queue (ft)	6	12
95th Queue (ft)	24	39
Link Distance (ft)	507	53
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	17
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	26
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 24

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Background Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗	
Traffic Vol, veh/h	0	0	0	1992	59	0
Future Vol, veh/h	0	0	0	1992	59	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	94
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2097	83	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1049
Stage 1	-	- 0
Stage 2	-	- 1049
Critical Hdwy	-	- 6.9
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.9
Follow-up Hdwy	-	- 3.55
Pot Cap-1 Maneuver	0	- 218 0
Stage 1	0	- - 0
Stage 2	0	- 292 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 218 -
Mov Cap-2 Maneuver	-	- 218 -
Stage 1	-	- - -
Stage 2	-	- 292 -

Approach	WB	NB
HCM Control Delay, s	0	31.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	218	-
HCM Lane V/C Ratio	0.381	-
HCM Control Delay (s)	31.3	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	1.7	-

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1551	145	0	0	0	110
Future Vol, veh/h	1551	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1633	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	817
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	315
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	315
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	26.2
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	315	-	-
HCM Lane V/C Ratio	0.472	-	-
HCM Control Delay (s)	26.2	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.4	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1989	62	0	59
Future Vol, veh/h	0	0	1989	62	0	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2094	65	0	83

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1047
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	- 0 225
Stage 1	-	- 0 -
Stage 2	-	- 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 225
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	30.1
HCM LOS		D

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	225
HCM Lane V/C Ratio	-	-	0.369
HCM Control Delay (s)	-	-	30.1
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.6

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Background Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1560	0	0	136	0
Future Vol, veh/h	0	1560	0	0	136	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1642	0	0	168	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	821	-
Stage 1	-	-	0	-
Stage 2	-	-	821	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	313	0
Stage 1	0	-	-	0
Stage 2	0	-	393	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	313	-
Mov Cap-2 Maneuver	-	-	313	-
Stage 1	-	-	-	-
Stage 2	-	-	393	-

Approach	EB	SB
HCM Control Delay, s	0	29.1
HCM LOS		D

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	313
HCM Lane V/C Ratio	-	0.536
HCM Control Delay (s)	-	29.1
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	3

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1912	20	0
Future Vol, veh/h	0	0	0	1912	20	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	95
Heavy Vehicles, %	2	2	2	2	11	2
Mvmt Flow	0	0	0	2013	33	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1007
Stage 1	-	- 0
Stage 2	-	- 1007
Critical Hdwy	-	- 7.02
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.02
Follow-up Hdwy	-	- 3.61
Pot Cap-1 Maneuver	0	- 222 0
Stage 1	0	- - 0
Stage 2	0	- 294 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 222 -
Mov Cap-2 Maneuver	-	- 222 -
Stage 1	-	- - -
Stage 2	-	- 294 -

Approach	WB	NB
HCM Control Delay, s	0	24.1
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	222	-
HCM Lane V/C Ratio	0.15	-
HCM Control Delay (s)	24.1	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.5	-

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1535	9	0	0	0	0	0	24	21	13	0
Future Vol, veh/h	0	1535	9	0	0	0	0	0	24	21	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	16736	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	95	95	92	92	92	60	60	60	95	95	92
Heavy Vehicles, %	2	2	2	2	2	2	0	0	0	2	2	2
Mvmt Flow	0	1616	9	0	0	0	0	0	40	22	14	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	808	808	1625	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	808	1625	-
Critical Hdwy	-	-	-	-	-	6.9	7.54	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.52	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	328	272	101	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	341	159	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	328	239	101	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	239	101	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	299	159	-

Approach	EB	NB	SB
HCM Control Delay, s	0	17.5	34.6
HCM LOS		C	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	328	-	-	157
HCM Lane V/C Ratio	0.122	-	-	0.228
HCM Control Delay (s)	17.5	-	-	34.6
HCM Lane LOS	C	-	-	D
HCM 95th %tile Q(veh)	0.4	-	-	0.8

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	98
Average Queue (ft)	41
95th Queue (ft)	82
Link Distance (ft)	32
Upstream Blk Time (%)	36
Queuing Penalty (veh)	22
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	126
Average Queue (ft)	43
95th Queue (ft)	89
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	100
Average Queue (ft)	32
95th Queue (ft)	76
Link Distance (ft)	940
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	91
Average Queue (ft)	55
95th Queue (ft)	91
Link Distance (ft)	34
Upstream Blk Time (%)	37
Queuing Penalty (veh)	51
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	56
Average Queue (ft)	18
95th Queue (ft)	48
Link Distance (ft)	48
Upstream Blk Time (%)	2
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	38	53
Average Queue (ft)	11	25
95th Queue (ft)	32	51
Link Distance (ft)	507	51
Upstream Blk Time (%)		1
Queuing Penalty (veh)		1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	43
Average Queue (ft)	3
95th Queue (ft)	24
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	74
Average Queue (ft)	7
95th Queue (ft)	38
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	23
Average Queue (ft)	2
95th Queue (ft)	18
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	27
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 75

Appendix 4

Trip Generation Calculations

Land Use: 210

Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077, 1078, 1079

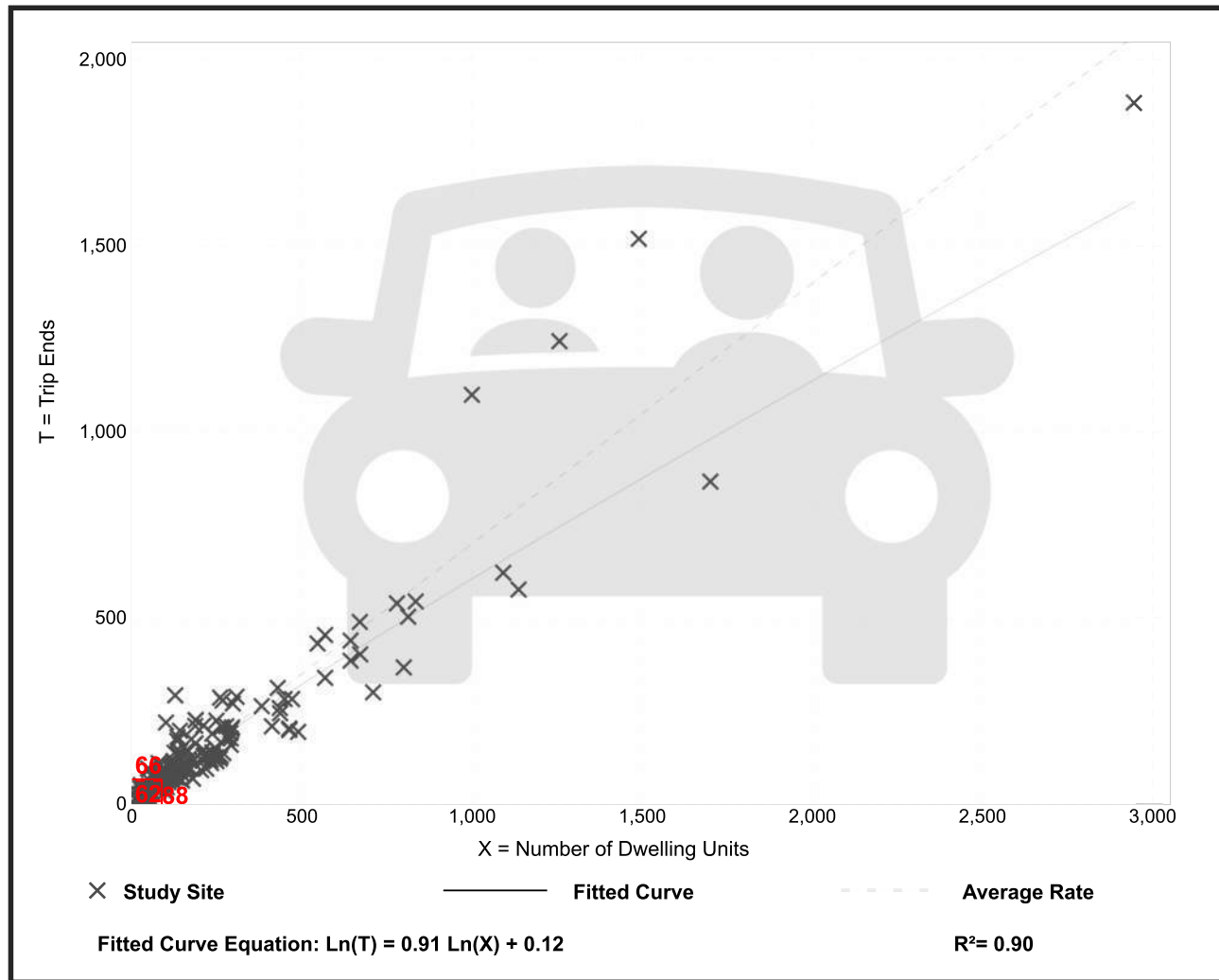
Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 192
 Avg. Num. of Dwelling Units: 226
 Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



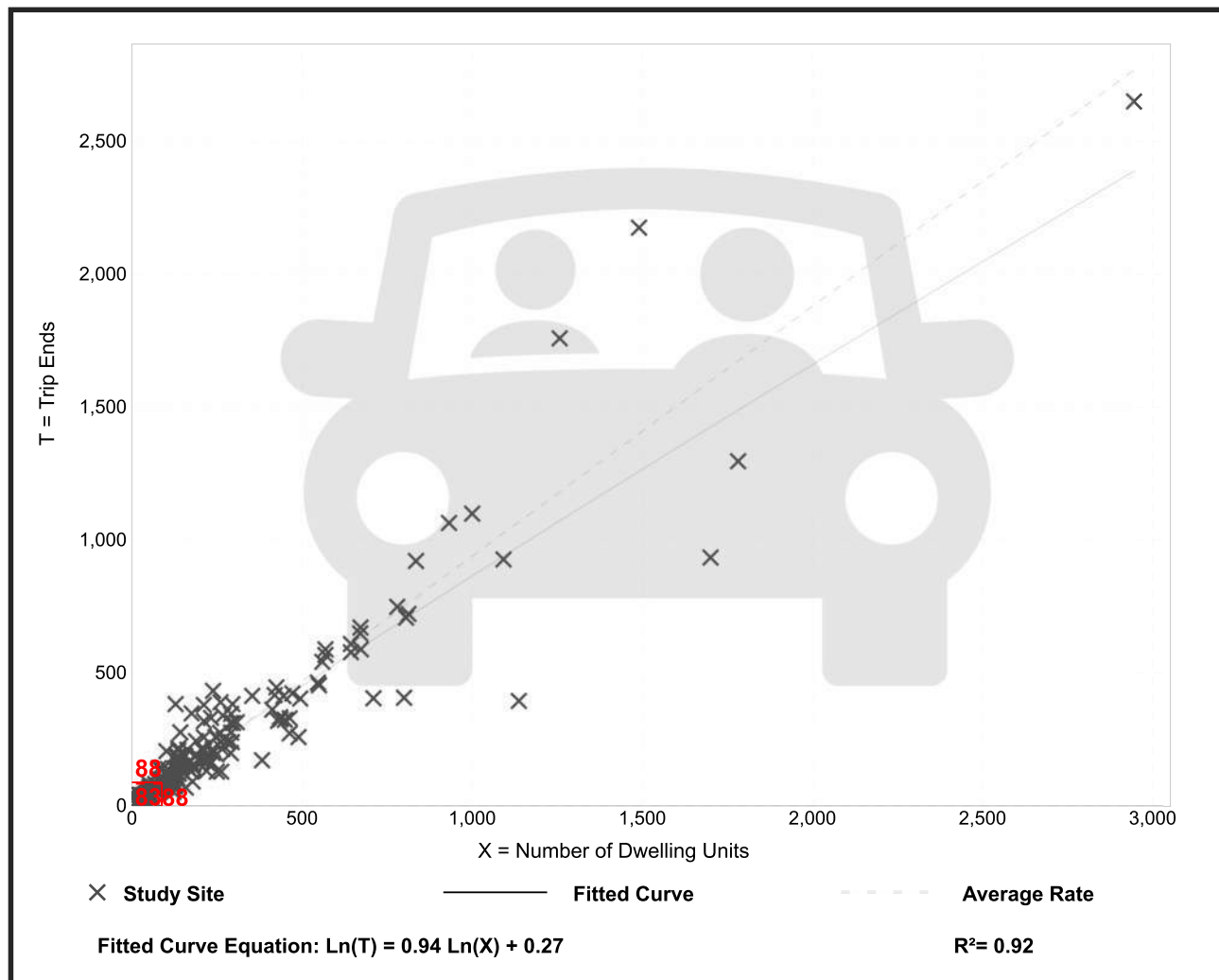
Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 208
 Avg. Num. of Dwelling Units: 248
 Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Single-Family Detached Housing (210)

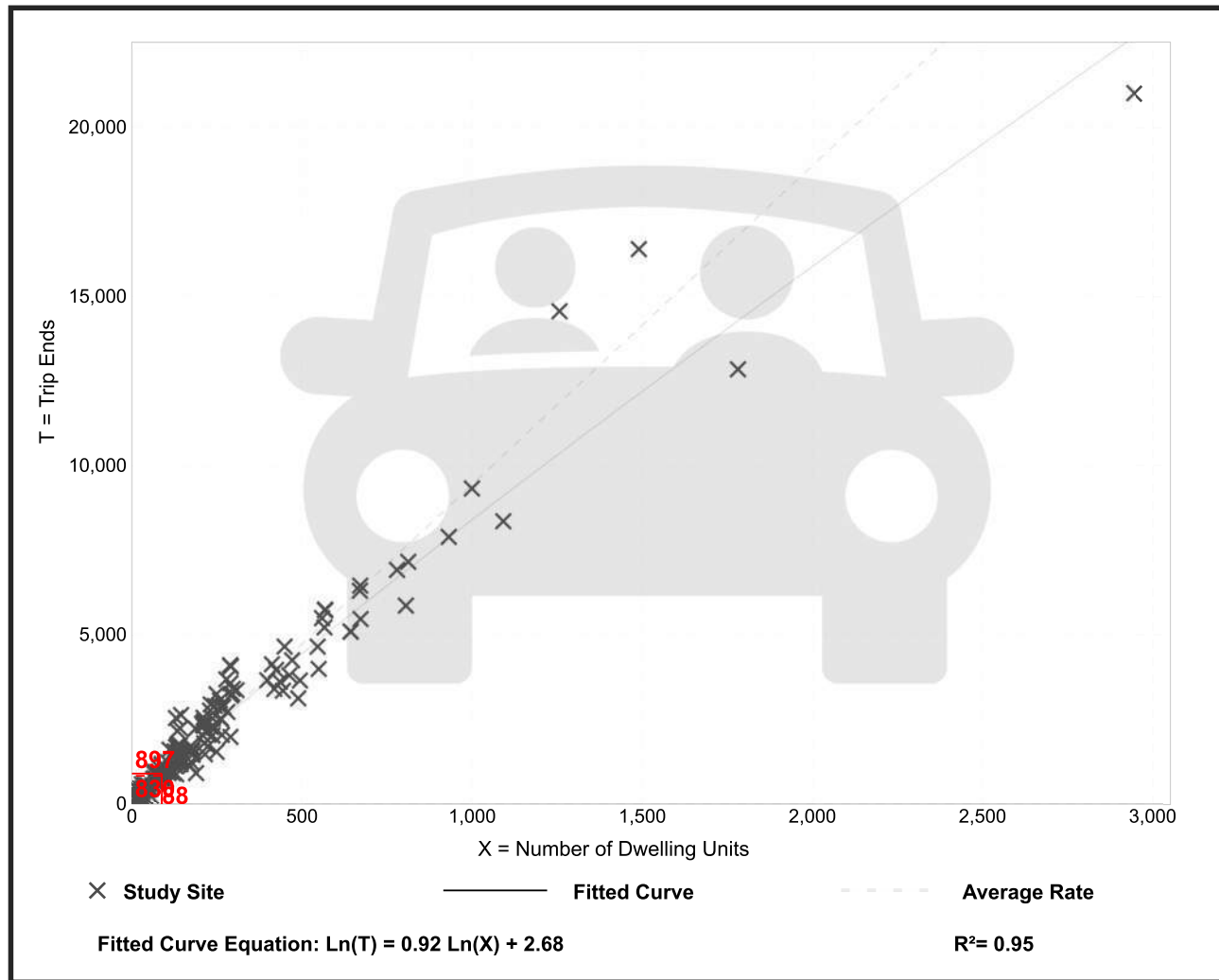
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



Land Use: 220

Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have two or three floors (levels). Various configurations fit this description, including walkup apartment, mansion apartment, and stacked townhouse.

- A walkup apartment typically is two or three floors in height with dwelling units that are accessed by a single or multiple entrances with stairways and hallways.
- A mansion apartment is a single structure that contains several apartments within what appears to be a single-family dwelling unit.
- A fourplex is a single two-story structure with two matching dwelling units on the ground and second floors. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.
- A stacked townhouse is designed to match the external appearance of a townhouse. But, unlike a townhouse dwelling unit that only shares walls with an adjoining unit, the stacked townhouse units share both floors and walls. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.

Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), affordable housing (Land Use 223), and off-campus student apartment (low-rise) (Land Use 225) are related land uses.

Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is $\frac{1}{2}$ mile or less.

Additional Data

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip

generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1980s, the 1990s, the 2000s, the 2010s, and the 2020s in British Columbia (CAN), California, Delaware, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Massachusetts, Minnesota, New Jersey, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, and Washington.

Source Numbers

188, 204, 237, 300, 305, 306, 320, 321, 357, 390, 412, 525, 530, 579, 583, 638, 864, 866, 896, 901, 903, 904, 936, 939, 944, 946, 947, 948, 963, 964, 966, 967, 1012, 1013, 1014, 1036, 1047, 1056, 1071, 1076

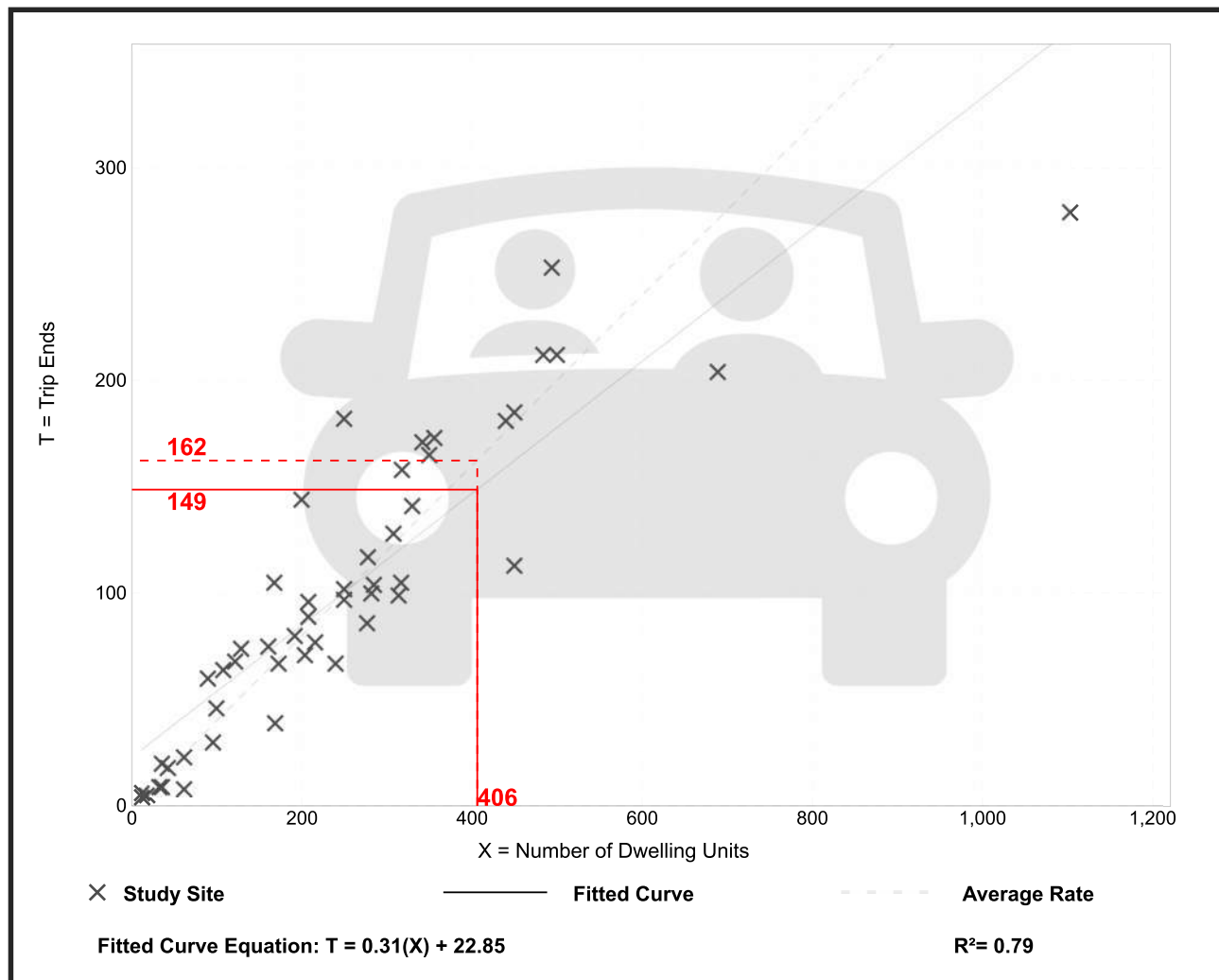
Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 49
 Avg. Num. of Dwelling Units: 249
 Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



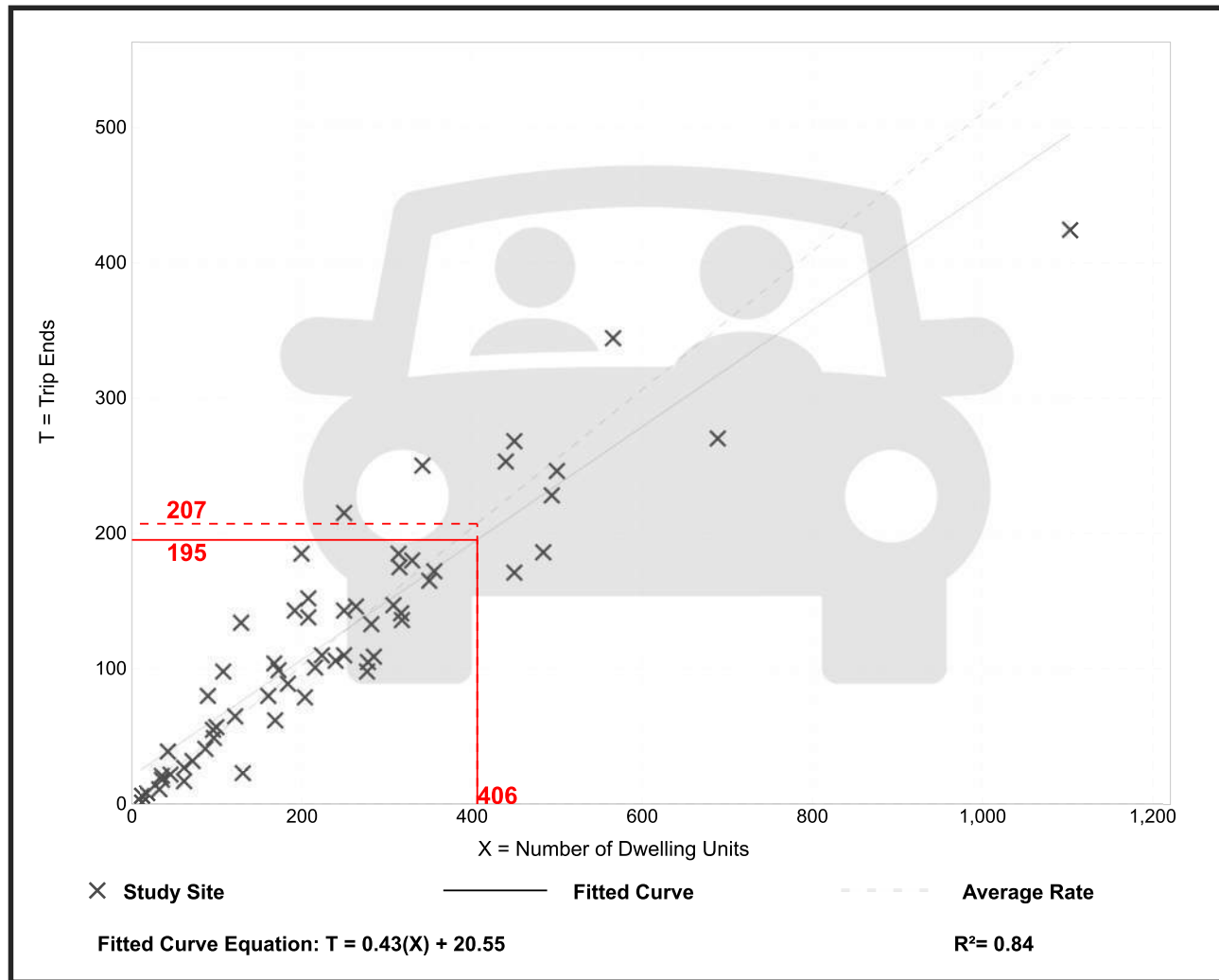
Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 59
 Avg. Num. of Dwelling Units: 241
 Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

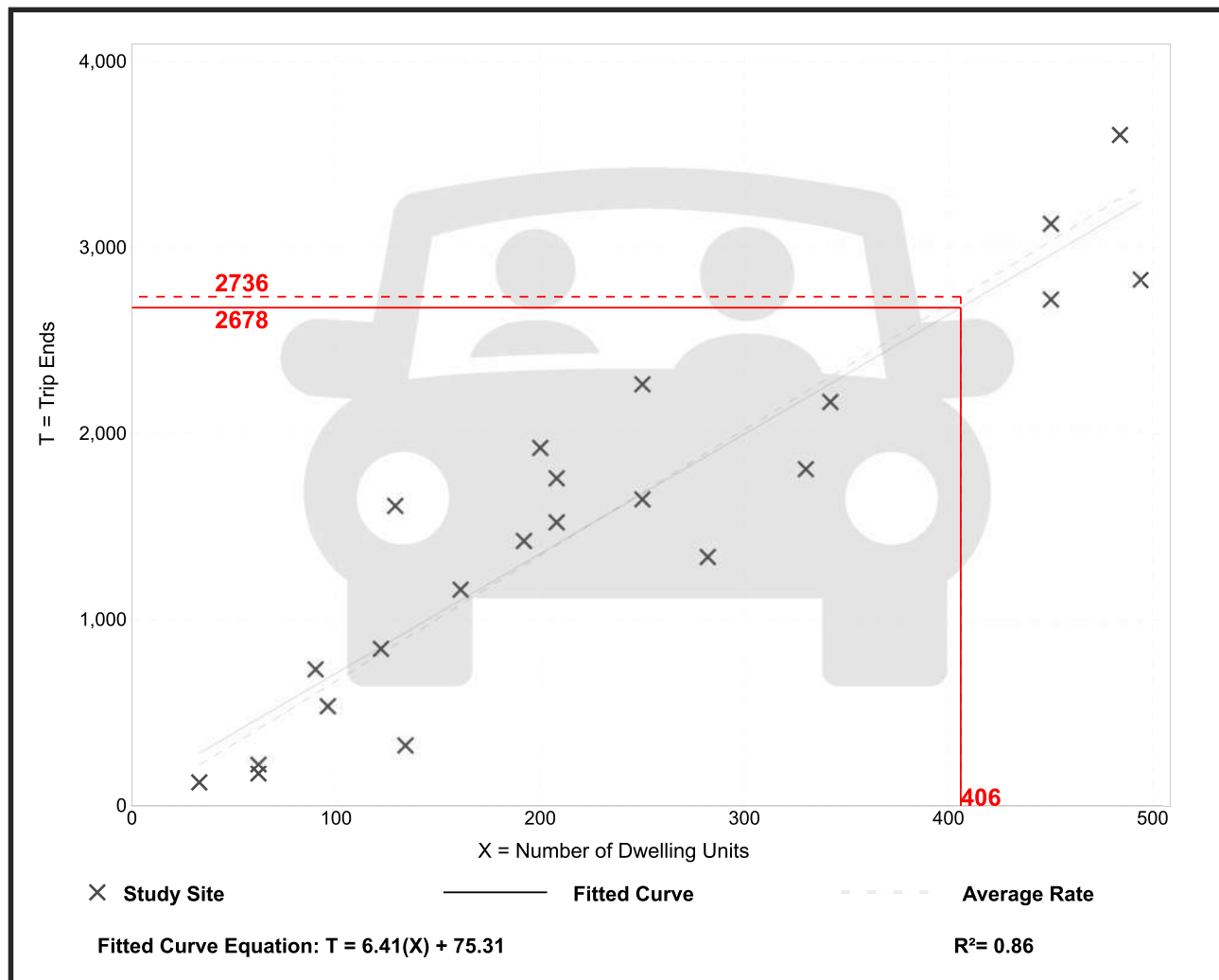
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 22
Avg. Num. of Dwelling Units: 229
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

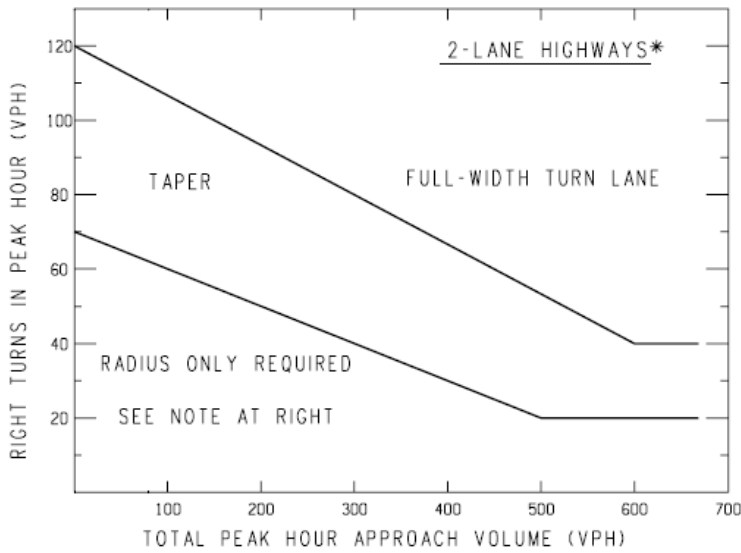
Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

Data Plot and Equation



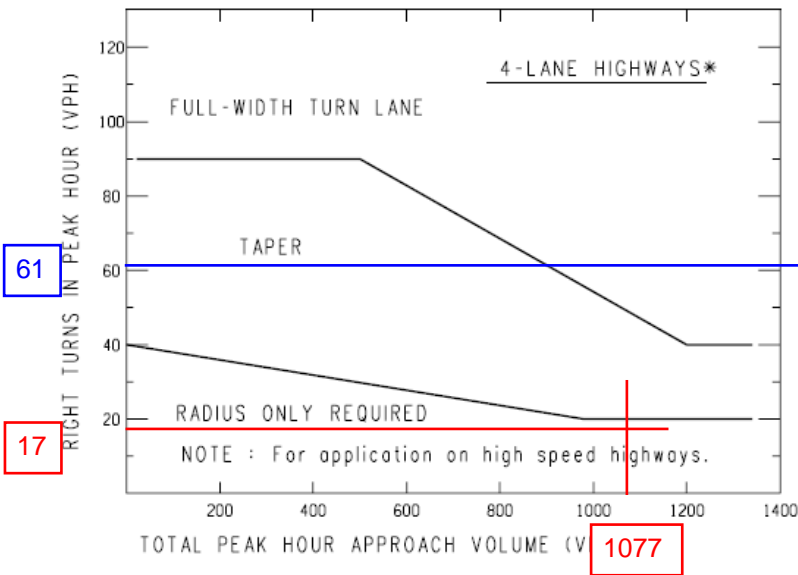
Appendix 5

Turn Lane Warrant



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



WB M-59 (Highland Road) and Driveway 4
 AM Peak Hour
 PM Peak Hour

*If a center left-turn lane exists (ie 3 or 5 lane roadway), 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.

Appendix 6

Future LOS Output Reports

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗	
Traffic Vol, veh/h	0	0	0	1029	92	0
Future Vol, veh/h	0	0	0	1029	92	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	92
Heavy Vehicles, %	2	2	2	6	6	5
Mvmt Flow	0	0	0	1083	153	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 542
Stage 1	-	- 0
Stage 2	-	- 542
Critical Hdwy	-	- 6.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	- 5.92
Follow-up Hdwy	-	- 3.56
Pot Cap-1 Maneuver	0	- 461
Stage 1	0	-
Stage 2	0	- 536
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 461
Mov Cap-2 Maneuver	-	- 461
Stage 1	-	-
Stage 2	-	- 536

Approach	WB	NB
HCM Control Delay, s	0	16.7
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	461	-
HCM Lane V/C Ratio	0.333	-
HCM Control Delay (s)	16.7	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.4	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Condition
AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1620	51	0	0	0	130
Future Vol, veh/h	1620	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1780	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	890
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	284
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	284
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	33.8
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	284	-	-
HCM Lane V/C Ratio	0.579	-	-
HCM Control Delay (s)	33.8	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	3.4	-	-

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1028	93	0	157
Future Vol, veh/h	0	0	1028	93	0	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	8	8	2	2
Mvmt Flow	0	0	1105	100	0	262

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	21.3
HCM LOS		C

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	477
HCM Lane V/C Ratio	-	-	0.549
HCM Control Delay (s)	-	-	21.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	3.3

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1541	0	0	130	0
Future Vol, veh/h	0	1541	0	0	130	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1731	0	0	178	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	866	-
Stage 1	-	-	0	-
Stage 2	-	-	866	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	285	0
Stage 1	0	-	-	0
Stage 2	0	-	362	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	285	-
Mov Cap-2 Maneuver	-	-	285	-
Stage 1	-	-	-	-
Stage 2	-	-	362	-

Approach	EB	SB
HCM Control Delay, s	0	36.6
HCM LOS		E

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	285
HCM Lane V/C Ratio	-	0.625
HCM Control Delay (s)	-	36.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	3.9

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1055	22	0
Future Vol, veh/h	0	0	0	1055	22	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1111	37	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 444
Stage 1	-	- 0
Stage 2	-	- 444
Critical Hdwy	-	- 5.86
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.16
Follow-up Hdwy	-	- 3.88
Pot Cap-1 Maneuver	0	- 567
Stage 1	0	- - 0
Stage 2	0	- 546
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 567
Mov Cap-2 Maneuver	-	- 567
Stage 1	-	- -
Stage 2	-	- 546

Approach	WB	NB
HCM Control Delay, s	0	11.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	567	-
HCM Lane V/C Ratio	0.065	-
HCM Control Delay (s)	11.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
Future Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084905472	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1688	4	0	0	0	0	0	8	58	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	844	844	1692	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	844	1692	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	311	250	88	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	316	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	311	244	88	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	88	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	308	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.8
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	311	-	-	183
HCM Lane V/C Ratio	0.026	-	-	0.391
HCM Control Delay (s)	16.9	-	-	36.8
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	1.7

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	1	61	15	0	54
Future Vol, veh/h	44	1	61	15	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	1	66	16	0	59

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	133	74	0	0	82
Stage 1	74	-	-	-	-
Stage 2	59	-	-	-	-
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	861	988	-	-	1515
Stage 1	949	-	-	-	-
Stage 2	964	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	861	988	-	-	1515
Mov Cap-2 Maneuver	861	-	-	-	-
Stage 1	949	-	-	-	-
Stage 2	964	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	863	1515
HCM Lane V/C Ratio	-	-	0.057	-
HCM Control Delay (s)	-	-	9.4	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	T			T		T
Traffic Vol, veh/h	2	56	18	74	97	1
Future Vol, veh/h	2	56	18	74	97	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	61	20	80	105	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	226	106	106	0	0
Stage 1	106	-	-	-	-
Stage 2	120	-	-	-	-
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	762	948	1485	-	-
Stage 1	918	-	-	-	-
Stage 2	905	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	751	948	1485	-	-
Mov Cap-2 Maneuver	751	-	-	-	-
Stage 1	905	-	-	-	-
Stage 2	905	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1485	-	940	-	-
HCM Lane V/C Ratio	0.013	-	0.067	-	-
HCM Control Delay (s)	7.5	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	4	1	91	2	0	153
Future Vol, veh/h	4	1	91	2	0	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	1	99	2	0	166

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	266	100	0	0	101	0
Stage 1	100	-	-	-	-	-
Stage 2	166	-	-	-	-	-
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	723	956	-	-	1491	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	723	956	-	-	1491	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	760	1491
HCM Lane V/C Ratio	-	-	0.007	-
HCM Control Delay (s)	-	-	9.8	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1060	17	0	54
Future Vol, veh/h	0	0	1060	17	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	1116	18	0	59

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	473
HCM Lane V/C Ratio	-	0.124
HCM Control Delay (s)	-	13.7
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	83
Average Queue (ft)	39
95th Queue (ft)	68
Link Distance (ft)	32
Upstream Blk Time (%)	18
Queuing Penalty (veh)	16
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	185
Average Queue (ft)	61
95th Queue (ft)	132
Link Distance (ft)	269
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	99
Average Queue (ft)	41
95th Queue (ft)	77
Link Distance (ft)	924
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	107
Average Queue (ft)	60
95th Queue (ft)	102
Link Distance (ft)	34
Upstream Blk Time (%)	40
Queuing Penalty (veh)	54
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	17
95th Queue (ft)	44
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	21	64
Average Queue (ft)	2	30
95th Queue (ft)	13	59
Link Distance (ft)	507	53
Upstream Blk Time (%)		4
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	55
Average Queue (ft)	25
95th Queue (ft)	49
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	58	17
Average Queue (ft)	28	1
95th Queue (ft)	52	8
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	4
95th Queue (ft)	20
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	WB
Directions Served	T
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	64
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	19
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	136	57
Average Queue (ft)	18	2
95th Queue (ft)	94	41
Link Distance (ft)		564
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	2	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement

Directions Served
 Maximum Queue (ft)
 Average Queue (ft)
 95th Queue (ft)
 Link Distance (ft)
 Upstream Blk Time (%)
 Queuing Penalty (veh)
 Storage Bay Dist (ft)
 Storage Blk Time (%)
 Queuing Penalty (veh)

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	3
95th Queue (ft)	24
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 75

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	2090	109	0
Future Vol, veh/h	0	0	0	2090	109	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	92
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2200	154	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1100
Stage 1	-	- 0
Stage 2	-	- 1100
Critical Hdwy	-	- 6.9
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.9
Follow-up Hdwy	-	- 3.55
Pot Cap-1 Maneuver	0	- 202
Stage 1	0	- - 0
Stage 2	0	- 274
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 202
Mov Cap-2 Maneuver	-	- 202
Stage 1	-	- -
Stage 2	-	- 274

Approach	WB	NB
HCM Control Delay, s	0	63.7
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	202	-
HCM Lane V/C Ratio	0.76	-
HCM Control Delay (s)	63.7	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	5.1	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Condition
PM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1648	145	0	0	0	110
Future Vol, veh/h	1648	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1735	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	868
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	292
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	292
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	29.4
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	292	-	-
HCM Lane V/C Ratio	0.509	-	-
HCM Control Delay (s)	29.4	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.7	-	-

Intersection						
Int Delay, s/veh	4.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	2023	176	0	127
Future Vol, veh/h	0	0	2023	176	0	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2129	185	0	179

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1065
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- - 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- - 3.32
Pot Cap-1 Maneuver	-	- 0 219
Stage 1	-	- 0 -
Stage 2	-	- 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- - 219
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	68.2
HCM LOS		F

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	219
HCM Lane V/C Ratio	-	-	0.817
HCM Control Delay (s)	-	-	68.2
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	6.1

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1627	0	0	166	0
Future Vol, veh/h	0	1627	0	0	166	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1713	0	0	205	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	857	-
Stage 1	-	-	0	-
Stage 2	-	-	857	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	296
HCM Lane V/C Ratio	-	0.692
HCM Control Delay (s)	-	40.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	4.8

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1984	47	0
Future Vol, veh/h	0	0	0	1984	47	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	2	11	4
Mvmt Flow	0	0	0	2088	78	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	835
Stage 1	-	0
Stage 2	-	835
Critical Hdwy	-	5.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	6.22
Follow-up Hdwy	-	3.91
Pot Cap-1 Maneuver	0	355
Stage 1	0	-
Stage 2	0	331
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	355
Mov Cap-2 Maneuver	-	355
Stage 1	-	-
Stage 2	-	331

Approach	WB	NB
HCM Control Delay, s	0	18
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	355	-
HCM Lane V/C Ratio	0.221	-
HCM Control Delay (s)	18	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.8	-

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
Future Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	17248	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	63	63	60	68	68	68
Heavy Vehicles, %	5	2	2	2	2	2	0	0	0	4	4	4
Mvmt Flow	0	1697	9	0	0	0	0	0	40	56	19	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	849	849	1706	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	849	1706	-
Critical Hdwy	-	-	-	-	-	6.9	7.58	6.58	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.58	5.58	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.54	4.04	-
Pot Cap-1 Maneuver	0	-	-	0	0	308	251	89	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	318	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	308	218	89	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	89	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	277	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	46.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	308	-	-	159
HCM Lane V/C Ratio	0.13	-	-	0.472
HCM Control Delay (s)	18.4	-	-	46.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	2.2

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	0	63	52	1	61
Future Vol, veh/h	30	0	63	52	1	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	0	68	57	1	66

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	165	97	0	0	125	0
Stage 1	97	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	826	959	-	-	1462	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	959	-	-	1462	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	825	1462
HCM Lane V/C Ratio	-	-	0.04	0.001
HCM Control Delay (s)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	35	60	114	89	2
Future Vol, veh/h	1	35	60	114	89	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	38	65	124	97	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	352	98	99	0	0
Stage 1	98	-	-	-	-
Stage 2	254	-	-	-	-
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	646	958	1494	-	-
Stage 1	926	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	616	958	1494	-	-
Mov Cap-2 Maneuver	616	-	-	-	-
Stage 1	882	-	-	-	-
Stage 2	788	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1494	-	943	-	-
HCM Lane V/C Ratio	0.044	-	0.041	-	-
HCM Control Delay (s)	7.5	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	0	174	2	0	124
Future Vol, veh/h	3	0	174	2	0	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	0	189	2	0	135

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	325	190	0	0	191	0
Stage 1	190	-	-	-	-	-
Stage 2	135	-	-	-	-	-
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	669	852	-	-	1383	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	669	852	-	-	1383	-
Mov Cap-2 Maneuver	669	-	-	-	-	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	669	1383
HCM Lane V/C Ratio	-	-	0.005	-
HCM Control Delay (s)	-	-	10.4	0
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1970	61	0	36
Future Vol, veh/h	0	0	1970	61	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	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	0	0	2141	66	0	39

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1071
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 0 217
Stage 1	-	0 0 -
Stage 2	-	0 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 217
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	25.2
HCM LOS		D

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	217
HCM Lane V/C Ratio	-	0.18
HCM Control Delay (s)	-	25.2
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	111
Average Queue (ft)	67
95th Queue (ft)	111
Link Distance (ft)	32
Upstream Blk Time (%)	67
Queuing Penalty (veh)	77
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	174
Average Queue (ft)	53
95th Queue (ft)	135
Link Distance (ft)	269
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	345
Average Queue (ft)	130
95th Queue (ft)	314
Link Distance (ft)	933
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	96
Average Queue (ft)	61
95th Queue (ft)	96
Link Distance (ft)	34
Upstream Blk Time (%)	49
Queuing Penalty (veh)	83
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	WB	NB
Directions Served	T	L
Maximum Queue (ft)	6	68
Average Queue (ft)	0	36
95th Queue (ft)	4	67
Link Distance (ft)	131	49
Upstream Blk Time (%)		13
Queuing Penalty (veh)		7
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	38	55
Average Queue (ft)	13	31
95th Queue (ft)	33	59
Link Distance (ft)	507	51
Upstream Blk Time (%)		7
Queuing Penalty (veh)		4
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	51
Average Queue (ft)	19
95th Queue (ft)	46
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	44	35
Average Queue (ft)	23	5
95th Queue (ft)	48	23
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	24
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	WB	SB
Directions Served	T	R
Maximum Queue (ft)	8	19
Average Queue (ft)	0	1
95th Queue (ft)	5	10
Link Distance (ft)	64	288
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB	EB	EB
Directions Served	L	T	T
Maximum Queue (ft)	205	162	117
Average Queue (ft)	46	11	6
95th Queue (ft)	168	103	79
Link Distance (ft)		465	465
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	3	0	
Queuing Penalty (veh)	22	0	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	89
Average Queue (ft)	14
95th Queue (ft)	56
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	80
Average Queue (ft)	11
95th Queue (ft)	50
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	51
Average Queue (ft)	5
95th Queue (ft)	29
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 192

Appendix 7

Future Improvement LOS Output Reports

HCM 6th Signalized Intersection Summary
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑				
Traffic Volume (veh/h)	0	0	0	0	1029	0	92	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	1029	0	92	0	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach				No			No					
Adj Sat Flow, veh/h/ln				0	1906	0	1906	1969	0			
Adj Flow Rate, veh/h				0	1083	0	153	0	0			
Peak Hour Factor				0.95	0.95	0.92	0.60	0.92	0.92			
Percent Heavy Veh, %				0	6	0	6	2	0			
Cap, veh/h				0	2776	0	201	0	0			
Arrive On Green				0.00	0.25	0.00	0.11	0.00	0.00			
Sat Flow, veh/h				0	3813	0	1875	0	0			
Grp Volume(v), veh/h				0	1083	0	153	0	0			
Grp Sat Flow(s),veh/h/ln				0	1811	0	1875	0	0			
Q Serve(g_s), s				0.0	22.3	0.0	7.1	0.0	0.0			
Cycle Q Clear(g_c), s				0.0	22.3	0.0	7.1	0.0	0.0			
Prop In Lane				0.00		0.00	1.00		0.00			
Lane Grp Cap(c), veh/h				0	2776	0	201	0	0			
V/C Ratio(X)				0.00	0.39	0.00	0.76	0.00	0.00			
Avail Cap(c_a), veh/h				0	2776	0	517	0	0			
HCM Platoon Ratio				1.00	0.33	1.00	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.93	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh				0.0	16.2	0.0	39.1	0.0	0.0			
Incr Delay (d2), s/veh				0.0	0.4	0.0	5.9	0.0	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	10.6	0.0	3.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	16.6	0.0	45.0	0.0	0.0			
LnGrp LOS				A	B	A	D	A	A			
Approach Vol, veh/h					1083			153				
Approach Delay, s/veh					16.6			45.0				
Approach LOS					B			D				
Timer - Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		75.2		14.8								
Change Period (Y+Rc), s		* 6.2		* 5.2								
Max Green Setting (Gmax), s		* 54		* 25								
Max Q Clear Time (g_c+I1), s		24.3		9.1								
Green Ext Time (p_c), s		7.7		0.7								
Intersection Summary												
HCM 6th Ctrl Delay				20.1								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1620	51	0	0	0	130
Future Vol, veh/h	1620	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1780	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	890
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	284
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	284
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	33.8
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	284	-	-
HCM Lane V/C Ratio	0.579	-	-
HCM Control Delay (s)	33.8	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	3.4	-	-

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1028	93	0	157
Future Vol, veh/h	0	0	1028	93	0	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	8	8	2	2
Mvmt Flow	0	0	1105	100	0	262

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	21.3
HCM LOS		C

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	477
HCM Lane V/C Ratio	-	-	0.549
HCM Control Delay (s)	-	-	21.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	3.3

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1541	0	0	130	0
Future Vol, veh/h	0	1541	0	0	130	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1731	0	0	178	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	866	-
Stage 1	-	-	0	-
Stage 2	-	-	866	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	285	0
Stage 1	0	-	-	0
Stage 2	0	-	362	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	285	-
Mov Cap-2 Maneuver	-	-	285	-
Stage 1	-	-	-	-
Stage 2	-	-	362	-

Approach	EB	SB
HCM Control Delay, s	0	36.6
HCM LOS		E

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	285
HCM Lane V/C Ratio	-	0.625
HCM Control Delay (s)	-	36.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	3.9

HCM 6th TWSC
 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1055	22	0
Future Vol, veh/h	0	0	0	1055	22	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1111	37	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 444
Stage 1	-	- 0
Stage 2	-	- 444
Critical Hdwy	-	- 5.86
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.16
Follow-up Hdwy	-	- 3.88
Pot Cap-1 Maneuver	0	- 567
Stage 1	0	- - 0
Stage 2	0	- 546
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 567
Mov Cap-2 Maneuver	-	- 567
Stage 1	-	- -
Stage 2	-	- 546

Approach	WB	NB
HCM Control Delay, s	0	11.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	567	-
HCM Lane V/C Ratio	0.065	-
HCM Control Delay (s)	11.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
Future Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084905472	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1688	4	0	0	0	0	0	8	58	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	844	844	1692	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	844	1692	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	311	250	88	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	316	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	311	244	88	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	88	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	308	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.8
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	311	-	-	183
HCM Lane V/C Ratio	0.026	-	-	0.391
HCM Control Delay (s)	16.9	-	-	36.8
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	1.7

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	1	61	15	0	54
Future Vol, veh/h	44	1	61	15	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	1	66	16	0	59

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	133	74	0	0	82	0
Stage 1	74	-	-	-	-	-
Stage 2	59	-	-	-	-	-
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	861	988	-	-	1515	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	861	988	-	-	1515	-
Mov Cap-2 Maneuver	861	-	-	-	-	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	863	1515
HCM Lane V/C Ratio	-	-	0.057	-
HCM Control Delay (s)	-	-	9.4	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	56	18	74	97	1
Future Vol, veh/h	2	56	18	74	97	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	61	20	80	105	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	226	106	106	0	0
Stage 1	106	-	-	-	-
Stage 2	120	-	-	-	-
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	762	948	1485	-	-
Stage 1	918	-	-	-	-
Stage 2	905	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	751	948	1485	-	-
Mov Cap-2 Maneuver	751	-	-	-	-
Stage 1	905	-	-	-	-
Stage 2	905	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1485	-	940	-	-
HCM Lane V/C Ratio	0.013	-	0.067	-	-
HCM Control Delay (s)	7.5	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	1	91	2	0	153
Future Vol, veh/h	4	1	91	2	0	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	1	99	2	0	166

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	266	100	0	0	101	0
Stage 1	100	-	-	-	-	-
Stage 2	166	-	-	-	-	-
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	723	956	-	-	1491	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	723	956	-	-	1491	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	760	1491
HCM Lane V/C Ratio	-	-	0.007	-
HCM Control Delay (s)	-	-	9.8	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1060	17	0	54
Future Vol, veh/h	0	0	1060	17	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	1116	18	0	59

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	473
HCM Lane V/C Ratio	-	0.124
HCM Control Delay (s)	-	13.7
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	WB	WB	NB
Directions Served	T	T	LT
Maximum Queue (ft)	38	50	84
Average Queue (ft)	3	4	41
95th Queue (ft)	21	23	73
Link Distance (ft)	2262	2262	35
Upstream Blk Time (%)			17
Queuing Penalty (veh)			16
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	142
Average Queue (ft)	54
95th Queue (ft)	107
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	122
Average Queue (ft)	44
95th Queue (ft)	90
Link Distance (ft)	924
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	104
Average Queue (ft)	54
95th Queue (ft)	94
Link Distance (ft)	34
Upstream Blk Time (%)	36
Queuing Penalty (veh)	49
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	52
Average Queue (ft)	16
95th Queue (ft)	45
Link Distance (ft)	49
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	29	62
Average Queue (ft)	4	32
95th Queue (ft)	19	61
Link Distance (ft)	507	53
Upstream Blk Time (%)		4
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	50
Average Queue (ft)	23
95th Queue (ft)	47
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	50	34
Average Queue (ft)	28	2
95th Queue (ft)	51	15
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	5
95th Queue (ft)	24
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	SB
Directions Served	R
Maximum Queue (ft)	22
Average Queue (ft)	1
95th Queue (ft)	16
Link Distance (ft)	288
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	66
Average Queue (ft)	7
95th Queue (ft)	38
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement

Directions Served
 Maximum Queue (ft)
 Average Queue (ft)
 95th Queue (ft)
 Link Distance (ft)
 Upstream Blk Time (%)
 Queuing Penalty (veh)
 Storage Bay Dist (ft)
 Storage Blk Time (%)
 Queuing Penalty (veh)

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	60
Average Queue (ft)	4
95th Queue (ft)	26
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 68

HCM 6th Signalized Intersection Summary
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑				
Traffic Volume (veh/h)	0	0	0	0	2090	0	109	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	2090	0	109	0	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach				No			No					
Adj Sat Flow, veh/h/ln				0	1969	0	1922	1969	0			
Adj Flow Rate, veh/h				0	2200	0	154	0	0			
Peak Hour Factor				0.95	0.95	0.92	0.71	0.92	0.92			
Percent Heavy Veh, %				0	2	0	5	2	0			
Cap, veh/h				0	3005	0	191	0	0			
Arrive On Green				0.00	0.27	0.00	0.10	0.00	0.00			
Sat Flow, veh/h				0	3938	0	1875	0	0			
Grp Volume(v), veh/h				0	2200	0	154	0	0			
Grp Sat Flow(s),veh/h/ln				0	1870	0	1875	0	0			
Q Serve(g_s), s				0.0	64.4	0.0	9.6	0.0	0.0			
Cycle Q Clear(g_c), s				0.0	64.4	0.0	9.6	0.0	0.0			
Prop In Lane				0.00		0.00	1.00		0.00			
Lane Grp Cap(c), veh/h				0	3005	0	191	0	0			
V/C Ratio(X)				0.00	0.73	0.00	0.81	0.00	0.00			
Avail Cap(c_a), veh/h				0	3005	0	388	0	0			
HCM Platoon Ratio				1.00	0.33	1.00	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.58	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh				0.0	32.3	0.0	52.7	0.0	0.0			
Incr Delay (d2), s/veh				0.0	0.9	0.0	7.8	0.0	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	32.1	0.0	5.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	33.3	0.0	60.5	0.0	0.0			
LnGrp LOS				A	C	A	E	A	A			
Approach Vol, veh/h					2200			154				
Approach Delay, s/veh					33.3			60.5				
Approach LOS					C			E				
Timer - Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		102.6		17.4								
Change Period (Y+Rc), s		* 6.2		* 5.2								
Max Green Setting (Gmax), s		* 84		* 25								
Max Q Clear Time (g_c+I1), s		66.4		11.6								
Green Ext Time (p_c), s		13.7		0.6								
Intersection Summary												
HCM 6th Ctrl Delay				35.1								
HCM 6th LOS				D								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Improved Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1648	145	0	0	0	110
Future Vol, veh/h	1648	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1735	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	868
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	292
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	292
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	29.4
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	292	-	-
HCM Lane V/C Ratio	0.509	-	-
HCM Control Delay (s)	29.4	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.7	-	-

Intersection						
Int Delay, s/veh	4.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	2023	176	0	127
Future Vol, veh/h	0	0	2023	176	0	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2129	185	0	179

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1065
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 219
Stage 1	-	0 -
Stage 2	-	0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 219
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	68.2
HCM LOS		F

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	219
HCM Lane V/C Ratio	-	-	0.817
HCM Control Delay (s)	-	-	68.2
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	6.1

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Improved Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1627	0	0	166	0
Future Vol, veh/h	0	1627	0	0	166	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1713	0	0	205	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	857	-
Stage 1	-	-	0	-
Stage 2	-	-	857	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	296
HCM Lane V/C Ratio	-	0.692
HCM Control Delay (s)	-	40.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	4.8

HCM 6th TWSC
 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1984	47	0
Future Vol, veh/h	0	0	0	1984	47	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	2	11	4
Mvmt Flow	0	0	0	2088	78	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 835
Stage 1	-	- 0
Stage 2	-	- 835
Critical Hdwy	-	- 5.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	- 6.22
Follow-up Hdwy	-	- 3.91
Pot Cap-1 Maneuver	0	- 355
Stage 1	0	-
Stage 2	0	- 331
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 355
Mov Cap-2 Maneuver	-	- 355
Stage 1	-	-
Stage 2	-	- 331

Approach	WB	NB
HCM Control Delay, s	0	18
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	355	-
HCM Lane V/C Ratio	0.221	-
HCM Control Delay (s)	18	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.8	-

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
Future Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	17248	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	63	63	60	68	68	68
Heavy Vehicles, %	5	2	2	2	2	2	0	0	0	4	4	4
Mvmt Flow	0	1697	9	0	0	0	0	0	40	56	19	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	849	849	1706	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	849	1706	-
Critical Hdwy	-	-	-	-	-	6.9	7.58	6.58	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.58	5.58	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.54	4.04	-
Pot Cap-1 Maneuver	0	-	-	0	0	308	251	89	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	318	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	308	218	89	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	89	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	277	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	46.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	308	-	-	159
HCM Lane V/C Ratio	0.13	-	-	0.472
HCM Control Delay (s)	18.4	-	-	46.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	2.2

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	0	63	52	1	61
Future Vol, veh/h	30	0	63	52	1	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	0	68	57	1	66

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	165	97	0	0	125	0
Stage 1	97	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	826	959	-	-	1462	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	959	-	-	1462	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	825	1462
HCM Lane V/C Ratio	-	-	0.04	0.001
HCM Control Delay (s)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	35	60	114	89	2
Future Vol, veh/h	1	35	60	114	89	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	38	65	124	97	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	352	98	99	0	0
Stage 1	98	-	-	-	-
Stage 2	254	-	-	-	-
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	646	958	1494	-	-
Stage 1	926	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	616	958	1494	-	-
Mov Cap-2 Maneuver	616	-	-	-	-
Stage 1	882	-	-	-	-
Stage 2	788	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1494	-	943	-	-
HCM Lane V/C Ratio	0.044	-	0.041	-	-
HCM Control Delay (s)	7.5	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	0	174	2	0	124
Future Vol, veh/h	3	0	174	2	0	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	0	189	2	0	135

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	325	190	0	0	191
Stage 1	190	-	-	-	-
Stage 2	135	-	-	-	-
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	669	852	-	-	1383
Stage 1	842	-	-	-	-
Stage 2	891	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	669	852	-	-	1383
Mov Cap-2 Maneuver	669	-	-	-	-
Stage 1	842	-	-	-	-
Stage 2	891	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	669	1383
HCM Lane V/C Ratio	-	-	0.005	-
HCM Control Delay (s)	-	-	10.4	0
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1970	61	0	36
Future Vol, veh/h	0	0	1970	61	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	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	0	0	2141	66	0	39

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1071
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 0 217
Stage 1	-	0 0 -
Stage 2	-	0 0 -
Platoon blocked, %	-	
Mov Cap-1 Maneuver	-	- 217
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	25.2
HCM LOS		D

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	217
HCM Lane V/C Ratio	-	0.18
HCM Control Delay (s)	-	25.2
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	WB	WB	NB
Directions Served	T	T	LT
Maximum Queue (ft)	186	192	101
Average Queue (ft)	61	73	62
95th Queue (ft)	147	167	101
Link Distance (ft)	2252	2252	35
Upstream Blk Time (%)			49
Queuing Penalty (veh)			54
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	170
Average Queue (ft)	49
95th Queue (ft)	119
Link Distance (ft)	269
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	231
Average Queue (ft)	94
95th Queue (ft)	203
Link Distance (ft)	933
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	EB	SB
Directions Served	T	L
Maximum Queue (ft)	10	102
Average Queue (ft)	0	68
95th Queue (ft)	7	101
Link Distance (ft)	133	34
Upstream Blk Time (%)		58
Queuing Penalty (veh)		98
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	69
Average Queue (ft)	37
95th Queue (ft)	67
Link Distance (ft)	49
Upstream Blk Time (%)	14
Queuing Penalty (veh)	8
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	35	56
Average Queue (ft)	12	28
95th Queue (ft)	32	57
Link Distance (ft)	507	51
Upstream Blk Time (%)		3
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	44
Average Queue (ft)	22
95th Queue (ft)	46
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	58	40
Average Queue (ft)	24	6
95th Queue (ft)	52	28
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	2
95th Queue (ft)	13
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	288
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	90
Average Queue (ft)	15
95th Queue (ft)	62
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	122
Average Queue (ft)	23
95th Queue (ft)	90
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	63
Average Queue (ft)	7
95th Queue (ft)	34
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	35
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 162

Appendix 8

Signal Warrants

Summary of Warrants

Spot Number:	0		
Major Street:	WB M-59	Minor Street:	X-over east of Hill Road
Intersection:	WB M-59 at X-over east of Hill Road		
City/Twp:	White Lake Twp		
Date Performed:	5/25/2022	Performed By:	Fishbeck
Date Volumes Collected:	9/30/2021		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		YES
	Condition A	NO
	Condition B	YES
	Condition A&B	N/A
WARRANT 2: Four-Hour Vehicular Volume	(70%)	YES
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	YES
	Condition A	NO
	Condition B	YES
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
	(Threshold)	HAWK NO
	(Threshold)	RRFB NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		NO
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		NO
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

0

TRAFFIC SIGNAL WARRANT ANALYSIS DATA ENTRY
ONLY ENTER DATA IN YELLOW CELLS

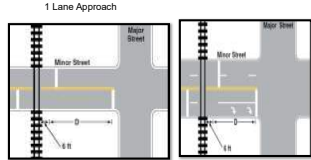
Spot Number

	MAJOR STREET	at	MINOR STREET				
Intersection of	WB M-59		over east of Hill Ro		Analysis Date	5/25/2022	by <input type="text"/> Postback
DIRECTION	E-W		N-S		Data Collection Date	9/30/2021	
City/Twp	White Lake Twp						

Is the intersection within an isolated community? Yes or No	NO
DO NOT ENTER ANY VALUE IN THIS BOX	
Discount for Right Turn Volume (or Lefts at Crossovers)?	NO
Percent Reduction in NB Right Turn Volumes	
Percent Reduction in SB Right Turn Volumes	
Percent Reduction in EB Right Turn Volumes	
Percent Reduction in WB Right Turn Volumes	
Have Other Remedial Measures Been Tried (Warrant 1 A&B)?	NO
Have Other Remedial Measures Been Tried (Warrant 7)?	NO
Are there 5 or more Crashes Susceptible to Correction by Signalization in a 12 Month Period?	
Review Peak Hour Warrant?	YES
Peak Hour Stop Delay (Vehicle Hours)	0.1
Number of Intersection Approaches	2
Peak Hour	17:00 - 18:00
Has a Study been Conducted that Demonstrates a Need for Signalization Based on a Lack of Signal Coordination (Warrant 6)?	NO
Has a Study been Conducted that Demonstrates a Need for Signalization Based on a the Need to Encourage Concentration and Organization of Traffic Flow (Warrant 8)?	NO

Pedestrian Warrant Information	
Distance to nearest Signal or Stop Sign on Major Road (ft)	
Is the 15th Percentile Speed of Pedestrians Less than 3.5ft/sec?	
DO NOT ENTER ANY VALUE IN THIS BOX	
Number of Gaps for School Crossings	
Duration of Gap Study (minutes)	
Width of Street (feet)	
Number of School Children per Group	
Number of School Children	
Crosswalk Length	
Is Pedestrian Sight Distance Sufficient?	

Grade Crossing Information	
Clear Storage Distance (Enter Greater than 140 if no Railroad Present)	
Number of Approach Lanes Crossing Tracks	
Peak Hour for Train Crossings (If not known, use Peak Vehicle Hour)	
Trains Crossings per Day? (Use 3-5 if Unknown)	
Percentage of High Occupancy Buses (Use 0% if Unknown)?	
Percentage of Tractor Trailers? (Use 7.6% to 12.5% if Unknown)	



Issue to Be Addressed by Signalization:
<input type="text"/>

	X-over east of Hill Road				WB M-59			
	NORTHBOUND		SOUTHBOUND		EASTBOUND		WESTBOUND	
Number of lanes	1		0		0		2	
SPEED LIMIT OR 85th Percentile MPH	25						55	
	Direction # NB		Direction # SB		Direction # EB		Direction # WB	
	Machine #1	Manual Counts	Machine #1	Manual Counts	Machine #1	Manual Counts	Machine #1	Manual Counts
Traffic Counts	Machine Minor Vol #1	PED COUNT S+LEG	Machine Minor Vol #2	PED COUNT N+LEG	Machine Major Vol #3	PED COUNT W+LEG	Machine Major Vol #4	PED COUNT E+LEG
00:01 - 01:00								
01:00 - 02:00								
02:00 - 03:00								
03:00 - 04:00								
04:00 - 05:00								
05:00 - 06:00								
06:00 - 07:00	54						518	
07:00 - 08:00	104						883	
08:00 - 09:00	51						989	
09:00 - 10:00	75						886	
10:00 - 11:00	58						958	
11:00 - 12:00	79						1071	
12:00 - 13:00	67						1302	
13:00 - 14:00	73						1303	
14:00 - 15:00	96						1495	
15:00 - 16:00	94						1803	
16:00 - 17:00	119						2035	
17:00 - 18:00	150						2566	
18:00 - 19:00	116						1695	
19:00 - 20:00								
20:00 - 21:00								
21:00 - 22:00								
22:00 - 23:00								
23:00 - 00:00								

Were the machine and manual counts taken on the same day?

Ratio	MANUAL#1 / Machine NB	MANUAL#1 / Machine SB	MANUAL#1 / Machine EB	MANUAL#1 / Machine WB
	1.00	1.00	1.00	1.00
Input Check: Is data correct?	<input type="checkbox"/> YES	<input type="checkbox"/> YES	<input type="checkbox"/> YES	<input type="checkbox"/> YES

HELP

If a count has been input during at least one of the hours, if otherwise blank, ignore this error. Input may need to be fixed calculation.

Check Machine Counts - A 25 MPH has been posted for at least one hour. Volumes are correct, ignore this error. Ratio may need to be fixed calculated.

Check Manual Counts - The ratio between the manual counts and machine counts is out of normal range. Please check volumes. If otherwise blank, ignore this error.

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

Intersection:	WB M-59 @ X-over east of Hill Road		
Date	5/25/2022	by	Fishbeck

2	: No. of Lanes on Major St?
1	: No. of Lanes on Minor St?
55	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: 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

Time	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?
00:01 - 01:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
01:00 - 02:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
02:00 - 03:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
03:00 - 04:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
04:00 - 05:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
05:00 - 06:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
06:00 - 07:00	516	64	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
07:00 - 08:00	893	104	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
08:00 - 09:00	989	63	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
09:00 - 10:00	986	75	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
10:00 - 11:00	928	66	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
11:00 - 12:00	1071	79	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
12:00 - 13:00	1302	67	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
13:00 - 14:00	1303	77	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
14:00 - 15:00	1495	96	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
15:00 - 16:00	1803	94	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
16:00 - 17:00	2005	119	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
17:00 - 18:00	2066	150	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
18:00 - 19:00	1595	116	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
19:00 - 20:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
20:00 - 21:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
21:00 - 22:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
22:00 - 23:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
23:00 - 00:00	0	0	420	105	NO	630	53	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 =	12
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)	YES
C. Combination of Warrants A and B Criteria Met?	N/A

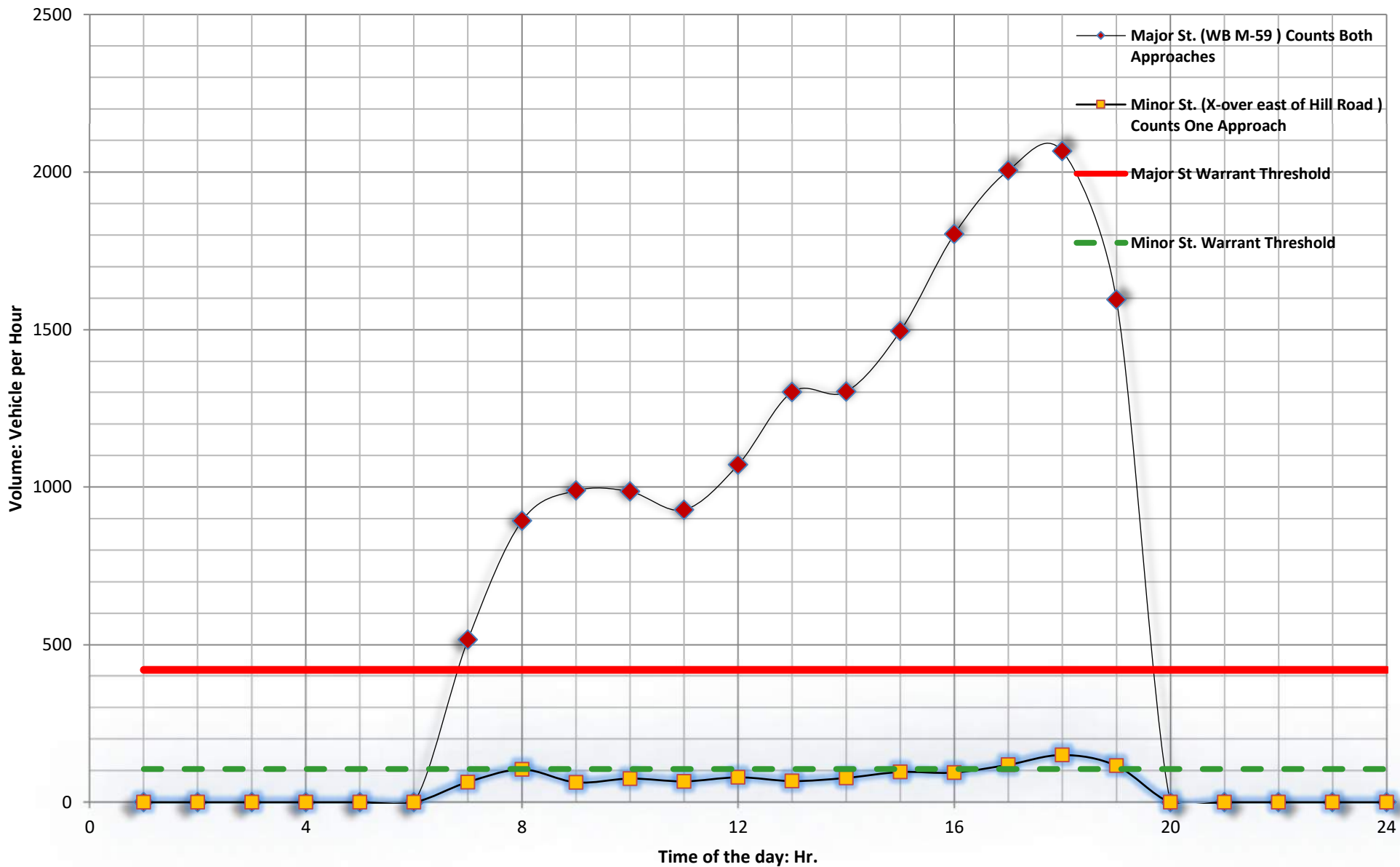


FIGURE 1: WARRANT 1A

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:

WB M-59 @ X-over east of Hill Road

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 3

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

Data Collection Date: 9/30/2021

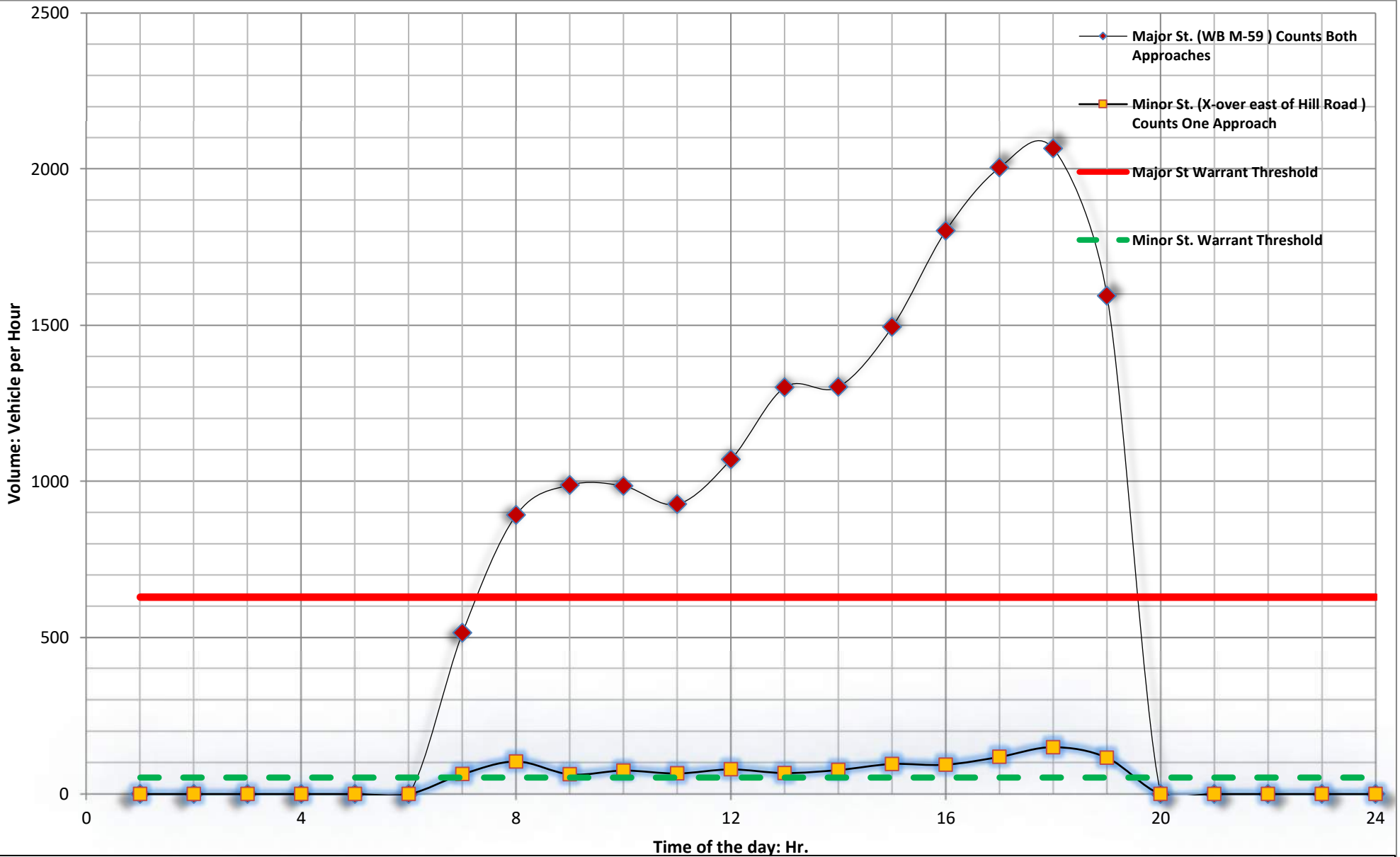


FIGURE 1: WARRANT 1B

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:

WB M-59 @ X-over east of Hill Road

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 12

Does this intersection meet Warrant 1B for signal installation? YES

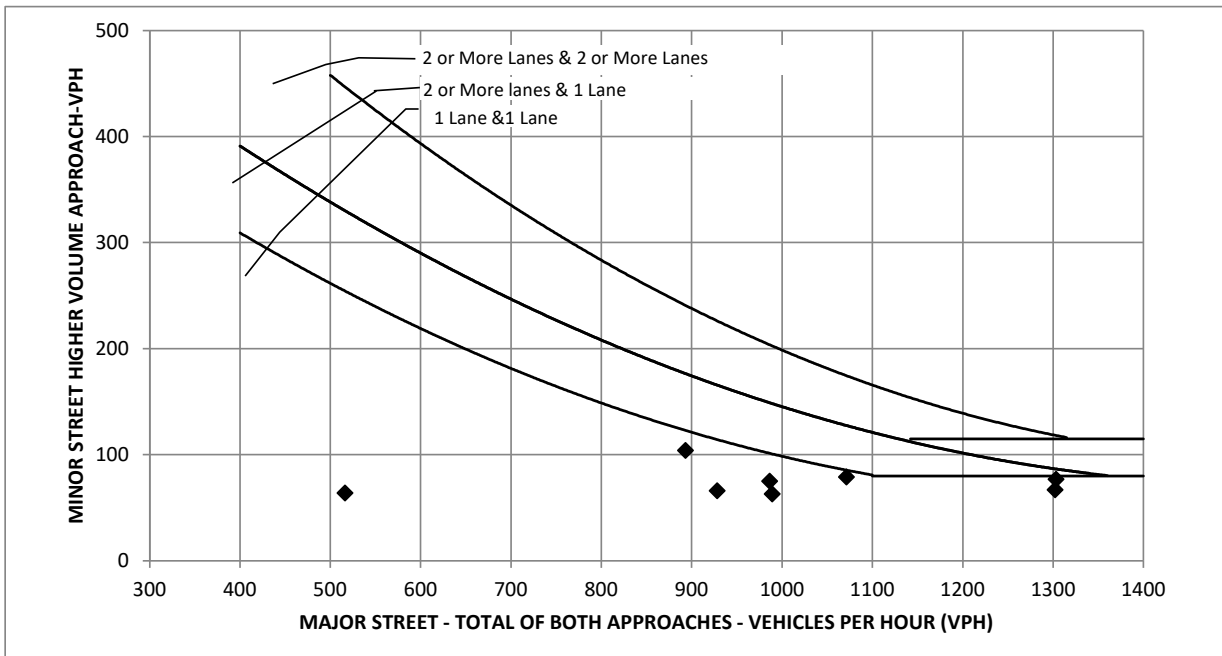
Data Collection Date: 9/30/2021

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

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/2022 by Fishbeck

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

DO NOT USE THIS GRAPH - USE 70% GRAPH

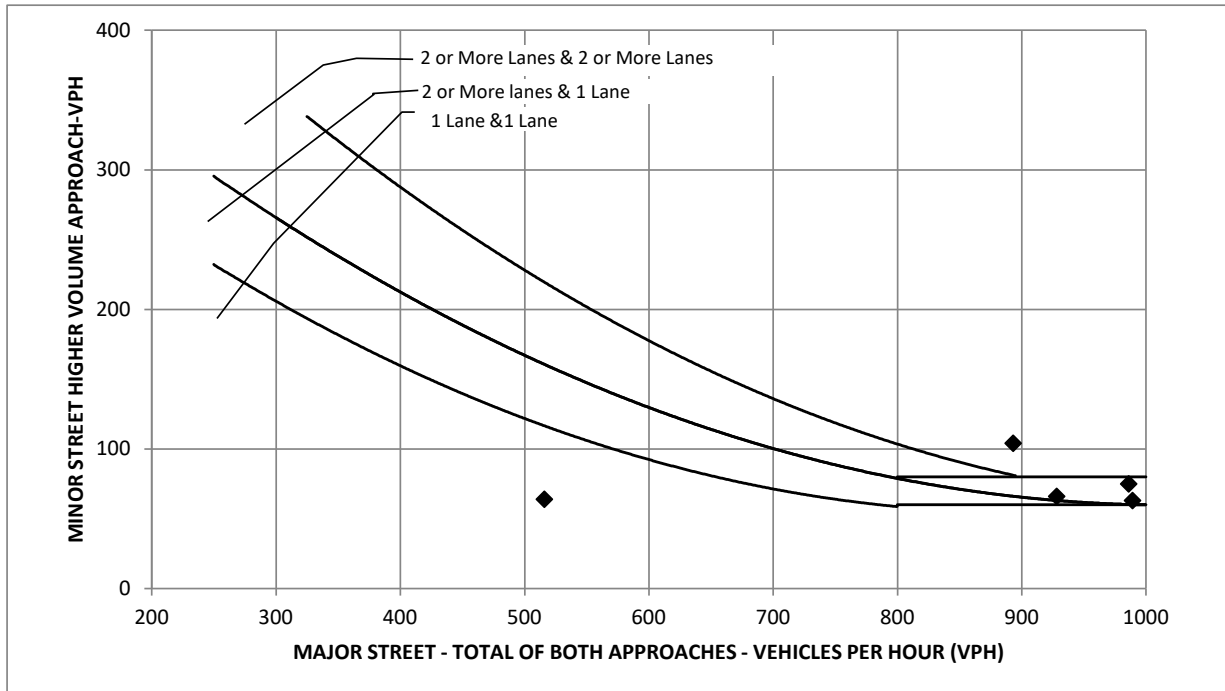


How Many Hours Are Met	5
Is Warrant 2 (100%) Met?	N/A

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

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/20222 by Fishbeck

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



How Many Hours Are Met

12

Is Warrant (70%) Met?

YES

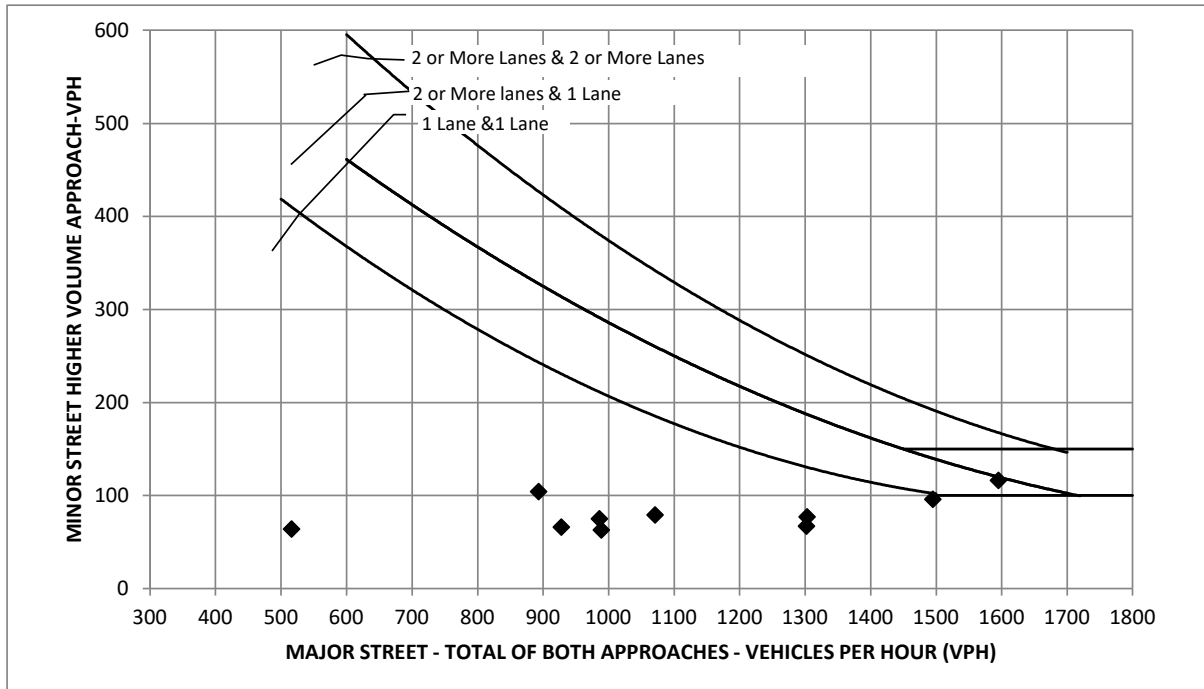
Michigan Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 3 A: Peak-Hour Vehicular Volume														
Spot Number:	0													
Intersection:	WB M-59 @ X-over east of Hill Road													
Date	5/25/2022	by Fishbeck												
NOT MET	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">0.13</td> <td>: Total Stop Time Delay (hrs)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>: Minor Street Approach Lanes</td> </tr> <tr> <td style="text-align: center;">2</td> <td>: Total Approaches</td> </tr> <tr> <td style="text-align: center;">150</td> <td>: Minor Approach Volume</td> </tr> <tr> <td style="text-align: center;">2216</td> <td>: Total Entering Volume</td> </tr> <tr> <td style="text-align: center;">17:00 - 18:00</td> <td>: Peak Hour</td> </tr> </table>		0.13	: Total Stop Time Delay (hrs)	1	: Minor Street Approach Lanes	2	: Total Approaches	150	: Minor Approach Volume	2216	: Total Entering Volume	17:00 - 18:00	: Peak Hour
0.13	: Total Stop Time Delay (hrs)													
1	: Minor Street Approach Lanes													
2	: Total Approaches													
150	: Minor Approach Volume													
2216	: Total Entering Volume													
17:00 - 18:00	: Peak Hour													
Is Warrant 3 A Met?		NO												

**Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(100%): Peak-Hour Vehicular Volume**

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/20222 by Fishbeck

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

DO NOT USE THIS GRAPH - USE 70% GRAPH



How Many Hours Are Met

3

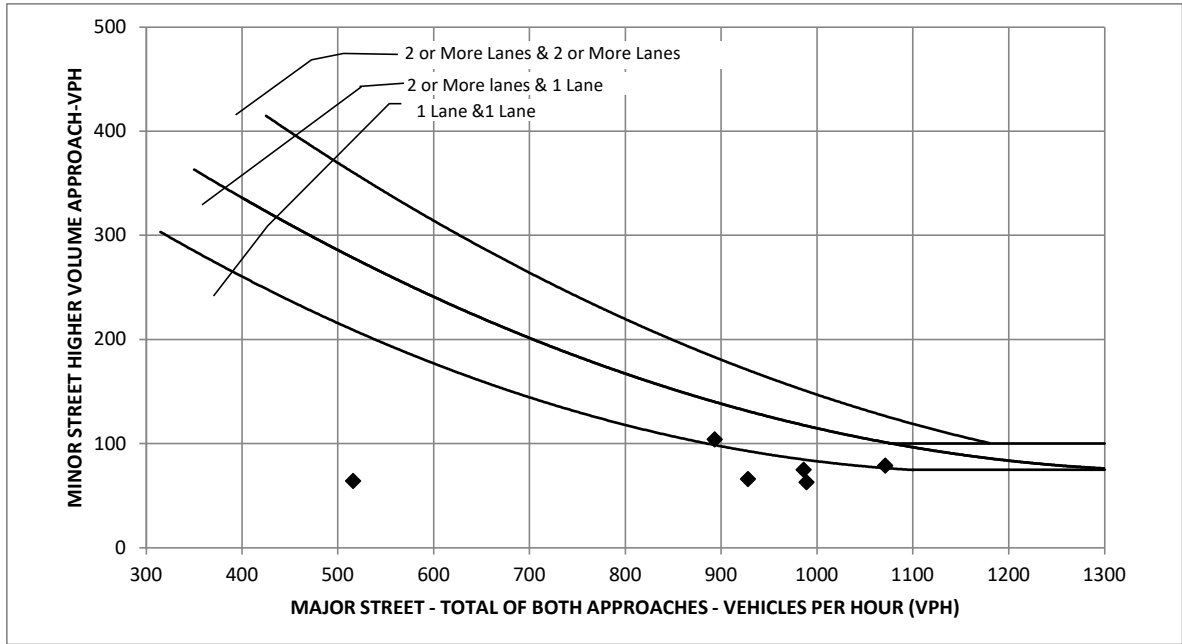
Is Warrant 3 B (100%) Met?

YES

**Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(70%): Peak-Hour Vehicular Volume**

Spot Number:	0		
Intersection:	WB M-59 @ X-over east of Hill Road		
Date	5/25/20222	by	Fishbeck

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



How Many Hours Are Met	8
Is Warrant (70%) Met?	YES

WB M-59 Merged - TMC

Thu Sep 30, 2021

Full Length ()

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 6:00AM	159	4	163	71	0	71	234
6:15AM	223	5	228	120	0	120	348
6:30AM	282	4	286	119	0	119	405
6:45AM	338	8	346	163	0	163	509
Hourly Total	1002	21	1023	473	0	473	1496
7:00AM	357	12	369	164	0	164	533
7:15AM	354	8	362	188	0	188	550
7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
Hourly Total	1440	69	1509	844	0	844	2353
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
8:30AM	306	4	310	225	0	225	535
8:45AM	362	8	370	229	0	229	599
Hourly Total	1356	32	1388	940	0	940	2328
9:00AM	320	10	330	240	0	240	570
9:15AM	299	5	304	232	0	232	536
9:30AM	299	6	305	232	0	232	537
9:45AM	284	11	295	225	0	225	520
Hourly Total	1202	32	1234	929	0	929	2163
10:00AM	236	5	241	182	0	182	423
10:15AM	249	7	256	212	0	212	468
10:30AM	253	2	255	253	0	253	508
10:45AM	251	10	261	226	0	226	487
Hourly Total	989	24	1013	873	0	873	1886
11:00AM	263	4	267	223	0	223	490
11:15AM	254	10	264	236	0	236	500
11:30AM	293	8	301	251	0	251	552
11:45AM	251	8	259	297	0	297	556
Hourly Total	1061	30	1091	1007	0	1007	2098
12:00PM	262	4	266	322	0	322	588
12:15PM	295	11	306	289	0	289	595
12:30PM	334	6	340	313	0	313	653
12:45PM	219	9	228	295	0	295	523
Hourly Total	1110	30	1140	1219	0	1219	2359
1:00PM	257	12	269	299	0	299	568
1:15PM	277	11	288	302	0	302	590
1:30PM	248	6	254	299	0	299	553
1:45PM	275	11	286	320	0	320	606
Hourly Total	1057	40	1097	1220	0	1220	2317
2:00PM	289	8	297	297	0	297	594
2:15PM	272	15	287	372	0	372	659
2:30PM	322	12	334	363	0	363	697
2:45PM	334	16	350	365	0	365	715
Hourly Total	1217	51	1268	1397	0	1397	2665
3:00PM	315	13	328	403	0	403	731
3:15PM	325	17	342	399	0	399	741
3:30PM	337	5	342	458	0	458	800
3:45PM	313	8	321	428	0	428	749
Hourly Total	1290	43	1333	1688	0	1688	3021
4:00PM	297	9	306	423	0	423	729
4:15PM	372	8	380	463	0	463	843
4:30PM	345	9	354	497	0	497	851
4:45PM	348	14	362	466	0	466	828

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
Hourly Total	1362	40	1402	1849	0	1849	3251
5:00PM	416	9	425	478	0	478	903
5:15PM	396	20	416	490	0	490	906
5:30PM	377	14	391	499	0	499	890
5:45PM	364	15	379	426	0	426	805
Hourly Total	1553	58	1611	1893	0	1893	3504
6:00PM	301	14	315	438	0	438	753
6:15PM	319	12	331	360	0	360	691
6:30PM	281	13	294	368	0	368	662
6:45PM	258	14	272	306	0	306	578
Hourly Total	1159	53	1212	1472	0	1472	2684
Total	15798	523	16321	15804	0	15804	32125
% Approach	96.8%	3.2%	-	100%	0%	-	-
% Total	49.2%	1.6%	50.8%	49.2%	0%	49.2%	-
Lights	15281	499	15780	15227	0	15227	31007
% Lights	96.7%	95.4%	96.7%	96.3%	0%	96.3%	96.5%
Articulated Trucks	161	3	164	186	0	186	350
% Articulated Trucks	1.0%	0.6%	1.0%	1.2%	0%	1.2%	1.1%
Buses and Single-Unit Trucks	356	21	377	391	0	391	768
% Buses and Single-Unit Trucks	2.3%	4.0%	2.3%	2.5%	0%	2.5%	2.4%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

Full Length ()

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
Total	1417	69	1486	978	0	978	2464
% Approach	95.4%	4.6%	-	100%	0%	-	-
% Total	57.5%	2.8%	60.3%	39.7%	0%	39.7%	-
PHF	0.945	0.575	0.917	0.955	-	0.955	0.932
Lights	1354	65	1419	923	0	923	2342
% Lights	95.6%	94.2%	95.5%	94.4%	0%	94.4%	95.0%
Articulated Trucks	27	0	27	20	0	20	47
% Articulated Trucks	1.9%	0%	1.8%	2.0%	0%	2.0%	1.9%
Buses and Single-Unit Trucks	36	4	40	35	0	35	75
% Buses and Single-Unit Trucks	2.5%	5.8%	2.7%	3.6%	0%	3.6%	3.0%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

Midday Peak (11:45 AM - 12:45 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 11:45AM	251	8	259	297	0	297	556
	12:00PM	262	4	266	322	0	322	588
	12:15PM	295	11	306	289	0	289	595
	12:30PM	334	6	340	313	0	313	653
	Total	1142	29	1171	1221	0	1221	2392
	% Approach	97.5%	2.5%	-	100%	0%	-	-
	% Total	47.7%	1.2%	49.0%	51.0%	0%	51.0%	-
	PHF	0.855	0.659	0.861	0.948	-	0.948	0.916
	Lights	1098	27	1125	1171	0	1171	2296
	% Lights	96.1%	93.1%	96.1%	95.9%	0%	95.9%	96.0%
	Articulated Trucks	16	0	16	21	0	21	37
	% Articulated Trucks	1.4%	0%	1.4%	1.7%	0%	1.7%	1.5%
	Buses and Single-Unit Trucks	28	2	30	29	0	29	59
	% Buses and Single-Unit Trucks	2.5%	6.9%	2.6%	2.4%	0%	2.4%	2.5%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

Midday Peak (11:45 AM - 12:45 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 4:45PM	348	14	362	466	0	466	828
	5:00PM	416	9	425	478	0	478	903
	5:15PM	396	20	416	490	0	490	906
	5:30PM	377	14	391	499	0	499	890
	Total	1537	57	1594	1933	0	1933	3527
	% Approach	96.4%	3.6%	-	100%	0%	-	-
	% Total	43.6%	1.6%	45.2%	54.8%	0%	54.8%	-
	PHF	0.924	0.713	0.938	0.968	-	0.968	0.973
	Lights	1506	54	1560	1897	0	1897	3457
	% Lights	98.0%	94.7%	97.9%	98.1%	0%	98.1%	98.0%
	Articulated Trucks	11	1	12	16	0	16	28
	% Articulated Trucks	0.7%	1.8%	0.8%	0.8%	0%	0.8%	0.8%
	Buses and Single-Unit Trucks	20	2	22	20	0	20	42
	% Buses and Single-Unit Trucks	1.3%	3.5%	1.4%	1.0%	0%	1.0%	1.2%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 at EB to WB X-over, east of Hill Road

Leg	MI 59			MI 59			Growth to 2027		Growth Rate
	Eastbound		App Total	Westbound		App Total	X-over east of Hill Road	M-59	
Direction	Thru	U-Turn		Thru	U-Turn		LT	WB	
Start Time			App Total			App Total	Int	Thru	
2021-09-30 06:00:00	1002	21	1023	473	0	473	1496	22	487
2021-09-30 07:00:00	1440	69	1509	844	0	844	2353	71	870
2021-09-30 08:00:00	1356	32	1388	940	0	940	2328	33	969
2021-09-30 09:00:00	1202	32	1234	929	0	929	2163	33	957
2021-09-30 10:00:00	989	24	1013	873	0	873	1886	25	900
2021-09-30 11:00:00	1061	30	1091	1007	0	1007	2098	31	1038
2021-09-30 12:00:00	1110	30	1140	1219	0	1219	2359	31	1256
2021-09-30 13:00:00	1057	40	1097	1220	0	1220	2317	41	1257
2021-09-30 14:00:00	1217	51	1268	1397	0	1397	2665	53	1439
2021-09-30 15:00:00	1290	43	1333	1688	0	1688	3021	44	1739
2021-09-30 16:00:00	1362	40	1402	1849	0	1849	3251	41	1905
2021-09-30 17:00:00	1553	58	1611	1893	0	1893	3504	60	1951
2021-09-30 18:00:00	1159	53	1212	1472	0	1472	2684	55	1517
Grand Total	15798	523	16321	15804	0	15804	32125		
% Approach	96.8%	3.2%		100.0%	0.0%				
% Total	49.2%	1.6%	50.8%	49.2%	0.0%	49.2%			
Lights	15281	499	15780	15227	0	15227	31007		
% Lights	96.7%	95.4%	96.7%	96.3%	0.0%	96.3%	96.5%		
Articulated Trucks	161	3	164	186	0	186	350		
% Articulated Trucks	1.0%	0.6%	1.0%	1.2%	0.0%	1.2%	1.1%		
Buses and Single-Unit Trucks	356	21	377	391	0	391	768		
% Buses and Single-Unit Trucks	2.3%	4.0%	2.3%	2.5%	0.0%	2.5%	2.4%		

Daily Trip Generation for Mixed Use Development

Land Use Code	210			220			210			220		
	Single-Family Detached Housing			Multifamily Housing (Low-Rise)			Single-Family Detached Housing			Multifamily Housing (Low-Rise)		
Subcategory				Not Close to Rail Transit								
Setting	General Urban/Suburban			General Urban/Suburban								
Time Period	Weekday			Weekday								
# Data Sites	7			6								
	% of 24-Hour Vehicle Trips			% of 24-Hour Vehicle Trips								
Time	Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting
12:00 - 1:00 AM	0.3%	0.5%	0.2%	0.7%	0.9%	0.4%						
1:00 - 2:00 AM	0.2%	0.2%	0.1%	0.4%	0.5%	0.3%						
2:00 - 3:00 AM	0.2%	0.3%	0.1%	0.4%	0.4%	0.4%						
3:00 - 4:00 AM	0.2%	0.2%	0.2%	0.4%	0.4%	0.3%						
4:00 - 5:00 AM	0.6%	0.3%	0.8%	0.9%	0.3%	1.4%						
5:00 - 6:00 AM	1.2%	0.5%	2.0%	1.6%	0.5%	2.6%						
6:00 - 7:00 AM	3.7%	1.6%	5.8%	4.2%	1.4%	6.9%	33	17	16	111	56	55
7:00 - 8:00 AM	6.5%	3.1%	10.0%	6.5%	2.0%	10.8%	59	15	44	173	42	131
8:00 - 9:00 AM	6.2%	3.8%	8.5%	5.8%	3.1%	8.5%	55	14	41	156	37	119
9:00 - 10:00 AM	4.6%	3.3%	5.8%	3.9%	2.9%	4.9%	41	21	20	104	52	52
10:00 - 11:00 AM	4.9%	4.2%	5.6%	3.6%	2.4%	4.8%	44	22	22	96	48	48
11:00 - 12:00 PM	5.3%	5.4%	5.1%	4.3%	3.8%	4.7%	47	24	23	115	58	57
12:00 - 1:00 PM	5.7%	5.7%	5.7%	4.3%	4.5%	4.1%	51	26	25	116	58	58
1:00 - 2:00 PM	6.1%	6.1%	6.0%	4.2%	4.0%	4.4%	54	27	27	112	56	56
2:00 - 3:00 PM	6.6%	7.1%	6.1%	5.2%	5.6%	4.9%	59	30	29	141	71	70
3:00 - 4:00 PM	7.5%	8.7%	6.2%	6.1%	6.9%	5.3%	67	34	33	164	82	82
4:00 - 5:00 PM	8.9%	10.5%	7.4%	7.9%	10.1%	5.6%	80	50	30	210	132	78
5:00 - 6:00 PM	8.7%	10.0%	7.3%	9.5%	11.4%	7.6%	78	49	29	254	160	94
6:00 - 7:00 PM	7.2%	8.5%	5.9%	8.2%	9.7%	6.7%	64	32	32	220	110	110
7:00 - 8:00 PM	5.1%	6.1%	4.2%	6.4%	8.1%	4.7%						
8:00 - 9:00 PM	4.6%	6.1%	3.1%	5.9%	7.7%	4.2%						
9:00 - 10:00 PM	3.3%	4.4%	2.3%	4.4%	6.0%	2.7%						
10:00 - 11:00 PM	1.6%	2.1%	1.0%	3.5%	4.7%	2.4%						
11:00 - 12:00 AM	1.0%	1.3%	0.6%	1.9%	2.5%	1.4%						

LUC	Number of Units	Weekday, number of trips	Peak hour	Distribution (Entering/ Exiting)
210	88	897	AM	26/74
			PM	63/37
220	406	2678	AM	24/76
			PM	63/37

		AM		PM	
		Entering	Exiting	Entering	Exiting
East	M-59	0.4	0.6	0.55	0.45
West	M-59	0.58	0.38	0.43	0.54

Using crossover

WB entering

EB Entering

Total			EB	WB
Total	Entering	Exiting	Entering	Entering
144	73	71	42	29
232	57	175	33	23
211	51	160	30	20
145	73	72	42	29
140	70	70	41	28
162	82	80	48	33
167	84	83	36	46
166	83	83	36	46
200	101	99	43	56
231	116	115	50	64
290	182	108	78	100
332	209	123	90	115
284	142	142	61	78

Summary of Traffic Counts for Traffic Signal Warrant for WB M-59 and Crossover east of Hill Road

	2027		Trip Generation		Total	
	WB	NB	WB	NB	WB	NB
6:00:00	487	22	29	42	516	64
7:00:00	870	71	23	33	893	104
8:00:00	969	33	20	30	989	63
9:00:00	957	33	29	42	986	75
10:00:00	900	25	28	41	928	66
11:00:00	1038	31	33	48	1071	79
12:00:00	1256	31	46	36	1302	67
13:00:00	1257	41	46	36	1303	77
14:00:00	1439	53	56	43	1495	96
15:00:00	1739	44	64	50	1803	94
16:00:00	1905	41	100	78	2005	119
17:00:00	1951	60	115	90	2066	150
18:00:00	1517	55	78	61	1595	116



INNOVATIVE IDEAS
EXCEPTIONAL DESIGN
UNMATCHED CLIENT SERVICE

June 15, 2022

Sean O’Neil, Director
Community Development Department
Charter Township of White Lake
7525 Highland Road
White Lake, Michigan 48383

**RE: Traffic Impact Study Review
Mixed-Use Development at Highland Road (M-59) and Hill Road**

Ref: DLZ File No. 2145-7233-21
Date of Study: 06/07/2022

Design Professional: Fishbeck

The applicant has submitted a revised Traffic Impact Study for the redevelopment of P.I.’s #12-20-101-003 and 12-20-126-006. P.I. #12-20-101-003 and 12-20-126-006 total 110.02 acres and are located on the north side of Highland Road (M-59) on both the east and west side of Hill Road. The study evaluated existing conditions, anticipated background conditions and anticipated traffic generated by the proposed development, then it completed both traffic signal warrants and right turn lane warrants for the proposed site. All of the intersections evaluated along Highland Road are under the jurisdiction of the Michigan Department of Transportation (MDOT).

The first observation of the TIS, is that despite utilizing the same traffic data as the previous TIS, which was submitted in December 2021, the Level of Service (LOS) analysis for the existing conditions had a significant change in the existing LOS of the WB Highland Rd. and EB Crossover intersection in the PM Peak hour. The previous TIS had an existing LOS of F and a delay time of 66.8 sec. The revised TIS has an existing LOS of D and a delay time of 29.1 sec for the same intersection in the PM Peak hour. DLZ is not aware of the reason for the change in delay, but the change provides doubt to the potential findings in the TIS. There is also a significant difference between the two reports for the same intersection and same time period in the Background Conditions analysis (LOS F: 78.0 sec delay vs LOS D: 31.3 sec delay).

Upon running the traffic signal warrants at each intersection, the study determined that Warrant 1 – Eight Hour Vehicular Volume and Warrant 3 – Peak Hour Vehicular Volume are met for the WB Highland Road and EB Cross (east of Hill Road) intersection. The intersection was then modeled with a traffic signal, which resulted in improved LOS for the intersection compared with the unimproved future conditions. However, the improved future condition LOS analysis revealed that the LOS is significant worse for the following intersections in the PM Peak hour compared with the background conditions analysis:

Intersection	Background Condition LOS/Delay	Improved Future Condition LOS/Delay
M-59 and EB crossover (NB)	AM: LOS B – 14.1 sec	AM: LOS D – 45.0 sec
	PM: LOS D – 31.3 sec	PM: LOS E – 60.5 sec
WB M-59 and Hill Road (SB)	AM: LOS B – 14.2 sec	AM: LOS C – 21.3 sec
	PM: LOS D – 30.1 sec	PM: LOS F – 68.2 sec
EB M-59 and WB crossover (SB)	AM: LOS C – 22.3 sec	AM: LOS E – 36.6 sec
	PM: LOS D – 29.1 sec	PM: LOS E – 40.6 sec
EB M-59 and Haven Rd (SB)	PM: LOS D – 34.6 sec	PM: LOS E – 46.4 sec

Due to the number of intersections where the LOS changes from LOS D to LOS E or F, DLZ believes there are further improvements to be made in this area.


We have reviewed the analysis; the methodology appear to be in line with standard practices, and the findings are supported by the data provided, though are in potential conflict with the previous TIS that used the same data. However, the resulting LOS for the intersections is worse than the background conditions for the site on several legs of the analyzed intersections. Several legs currently operating at LOS D or better will change to a LOS E or F, and nearly all legs will operate at a LOS worse than the background conditions. Further evaluation and improvements adjacent to the proposed site should be considered.

Upon running the right turn lane warrant for the WB Highland Road and Hill Road intersection, it was determined that a full right turn lane was warranted due to PM peak hour traffic volumes.

DLZ believes additional improvements are needed in the area in order to improve Level of Service in the corridor to an acceptable level, but would note that final approval of the Traffic Impact Study will be provided by MDOT.

If you have any questions, please feel free to contact to me.

Respectfully,
DLZ Michigan, Inc.

 Digitally signed by Leigh C Merrill III
Date: 2022.06.16 12:52:27-04'00'

Leigh Merrill, P.E.
Project Manager

CC: Cc: Michael Leuffgen, P.E., DLZ *via email*
Justin Quagliata, Community Development *via e-mail*



Mixed Use Residential Development in White Lake Township Traffic Impact Study

Project No. 220895
June 7, 2022

Mixed Use Residential Development in White Lake Township Traffic Impact Study

**Prepared For:
Lautrec Ltd.
Farmington Hills, MI**

**June 7, 2022
Project No. 220895**

Executive Summary1

1.0 Introduction.....2

 1.1 Project Overview.....2

 1.2 Study Methodology.....2

 1.3 Intersection Characteristics3

 1.4 Existing Traffic Volumes.....5

2.0 Existing Conditions Analysis7

 2.1 Traffic Operations Analysis Methodology7

 2.2 Existing Conditions Traffic Analysis7

3.0 Background Conditions Analysis8

 3.1 Background Conditions Traffic Analysis10

4.0 Site Traffic Characteristics.....10

 4.1 Trip Generation.....11

 4.2 Trip Distribution12

5.0 Future Conditions Analysis.....15

 5.1 Turn Lane Warrants15

 5.2 Future Conditions Traffic Analysis.....15

 5.3 Future Improvement Conditions Traffic Analysis.....16

 5.4 Signal Warrant Analysis18

6.0 Findings and Recommendations.....19

List of Figures

Figure 1 – Project Location and Study Network2

Figure 2 – Existing Lane Configurations4

Figure 3 – Existing Traffic Volumes6

Figure 4 – Background Traffic Volumes9

Figure 5 – Conceptual Site Plan.....11

Figure 6 – Trip Generation Volumes13

Figure 7 – Pass-By Volumes.....14

List of Tables

Table 1 – Proposed Improvements1

Table 2 – LOS Criteria7

Table 3 – LOS Analysis for Existing Conditions.....7

Table 4 – LOS Analysis for Background Conditions.....10

Table 5 – Trip Generation for Proposed Development11

Table 6 – Trip Distribution12

Table 7 – Turn Lane Warrants15

Table 8 – LOS Analysis for Future Conditions15

Table 9 – LOS Analysis for Future Improvement Conditions.....17

Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road.....18

Table 11 – Proposed Improvements19

List of Appendices

- Appendix 1 – Traffic Volume Data
- Appendix 2 – Existing LOS Output Reports
- Appendix 3 – Background LOS Output Reports
- Appendix 4 – Trip Generation Calculations
- Appendix 5 – Turn Lane Warrant
- Appendix 6 – Future LOS Output Reports
- Appendix 7 – Future Improvement LOS Output Reports
- Appendix 8 – Signal Warrants

List of Abbreviations/Acronyms

AASHTO	American Association of State Highway and Transportation Officials
DU	Dwelling Units
EB	Eastbound
HCM	Highway Capacity Manual
ITE	Institute of Transportation Engineers
LOS	Level of Service
LUC	Land Use Code
M-59	Highland Road
MDOT	Michigan Department of Transportation
MMUTCD	Michigan Manual on Uniform Traffic Control Devices
mph	Miles per Hour
NB	Northbound
RCOC	Road Commission for Oakland County
RIRO	Right-In/Right-Out (driveway)
SB	Southbound
SEMCOG	Southeast Michigan Council of Governments
TIS	Traffic Impact Study
TMC	Turning Movement Count
TCDS	Traffic Count Database System
Township	White Lake Township
WB	Westbound

References

- The Highway Capacity Manual, 6th Edition.* (2016). Washington, DC.
- The Highway Capacity Manual: 2000.* (2000). Washington, DC.
- Trip Generation Handbook, 3rd Edition.* (2017). Washington DC.
- Trip Generation Manual, 11th Edition.* (2021). Washington DC.

Executive Summary

Fishbeck has completed a traffic impact study (TIS) related to the development of a mixed-use residential development located on the northeast and northwest side of Hill Road near Highland Road (M-59) in White Lake Township (Township), Michigan. The existing land is vacant. The proposed site presents 88 single family condominiums and 406 multifamily housing (low-rise) units. The development is assumed to be open and fully operational in 2027.

All the access points to the development are proposed. There will be three access points on Hill Road and one access point on M-59. The accesses on Hill Road will be full movement (left and right turn movements allowed, ingress and egress). The access on M-59 will be right-in/right-out (RIRO).

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Michigan Department of Transportation (MDOT), Road Commission for Oakland County (RCOC), and the Township.

Vehicular, pedestrian, and cyclist Turning Movement Count (TMC)s were collected at the study intersection on Thursday, September 30, 2021, during the weekday a.m. (7 a.m. to 9 a.m.) and p.m. (4 p.m. to 6 p.m.) peak periods of the roadway network. Based on this review of 2021 traffic counts from Southeast Michigan Council of Governments (SEMCOG)'s Traffic Count Database System (TCDS), there was no compelling evidence to apply a COVID adjustment factor to the collected TMCs.

Site-generated traffic was forecast using the information and methodologies specified in the latest version of Trip Generation, Trip Generation Manual, 11th Edition, 2021. The existing traffic volumes, site layout, and engineering judgement were used to develop a trip distribution model for the a.m. and p.m. peak hours for the new traffic that will be generated by the proposed development. Additionally, directions of origin, surrounding residential densities, and commuting patterns were considered.

Capacity analyses were conducted for existing, background, and total future conditions based on Highway Capacity Manual (HCM) 6th Edition methodologies using Synchro traffic analysis software. Synchro network models were also simulated using SimTraffic to evaluate network operations including intersection queueing.

Based on the findings of the HCM operational analyses, crash data, and site traffic generation, Table 1 – Proposed Improvements has the recommended existing, background, and future improvements to the study intersections to mitigate traffic impacts.

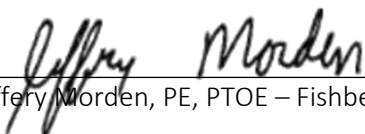
Table 1 – Proposed Improvements

Intersection	Existing	Background	Future
WB M-59 and crossover east of Hill Road	No improvements	No improvements	Traffic signal warranted.
WB M-59 and Driveway 4	No improvements	No improvements	Right turn lane warranted.

Westbound (WB)

The opinions, findings, and conclusions expressed in this TIS are those of Fishbeck and not necessarily those of the Owner/Applicant, MDOT, RCOC, or the Township.

Prepared By:


 Jeffrey Morden, PE, PTOE – Fishbeck


 Jill Bauer, PE, PTOE – Fishbeck
 Project Manager

1.0 Introduction

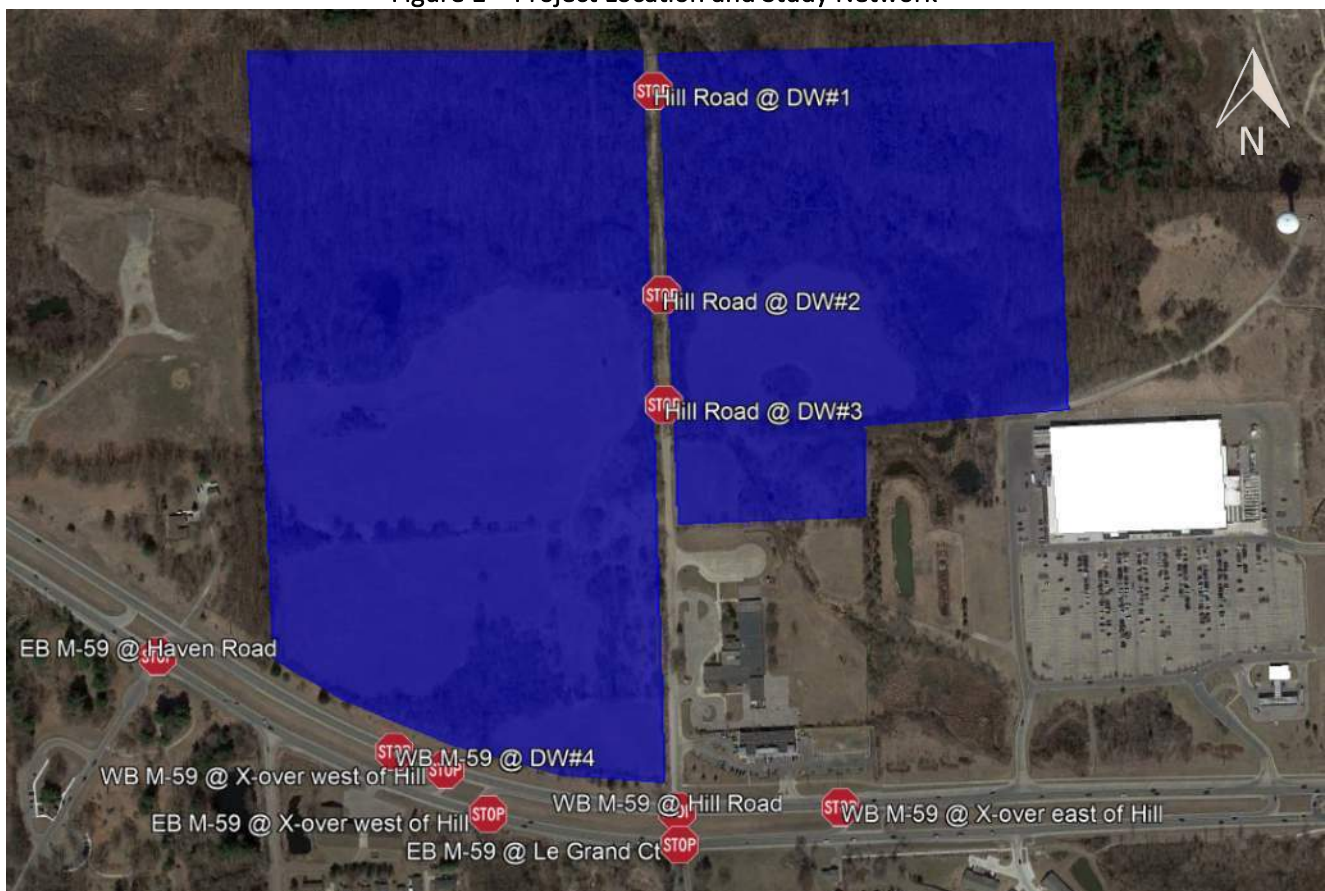
1.1 Project Overview

On behalf of Lautrec Ltd., Fishbeck has conducted a traffic impact study (TIS) related to the development of a mixed-use residential development located on the northeast and northwest side of Hill Road near Highland Road (M-59) in White Lake Township (Township), Michigan. The existing land is vacant. The proposed site presents 88 single family condominiums and 406 multifamily housing (low-rise) units. The development is assumed to be open and fully operational in 2027.

All the access points to the development are proposed. There will be three access points on Hill Road and one access point on M-59. The accesses on Hill Road will be full movement (left and right turn movements allowed, ingress and egress). The access on M-59 will be right-in/right-out (RIRO).

The project location and study intersections are indicated in Figure 1 – Project Location and Study Network.

Figure 1 – Project Location and Study Network



1.2 Study Methodology

The objectives of this TIS were to determine what impacts, if any, the proposed project will have on adjacent roadway traffic operations, and to develop recommendations for any improvements necessary to mitigate the project impacts on the studied intersections. Study analyses were completed relative to typical weekday a.m. and p.m. peak periods.

This study was conducted according to the methodologies and guidance published by Institute of Transportation Engineers (ITE), American Association of State Highway and Transportation Officials (AASHTO), Michigan Department of Transportation (MDOT), Road Commission for Oakland County (RCOC), and the Township.

1.3 Intersection Characteristics

Based on the type and size of the proposed development and the likely area of influence for the site trips, traffic operations were analyzed for the following intersections:

1. Westbound (WB) M-59 and Hill Road (unsignalized).
2. Eastbound (EB) M-59 and Le Grand Court (unsignalized).
3. WB M-59 and crossover east of Hill Road (unsignalized).
4. EB M-59 and crossover west of Hill Road (unsignalized).
5. WB M-59 and crossover west of Hill Road (unsignalized).
6. EB M-59 and Haven Road (unsignalized).
7. Hill Road and Driveway 1 (proposed unsignalized driveway approximately 2,300 feet north of M-59).
8. Hill Road and Driveway 2 (proposed unsignalized driveway approximately 1,600 feet north of M-59).
9. Hill Road and Driveway 3 (proposed unsignalized driveway approximately 1,150 feet north of M-59).
10. WB M-59 and Driveway 4 (proposed unsignalized driveway approximately 950 feet west of Hill Road).

The existing intersection lane configurations, traffic controls, and posted speed limits are indicated in Figure 2 – Existing Lane Configurations.

1.4 Existing Traffic Volumes

Vehicular Turning Movement Count (TMC)'s was collected at the following study intersection during the weekday a.m. (7 to 9 a.m.) and p.m. (4 to 6 p.m.) peak periods of the road network on Thursday, September 30, 2021:

- WB M-59 and Hill Road.
- EB M-59 and Le Grand Court.
- WB M-59 and crossover east of Hill Road.
- EB M-59 and crossover west of Hill Road.
- WB M-59 and crossover west of Hill Road.
- EB M-59 and Haven Road.

Due to the impact of COVID-19, current traffic volume data may not be representative of typical operations. Historical traffic data from the Southeast Michigan Council of Governments (SEMCOG) Traffic Count Database System (TCDS) TMC's website was reviewed. Based on this review of 2021 traffic counts, there was no compelling evidence to apply a COVID adjustment factor to the collected TMCs.

Traffic volume information can be found in Appendix 1 – Traffic Volume Data, which includes heavy vehicle data. The adjusted existing traffic volumes used in this study are indicated in Figure 3– Existing Traffic Volumes.

2.0 Existing Conditions Analysis

2.1 Traffic Operations Analysis Methodology

Synchro was used to perform Highway Capacity Manual (HCM) operational analyses during the a.m. and p.m. peak hours for all the intersections within this study. According to the most recent editions of the HCM, level of service (LOS) is a qualitative measure describing operational conditions of a traffic stream or intersection. LOS ranges from A to F, with LOS A representing desirable traffic operations characterized by low delay and LOS F representing extremely poor traffic operations characterized by excessive delays and long vehicle queues. LOS D is generally considered acceptable for most areas. Table 2 – LOS Criteria presents the HCM criteria for various LOS for unsignalized and signalized intersections.

Table 2 – LOS Criteria

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

2.2 Existing Conditions Traffic Analysis

Synchro models for the existing network were created based on the existing roadway configurations and traffic controls. Where applicable, data concerning the existing intersection and roadway lane configurations, geometry, and traffic control that were observed in the field were entered in the models. The traffic signal timing permit for the signalized intersections of M-59 and Bogie Lake Road and EB M-59 and crossover west of Ormond Road were provided by RCOC for use in the models. These signalized intersections were added to the models to provide traffic progression through the study corridor.

The resulting LOS and delay for the existing conditions are indicated in Table 3 – LOS Analysis for Existing Conditions.

Table 3 – LOS Analysis for Existing Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 14.8	D 29.1
Overall	A 1.5	A 1.1
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 26.3	C 24.4
Overall	A 2.3	A 1.9
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	B 13.9	D 27.9
Overall	A 1.0	A 1.0

Table 3 – LOS Analysis for Existing Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	C 21.2	D 26.8
Overall	A 1.1	A 2.5
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 12.9	C 22.9
Overall	A 0.2	A 0.4
EB M-59 Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.1	C 16.9
SB crossover at Haven Road	E 36.7	E 36.5
Overall	A 0.6	A 1.5

Northbound (NB)

Southbound (SB)

Further analysis of the LOS results for existing conditions revealed that most movements, approaches, and intersections are expected to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For existing conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 2 – Existing LOS Output Reports for the existing conditions LOS reports and queuing analysis reports.

3.0 Background Conditions Analysis

Historical traffic data on the SEMCOG TCDS website was referenced in order to determine the applicable growth rate for the existing traffic volumes to the project build-out year in 2027. Based on this review, a background growth rate of 0.5% was utilized. There were no background developments identified and included in the background traffic conditions.

The total background traffic volumes are indicated in Figure 4 – Background Traffic Volumes.

3.1 Background Conditions Traffic Analysis

The resulting LOS and delay for the background conditions are indicated in Table 4 – LOS Analysis for Background Conditions.

Table 4 – LOS Analysis for Background Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 14.1	D 31.3
Overall	A 1.0	A 1.2
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-5	A 0.0	A 0.0
NB Le Grand Court	D 28.6	D 26.2
Overall	A 2.5	A 2.0
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	B 14.2	D 30.1
Overall	A 1.0	A 1.1
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	C 22.3	D 29.1
Overall	A 1.1	A 2.7
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 13.1	C 24.1
Overall	A 0.2	A 0.4
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.6	C 17.5
SB crossover at Haven Road	E 39.5	D 34.6
Overall	A 0.6	A 1.1

Further analysis of the LOS results for background conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. peak hour.

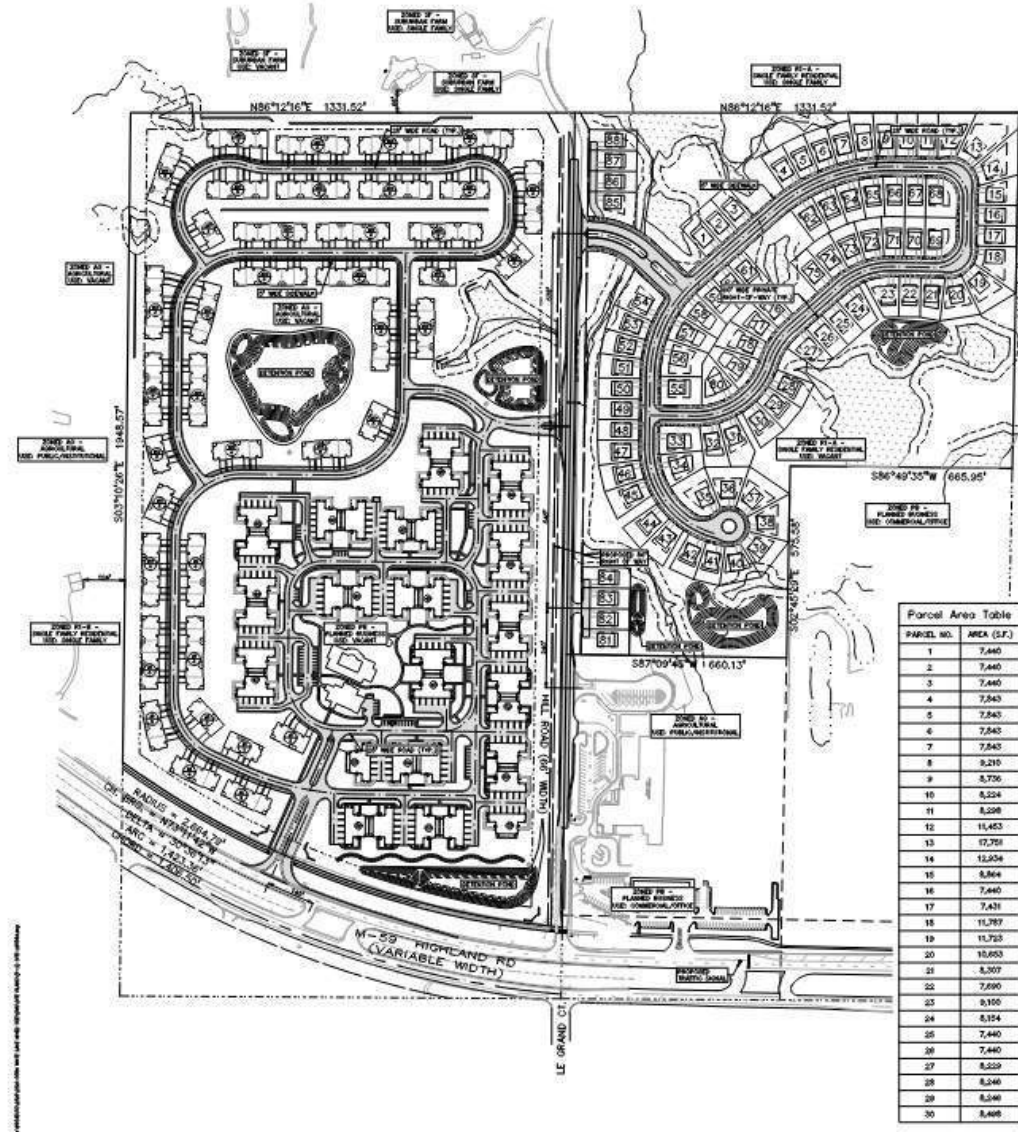
The LOS/delay for the p.m. peak hour became acceptable due to an increase in vehicles due to growth and the average delay decreased.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For background conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length, see Appendix 3 – Background LOS Output Reports.

4.0 Site Traffic Characteristics

A representation of the current conceptual site plan is provided in Figure 5 – Conceptual Site Plan.

Figure 5 – Conceptual Site Plan



4.1 Trip Generation

Using the information and methodologies specified in the latest version of Trip Generation, Fishbeck forecast the weekday a.m. and p.m. peak hour trips associated with the proposed development.

Table 5 – Trip Generation for Proposed Development presents the resulting trip generation for the development. Refer to Appendix 4 – Trip Generation Calculations.

Table 5 – Trip Generation for Proposed Development

ITE Land Use	LUC	Units	a.m. Peak Hour			p.m. Peak Hour			Weekday
			In	Out	Total	In	Out	Total	
Single-family Detached Housing	210	88 DU	17	49	66	55	33	88	897
Multi-family Housing (Low-Rise)	220	406 DU	36	113	149	123	72	195	2,678
Total			53	162	215	178	105	283	3,575

Dwelling Units (DU)
Land Use Code(LUC)

4.2 Trip Distribution

The directions that site traffic will travel to and from were based upon existing traffic patterns during the a.m. and p.m. peak hours. The existing traffic patterns reflect the gravity between origins and destinations in the study area, and therefore an accurate indication of where the proposed trips would be coming from and going to.

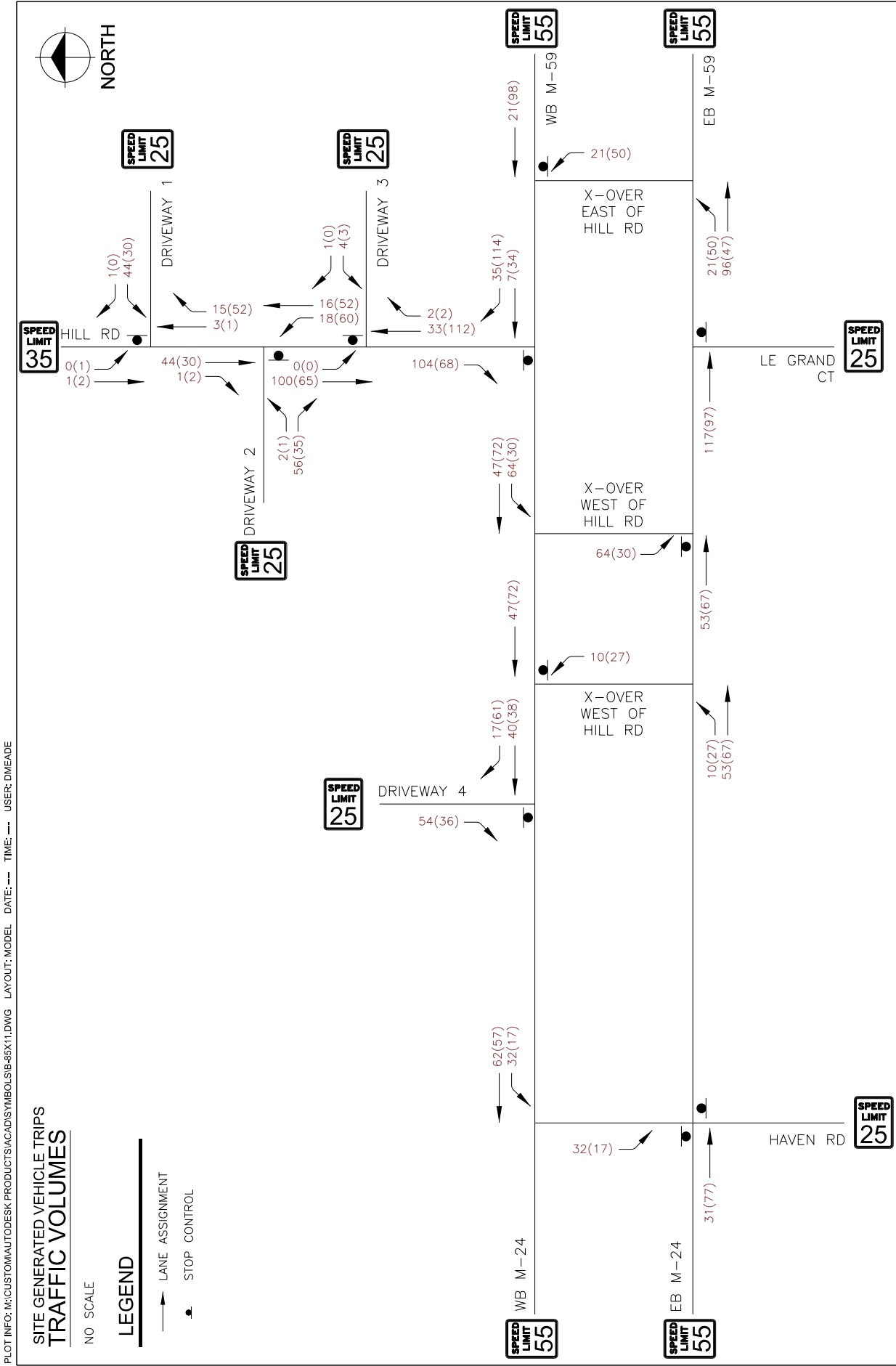
Table 6 – Trip Distribution provides the probable distribution based on the existing traffic patterns.

Table 6 – Trip Distribution

Direction	Via	a.m. peak hour		p.m. peak hour	
		To	From	To	From
North	Hill Road	2% (4)	2% (1)	1% (1)	2% (3)
East	M-59	60% (96)	40% (21)	45% (47)	55% (98)
West	M-59	38% (62)	58% (31)	54% (57)	43% (77)
Total		100% (162)	100% (53)	100% (105)	100% (178)

The trip distribution for the site is indicated in Figure 6 – Trip Generation Volumes, see below. These trips were added to the background volumes (Figure 4) to result in the future conditions volumes in Figure 7– Future Conditions Volumes.

Figure 6 – Trip Generation Volumes



PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-35X11.DWG LAYOUT: MODEL DATE: --- TIME: --- USER: DMEADE



Engineers | Architects | Scientists | Constructors

Hard copy is Intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

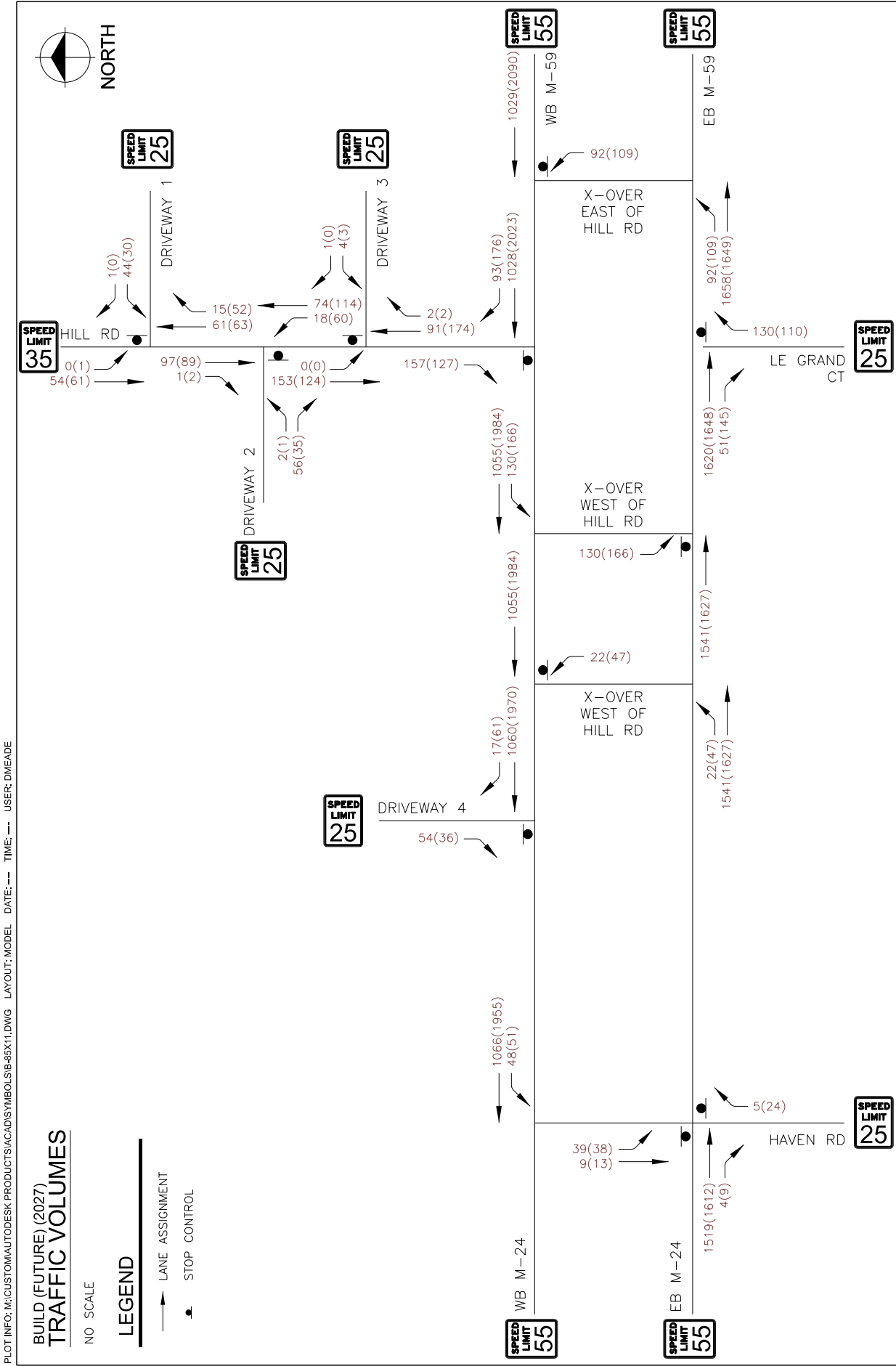
Mixed-Use Residential Development
White Lake Township, MI 48383

Traffic Impact Study

PROJECT NO.
220895

FIGURE NO.
6

Figure 7 – Future Conditions Volumes



PLOT INFO: M:\CUSTOM\AUTODESK PRODUCTS\ACAD\SYMBOLS\B-35X11.DWG LAYOUT; MODEL DATE: --- TIME: --- USER: DMEADE



Engineers | Architects | Scientists | Constructors

Hard copy is Intended to be 8.5"x11" when plotted. Scale(s) indicated and graphic quality may not be accurate for any other size.

Mixed-Use Residential Development
White Lake Township, MI 48383

Traffic Impact Study

PROJECT NO.
220895

FIGURE NO.
7

5.0 Future Conditions Analysis

5.1 Turn Lane Warrants

An evaluation was performed in accordance with MDOT requirements to determine if right turn deceleration lanes are required at the site driveway on WB M-59. The results of the analysis indicated that a full width right turn lane is warranted at Driveway 4. All turn lane warrant charts are in Appendix 5 – Turn Lane Warrants. The results of the analysis are presented in Table 7 – Turn Lane Warrants.

Table 7 – Turn Lane Warrants

Intersection	Movement	Result
WB M-59 and Driveway 4	WB Right-turn	Full width right turn lane warranted

5.2 Future Conditions Traffic Analysis

The resulting LOS and delay for the future conditions are shown in Table 8 – LOS Analysis for Future Conditions.

Table 8 – LOS Analysis for Future Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover east of Hill Road	B 16.7	F 63.7
Overall	A 2.1	A 4.2
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 33.8	D 29.4
Overall	A 2.8	A 2.1
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	C 21.3	F 68.2
Overall	A 3.8	A 4.9
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	E 36.6	E 40.6
Overall	A 3.4	A 4.3
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 11.8	C 18.0
Overall	A 0.4	A 0.7
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.9	C 18.4
SB crossover at Haven Road	E 36.8	E 46.4
Overall	A 1.6	A 2.3
Hill Road and Driveway 1 (Stop-Controlled)		
WB Driveway 1	A 9.4	A 9.5
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.1
Overall	A 2.4	A 1.4

Table 8 – LOS Analysis for Future Conditions

Approach/Lane Group	LOS/Delay (s)	
	a.m. Peak Hour	p.m. Peak Hour
Hill Road and Driveway 2 (Stop-Controlled)		
WB Driveway 2	A 9.1	A 9.0
NB Hill Road	A 1.5	A 2.6
SB Hill Road	A 0.0	A 0.0
Overall	A 2.7	A 2.6
Hill Road and Driveway 3 (Stop-Controlled)		
WB Driveway 3	A 9.8	B 10.4
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.0
Overall	A 0.2	A 0.1
WB M-59 and Driveway 4 (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Driveway 4	B 13.7	D 25.2
Overall	A 0.7	A 0.5

Further analysis of the LOS results for future conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- WB M-59 and crossover east of Hill Road:
 - The NB crossover approach operates at LOS F in the p.m. peak hour.
- WB M-59 and Hill Road:
 - The SB approach operates at LOS F in the p.m. peak hour.
- EB M-59 and crossover west of Hill Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours
- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length. See Appendix 6 – Future LOS Output Reports for the future conditions LOS reports and queueing analysis reports.

The 95th percentile queue lengths were reviewed for the development driveways. During the a.m. and p.m. peak hours, the queue lengths are less than 55 feet (two vehicles).

5.3 Future Improvement Conditions Traffic Analysis

The following observations were made, and improvements were recommended, if applicable, at the following intersections due to Future traffic conditions:

- WB M-59 and crossover east of Hill Road:
 - Due to unacceptable LOS/delay during the future condition, a traffic signal warrant was investigated to determine if a traffic signal could alleviate delay. The traffic signal is warranted for Warrants 1B, 2 (70%), and 3B. For more information on the traffic signal warrant, see section 5.4. The addition of this traffic signal is also providing additional vehicular gaps for SB Hill Road vehicles to enter WB M-59. The resulting LOS and delay for the future improvement conditions are indicated in Table 9 – LOS Analysis for Future Improvement Conditions.

Table 9 – Future with Improvements Conditions LOS/Delay

Approach/Lane Group	LOS/Delay(s)	
	a.m. Peak Hour	p.m. Peak Hour
WB M-59 and crossover east of Hill Road (Signalized)		
WB M-59	B 16.6	C 33.3
NB crossover east of Hill Road	D 45.0	E 60.5
Overall	C 20.1	D 35.1
EB M-59 and Le Grand Court (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Le Grand Court	D 33.8	D 29.4
Overall	A 2.8	A 2.1
WB M-59 and Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Hill Road	C 21.3	F 68.2
Overall	A 3.8	A 4.9
EB M-59 and crossover west of Hill Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
SB crossover west of Hill Road	E 36.6	E 40.6
Overall	A 3.4	A 4.3
WB M-59 and crossover west of Hill Road (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
NB crossover west of Hill Road	B 11.8	C 18.0
Overall	A 0.4	A 0.7
EB M-59 and Haven Road (Stop-Controlled)		
EB M-59	A 0.0	A 0.0
NB Haven Road	C 16.9	C 18.4
SB crossover at Haven Road	E 36.8	E 46.4
Overall	A 1.6	A 2.3
Hill Road and Driveway 1 (Stop-Controlled)		
WB Driveway 1	A 9.4	A 9.5
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.1
Overall	A 2.4	A 1.4
Hill Road and Driveway 2 (Stop-Controlled)		
WB Driveway 2	A 9.1	A 9.0
NB Hill Road	A 1.5	A 2.6
SB Hill Road	A 0.0	A 0.0
Overall	A 2.7	A 2.6
Hill Road and Driveway 3 (Stop-Controlled)		
WB Driveway 3	A 9.8	B 10.4
NB Hill Road	A 0.0	A 0.0
SB Hill Road	A 0.0	A 0.0
Overall	A 0.2	A 0.1
WB M-59 and Driveway 4 (Stop-Controlled)		
WB M-59	A 0.0	A 0.0
SB Driveway 4	B 13.7	D 25.2
Overall	A 0.7	A 0.5

Further analysis of the LOS a result for future improvement conditions revealed that most movements, approaches, and intersections are expected to continue to operate at an acceptable LOS D or better during both the a.m. and p.m. peak hours, with the following exceptions:

- WB M-59 and crossover east of Hill Road:
 - The NB crossover approach operates at LOS E in the p.m. peak hour.
- WB M-59 and Hill Road:
 - The SB approach operates at LOS F in the p.m. peak hour.
- EB M-59 and crossover west of Hill Road.
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.
- EB M-59 and Haven Road:
 - The SB crossover approach operates at LOS E in the a.m. and p.m. peak hours.

SimTraffic simulations were also reviewed to observe network operations and vehicle queues. For future improvement conditions, study network operations are acceptable, without significant vehicle queues or spill-back from available storage lanes. No 95th percentile queue lengths for the turning movements exceed the provided storage length, see Appendix 7 – Future Improvement LOS Output.

The addition of the traffic signal at WB M-59 and the crossover east of Hill Road provides some delay relief. It benefits the minor streets’ approaches on WB M-59 operationally. The traffic signal provides additional gaps for vehicles from Hill Road to turn onto WB M-59. For the p.m. peak hour, the SB queue reduced from 314 feet (13 vehicles) to 203 feet (eight vehicles). For the a.m. peak hour, the queue increased 13 feet with the traffic signal. The queue lengths for the crossover for the a.m. and p.m. peak hours is relatively the same with or without the traffic signal.

5.4 Signal Warrant Analysis

Signal warrants were completed at the intersection of WB M-59 and crossover east of Hill Road in accordance with Michigan Manual on Uniform Traffic Control Devices (MMUTCD) requirements. The results of this analysis revealed that several warrants are met at the intersection. The results of this analysis are presented in Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road, all signal warrant charts are included in Appendix 8 – Signal Warrants.

Table 10 – Signal Warrants – Intersection of WB M-59 and Crossover East of Hill Road

Warrant		Is Warrant Met?	Comments
1 – Eight Hour Vehicular Volume	Overall	Yes	
	Condition A	No	Hours Met: 3
	Condition B	Yes	Hours Met: 12
	Condition A and B	N/A	Hours Met: N/A
2 – Four Hour Vehicular Volume (70%)		Yes	Hours Met: 12
3 – Peak Hour Vehicular Volume (70%)	Overall	Yes	
	Condition A	No	
	Condition B	Yes	Hours Met: 8
4 – Four Hour Pedestrian Volume (70%)		No	Hours Met:
5 – School Crossing		Not Evaluated	
6 – Coordinated Signal System		Not Evaluated	
7 – Crash Experience	Overall	Not Evaluated	Crashes in five-year period:
	Condition A	Not Evaluated	
	Condition B	Not Evaluated	
8 – Roadway Network		Not Evaluated	
9 – Intersection Near at Grade Railroad Crossing		N/A	

6.0 Findings and Recommendations

The analyses conducted for this TIS indicate the proposed development will not result in any significant impact to the adjacent road network with improvements. The proposed site access configuration is appropriate and will acceptably facilitate site ingress and egress. These conclusions are supported by the following key findings:

1. Existing storage lengths are adequate for all movements in existing and future conditions.
2. Lane configurations and physical capacity are appropriate within the study area.
3. Existing nor planned transit or non-motorized facilities in the site vicinity would not be impacted by the project.

Based on the findings of the HCM operational analyses and site traffic generation, Table 11 – Proposed Improvements includes the recommended existing, background, and future improvements to the study intersections to mitigate traffic impacts.

Table 11 – Proposed Improvements

Intersection	Existing	Background	Future
WB M-59 and crossover east of Hill Road	No improvements	No improvements	Traffic signal warranted.
WB M-59 and Driveway 4	No improvements	No improvements	Right turn lane warranted.

Appendix 1

Traffic Volume Data

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 7:00AM	357	12	369	164	0	164	533
7:15AM	354	8	362	188	0	188	550
7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
Hourly Total	1440	69	1509	844	0	844	2353
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
8:30AM	306	4	310	225	0	225	535
8:45AM	362	8	370	229	0	229	599
Hourly Total	1356	32	1388	940	0	940	2328
4:00PM	297	9	306	423	0	423	729
4:15PM	372	8	380	463	0	463	843
4:30PM	345	9	354	497	0	497	851
4:45PM	348	14	362	466	0	466	828
Hourly Total	1362	40	1402	1849	0	1849	3251
5:00PM	416	9	425	478	0	478	903
5:15PM	396	20	416	490	0	490	906
5:30PM	377	14	391	499	0	499	890
5:45PM	364	15	379	426	0	426	805
Hourly Total	1553	58	1611	1893	0	1893	3504
Total	5711	199	5910	5526	0	5526	11436
% Approach	96.6%	3.4%	-	100%	0%	-	-
% Total	49.9%	1.7%	51.7%	48.3%	0%	48.3%	-
Lights	5547	188	5735	5345	0	5345	11080
% Lights	97.1%	94.5%	97.0%	96.7%	0%	96.7%	96.9%
Articulated Trucks	60	1	61	61	0	61	122
% Articulated Trucks	1.1%	0.5%	1.0%	1.1%	0%	1.1%	1.1%
Buses and Single-Unit Trucks	104	10	114	120	0	120	234
% Buses and Single-Unit Trucks	1.8%	5.0%	1.9%	2.2%	0%	2.2%	2.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877566, Location: 42.648859, -83.535424

GHA GEWALT HAMILTON ASSOCIATES, INC.
Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424

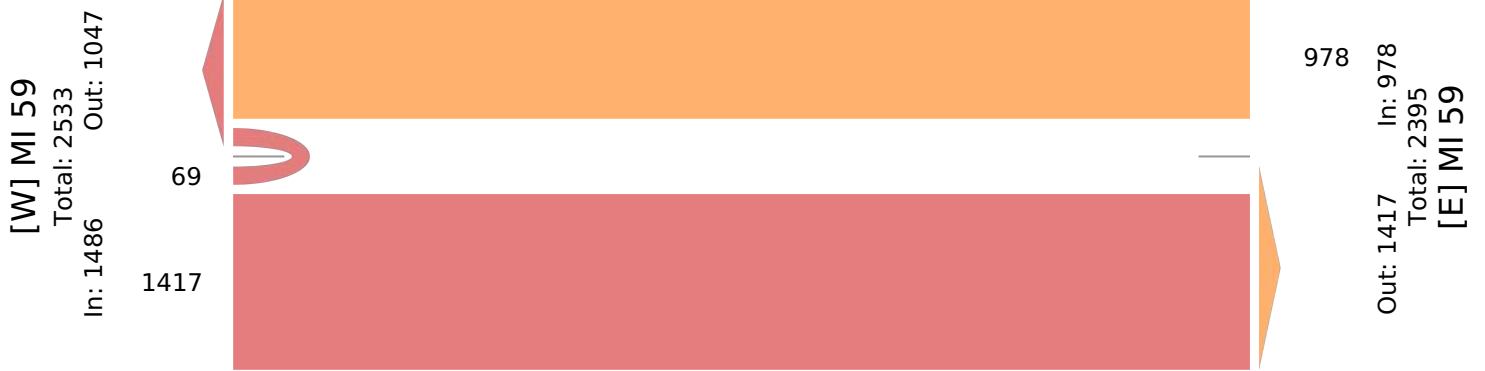


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
Total	1417	69	1486	978	0	978	2464
% Approach	95.4%	4.6%	-	100%	0%	-	-
% Total	57.5%	2.8%	60.3%	39.7%	0%	39.7%	-
PHF	0.945	0.575	0.917	0.955	-	0.955	0.932
Lights	1354	65	1419	923	0	923	2342
% Lights	95.6%	94.2%	95.5%	94.4%	0%	94.4%	95.0%
Articulated Trucks	27	0	27	20	0	20	47
% Articulated Trucks	1.9%	0%	1.8%	2.0%	0%	2.0%	1.9%
Buses and Single-Unit Trucks	36	4	40	35	0	35	75
% Buses and Single-Unit Trucks	2.5%	5.8%	2.7%	3.6%	0%	3.6%	3.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877566, Location: 42.648859, -83.535424



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 4:45PM	348	14	362	466	0	466	828
5:00PM	416	9	425	478	0	478	903
5:15PM	396	20	416	490	0	490	906
5:30PM	377	14	391	499	0	499	890
Total	1537	57	1594	1933	0	1933	3527
% Approach	96.4%	3.6%	-	100%	0%	-	-
% Total	43.6%	1.6%	45.2%	54.8%	0%	54.8%	-
PHF	0.924	0.713	0.938	0.968	-	0.968	0.973
Lights	1506	54	1560	1897	0	1897	3457
% Lights	98.0%	94.7%	97.9%	98.1%	0%	98.1%	98.0%
Articulated Trucks	11	1	12	16	0	16	28
% Articulated Trucks	0.7%	1.8%	0.8%	0.8%	0%	0.8%	0.8%
Buses and Single-Unit Trucks	20	2	22	20	0	20	42
% Buses and Single-Unit Trucks	1.3%	3.5%	1.4%	1.0%	0%	1.0%	1.2%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877566, Location: 42.648859, -83.535424



M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.

625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:00AM	346	5	0	351	0	0	0	0	0	31	0	31	382
7:15AM	336	11	0	347	0	0	0	0	0	29	0	29	376
7:30AM	342	20	0	362	0	0	0	0	0	40	0	40	402
7:45AM	399	8	0	407	0	0	0	0	0	26	0	26	433
Hourly Total	1423	44	0	1467	0	0	0	0	0	126	0	126	1593
8:00AM	352	10	0	362	0	0	0	0	0	31	0	31	393
8:15AM	332	12	0	344	0	0	0	0	0	19	0	19	363
8:30AM	313	8	0	321	0	0	0	0	0	24	0	24	345
8:45AM	340	14	0	354	0	0	0	0	0	40	0	40	394
Hourly Total	1337	44	0	1381	0	0	0	0	0	114	0	114	1495
4:00PM	319	27	0	346	0	0	0	0	0	14	0	14	360
4:15PM	382	40	0	422	0	0	0	0	0	17	0	17	439
4:30PM	365	34	0	399	0	0	0	0	0	19	0	19	418
4:45PM	366	32	0	398	0	0	0	0	0	23	0	23	421
Hourly Total	1432	133	0	1565	0	0	0	0	0	73	0	73	1638
5:00PM	394	39	0	433	0	0	0	0	0	36	0	36	469
5:15PM	367	36	0	403	0	0	0	0	0	26	0	26	429
5:30PM	384	34	0	418	0	0	0	0	0	22	0	22	440
5:45PM	360	35	0	395	0	0	0	0	0	20	0	20	415
Hourly Total	1505	144	0	1649	0	0	0	0	0	104	0	104	1753
Total	5697	365	0	6062	0	0	0	0	0	417	0	417	6479
% Approach	94.0%	6.0%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	87.9%	5.6%	0%	93.6%	0%	0%	0%	0%	0%	6.4%	0%	6.4%	-
Lights	5517	352	0	5869	0	0	0	0	0	403	0	403	6272
% Lights	96.8%	96.4%	0%	96.8%	0%	0%	0%	-	0%	96.6%	0%	96.6%	96.8%
Articulated Trucks	60	0	0	60	0	0	0	0	0	0	0	0	60
% Articulated Trucks	1.1%	0%	0%	1.0%	0%	0%	0%	-	0%	0%	0%	0%	0.9%
Buses and Single-Unit Trucks	120	13	0	133	0	0	0	0	0	14	0	14	147
% Buses and Single-Unit Trucks	2.1%	3.6%	0%	2.2%	0%	0%	0%	-	0%	3.4%	0%	3.4%	2.3%

*L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

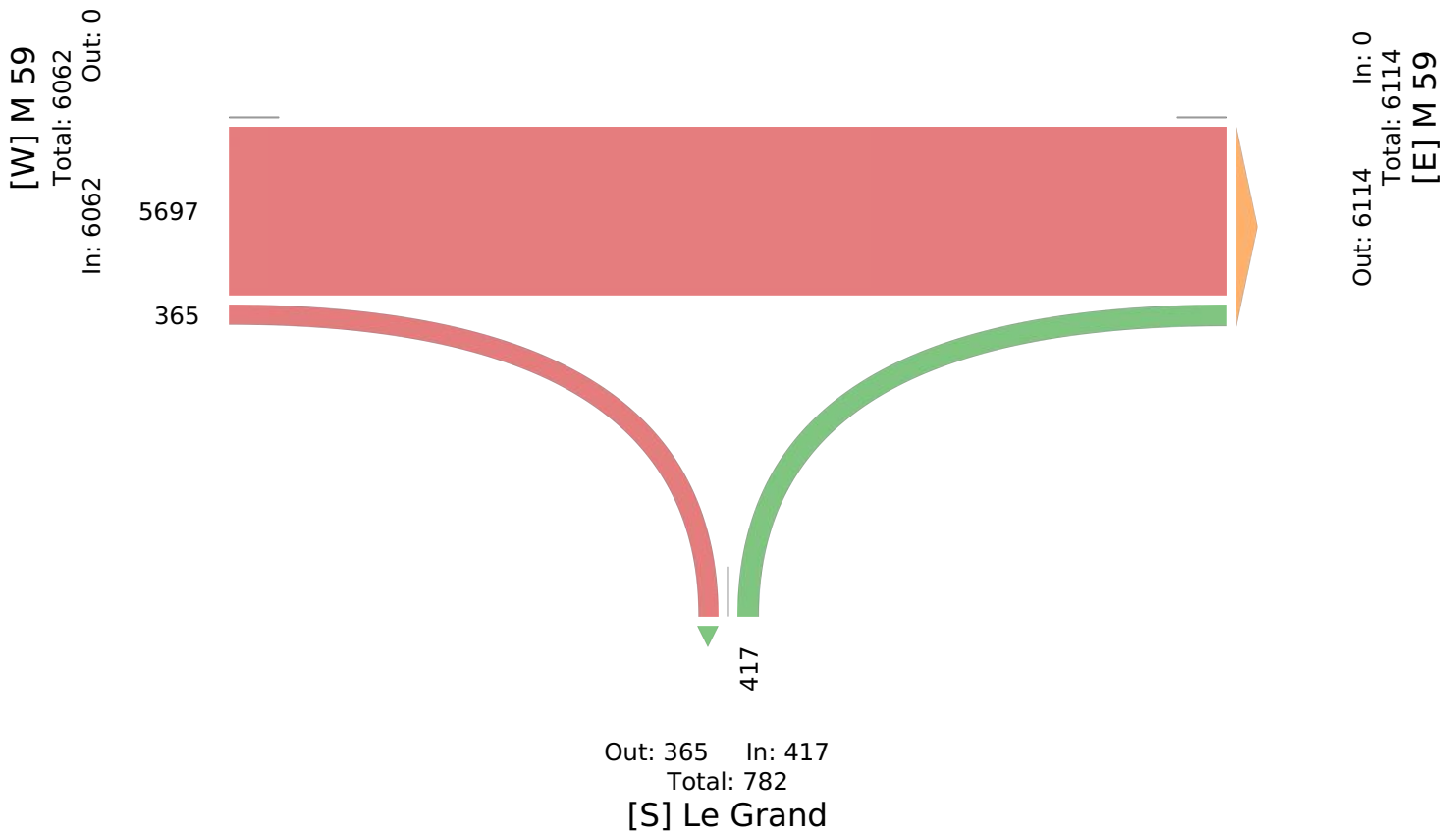
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



M-59 (Highland Road) and Le Grand Ct - TMC
 Thu Sep 30, 2021
 AM Peak (7:15 AM - 8:15 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:15AM	336	11	0	347	0	0	0	0	0	29	0	29	376
7:30AM	342	20	0	362	0	0	0	0	0	40	0	40	402
7:45AM	399	8	0	407	0	0	0	0	0	26	0	26	433
8:00AM	352	10	0	362	0	0	0	0	0	31	0	31	393
Total	1429	49	0	1478	0	0	0	0	0	126	0	126	1604
% Approach	96.7%	3.3%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	89.1%	3.1%	0%	92.1%	0%	0%	0%	0%	0%	7.9%	0%	7.9%	-
PHF	0.895	0.613	-	0.908	-	-	-	-	-	0.788	-	0.788	0.926
Lights	1369	46	0	1415	0	0	0	0	0	122	0	122	1537
% Lights	95.8%	93.9%	0%	95.7%	0%	0%	0%	-	0%	96.8%	0%	96.8%	95.8%
Articulated Trucks	26	0	0	26	0	0	0	0	0	0	0	0	26
% Articulated Trucks	1.8%	0%	0%	1.8%	0%	0%	0%	-	0%	0%	0%	0%	1.6%
Buses and Single-Unit Trucks	34	3	0	37	0	0	0	0	0	4	0	4	41
% Buses and Single-Unit Trucks	2.4%	6.1%	0%	2.5%	0%	0%	0%	-	0%	3.2%	0%	3.2%	2.6%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC

Thu Sep 30, 2021

AM Peak (7:15 AM - 8:15 AM)

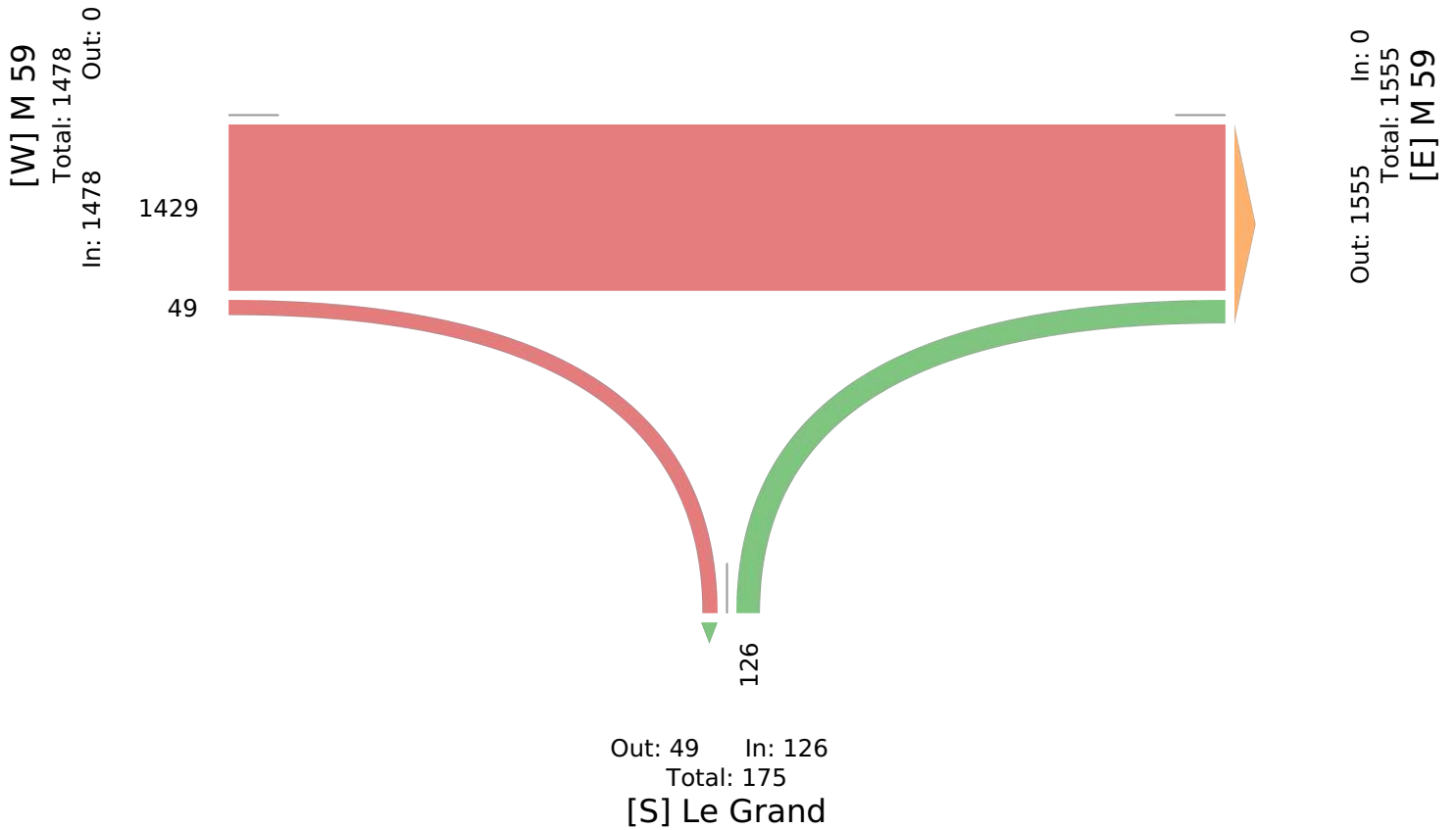
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877562, Location: 42.64847, -83.537354



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



M-59 (Highland Road) and Le Grand Ct - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877562, Location: 42.64847, -83.537354

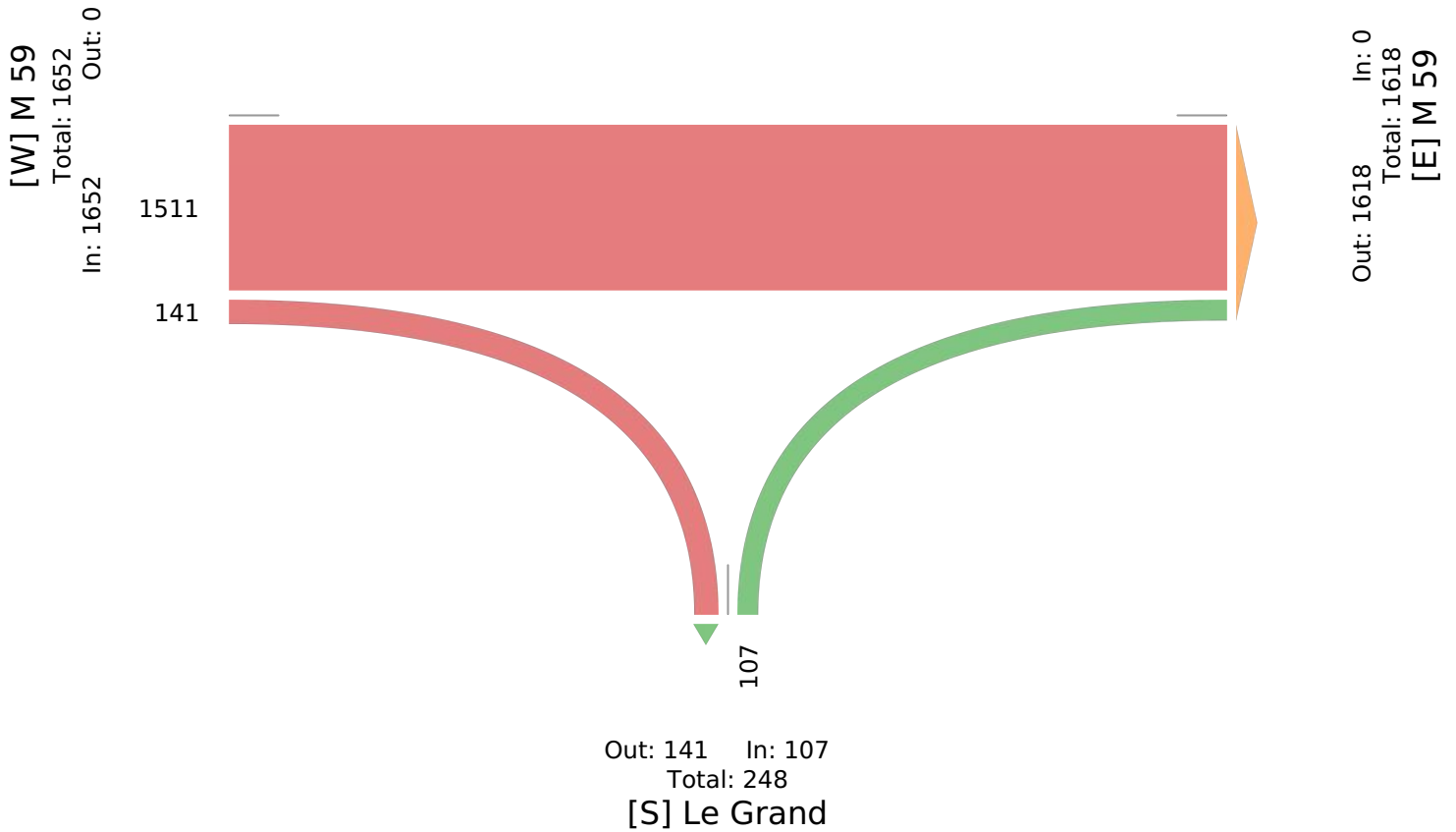


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	M 59 Eastbound				M 59 Westbound				Le Grand Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 4:45PM	366	32	0	398	0	0	0	0	0	23	0	23	421
5:00PM	394	39	0	433	0	0	0	0	0	36	0	36	469
5:15PM	367	36	0	403	0	0	0	0	0	26	0	26	429
5:30PM	384	34	0	418	0	0	0	0	0	22	0	22	440
Total	1511	141	0	1652	0	0	0	0	0	107	0	107	1759
% Approach	91.5%	8.5%	0%	-	0%	0%	0%	-	0%	100%	0%	-	-
% Total	85.9%	8.0%	0%	93.9%	0%	0%	0%	0%	0%	6.1%	0%	6.1%	-
PHF	0.959	0.904	-	0.954	-	-	-	-	-	0.743	-	0.743	0.938
Lights	1476	138	0	1614	0	0	0	0	0	103	0	103	1717
% Lights	97.7%	97.9%	0%	97.7%	0%	0%	0%	-	0%	96.3%	0%	96.3%	97.6%
Articulated Trucks	9	0	0	9	0	0	0	0	0	0	0	0	9
% Articulated Trucks	0.6%	0%	0%	0.5%	0%	0%	0%	-	0%	0%	0%	0%	0.5%
Buses and Single-Unit Trucks	26	3	0	29	0	0	0	0	0	4	0	4	33
% Buses and Single-Unit Trucks	1.7%	2.1%	0%	1.8%	0%	0%	0%	-	0%	3.7%	0%	3.7%	1.9%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Le Grand Ct - TMC
Thu Sep 30, 2021
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877562, Location: 42.64847, -83.537354



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.

625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 7:00AM	0	0	0	0	177	1	0	178	0	8	0	8	186
7:15AM	0	0	0	0	193	4	0	197	0	4	0	4	201
7:30AM	0	0	0	0	245	12	0	257	0	8	0	8	265
7:45AM	0	0	0	0	250	31	0	281	0	26	0	26	307
Hourly Total	0	0	0	0	865	48	0	913	0	46	0	46	959
8:00AM	0	0	0	0	242	7	0	249	0	13	0	13	262
8:15AM	0	0	0	0	254	6	0	260	0	4	0	4	264
8:30AM	0	0	0	0	232	0	0	232	0	8	0	8	240
8:45AM	0	0	0	0	232	2	0	234	0	4	0	4	238
Hourly Total	0	0	0	0	960	15	0	975	0	29	0	29	1004
4:00PM	0	0	0	0	423	8	0	431	0	7	0	7	438
4:15PM	0	0	0	0	463	5	0	468	0	10	0	10	478
4:30PM	0	0	0	0	490	5	0	495	0	8	0	8	503
4:45PM	0	0	0	0	473	8	0	481	0	9	0	9	490
Hourly Total	0	0	0	0	1849	26	0	1875	0	34	0	34	1909
5:00PM	0	0	0	0	473	11	0	484	0	11	0	11	495
5:15PM	0	0	0	0	480	11	0	491	0	17	0	17	508
5:30PM	0	0	0	0	494	15	0	509	0	9	0	9	518
5:45PM	0	0	0	0	462	23	0	485	0	20	0	20	505
Hourly Total	0	0	0	0	1909	60	0	1969	0	57	0	57	2026
Total	0	0	0	0	5583	149	0	5732	0	166	0	166	5898
% Approach	0%	0%	0%	-	97.4%	2.6%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	94.7%	2.5%	0%	97.2%	0%	2.8%	0%	2.8%	-
Lights	0	0	0	0	5389	141	0	5530	0	162	0	162	5692
% Lights	0%	0%	0%	-	96.5%	94.6%	0%	96.5%	0%	97.6%	0%	97.6%	96.5%
Articulated Trucks	0	0	0	0	47	2	0	49	0	0	0	0	49
% Articulated Trucks	0%	0%	0%	-	0.8%	1.3%	0%	0.9%	0%	0%	0%	0%	0.8%
Buses and Single-Unit Trucks	0	0	0	0	147	6	0	153	0	4	0	4	157
% Buses and Single-Unit Trucks	0%	0%	0%	-	2.6%	4.0%	0%	2.7%	0%	2.4%	0%	2.4%	2.7%

*L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 315

In: 166 Out: 149

166

149

5583

[W] MI 59

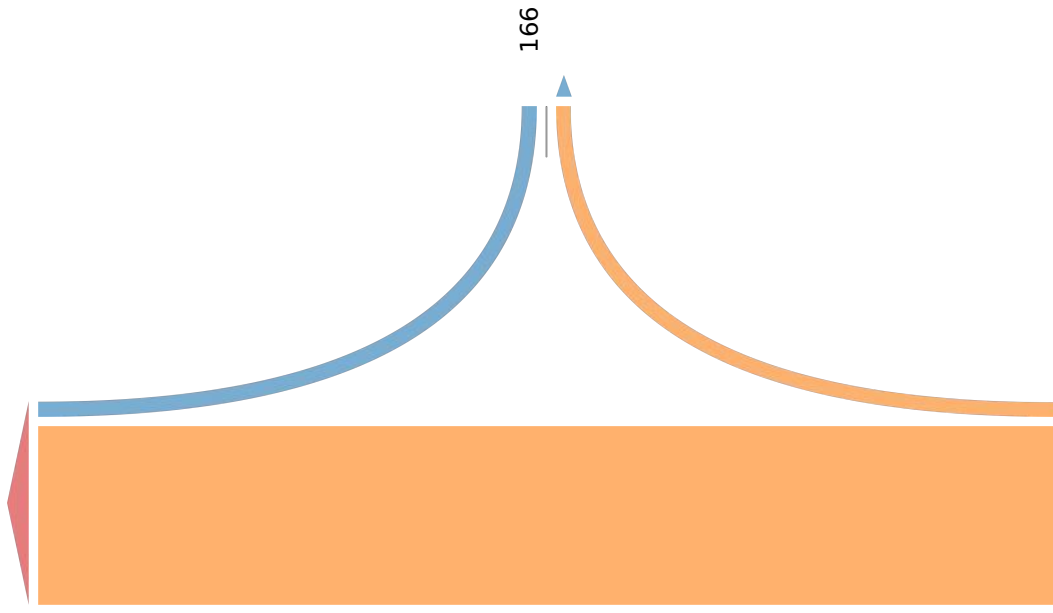
Total: 5749

In: 0 Out: 5749

Out: 0 In: 5732

Total: 5732

[E] MI 59



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 7:30AM	0	0	0	0	245	12	0	257	0	8	0	8	265
7:45AM	0	0	0	0	250	31	0	281	0	26	0	26	307
8:00AM	0	0	0	0	242	7	0	249	0	13	0	13	262
8:15AM	0	0	0	0	254	6	0	260	0	4	0	4	264
Total	0	0	0	0	991	56	0	1047	0	51	0	51	1098
% Approach	0%	0%	0%	-	94.7%	5.3%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	90.3%	5.1%	0%	95.4%	0%	4.6%	0%	4.6%	-
PHF	-	-	-	-	0.975	0.452	-	0.931	-	0.490	-	0.490	0.894
Lights	0	0	0	0	934	52	0	986	0	50	0	50	1036
% Lights	0%	0%	0%	-	94.2%	92.9%	0%	94.2%	0%	98.0%	0%	98.0%	94.4%
Articulated Trucks	0	0	0	0	17	0	0	17	0	0	0	0	17
% Articulated Trucks	0%	0%	0%	-	1.7%	0%	0%	1.6%	0%	0%	0%	0%	1.5%
Buses and Single-Unit Trucks	0	0	0	0	40	4	0	44	0	1	0	1	45
% Buses and Single-Unit Trucks	0%	0%	0%	-	4.0%	7.1%	0%	4.2%	0%	2.0%	0%	2.0%	4.1%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 107

In: 51 Out: 56

51

56

991

[W] MI 59

Total: 1042

In: 0

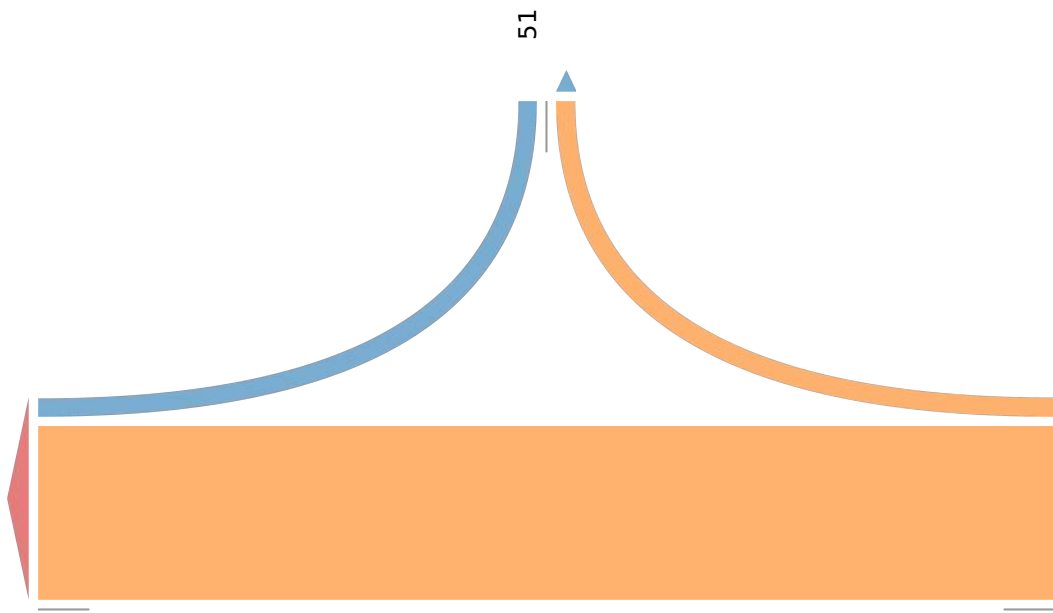
Out: 1042

Out: 0

In: 1047

Total: 1047

[E] MI 59



M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Hill Southbound				Int
	L	T	U	App	T	R	U	App	L	R	U	App	
2021-09-30 5:00PM	0	0	0	0	473	11	0	484	0	11	0	11	495
5:15PM	0	0	0	0	480	11	0	491	0	17	0	17	508
5:30PM	0	0	0	0	494	15	0	509	0	9	0	9	518
5:45PM	0	0	0	0	462	23	0	485	0	20	0	20	505
Total	0	0	0	0	1909	60	0	1969	0	57	0	57	2026
% Approach	0%	0%	0%	-	97.0%	3.0%	0%	-	0%	100%	0%	-	-
% Total	0%	0%	0%	0%	94.2%	3.0%	0%	97.2%	0%	2.8%	0%	2.8%	-
PHF	-	-	-	-	0.966	0.652	-	0.967	-	0.713	-	0.713	0.978
Lights	0	0	0	0	1878	58	0	1936	0	56	0	56	1992
% Lights	0%	0%	0%	-	98.4%	96.7%	0%	98.3%	0%	98.2%	0%	98.2%	98.3%
Articulated Trucks	0	0	0	0	9	1	0	10	0	0	0	0	10
% Articulated Trucks	0%	0%	0%	-	0.5%	1.7%	0%	0.5%	0%	0%	0%	0%	0.5%
Buses and Single-Unit Trucks	0	0	0	0	22	1	0	23	0	1	0	1	24
% Buses and Single-Unit Trucks	0%	0%	0%	-	1.2%	1.7%	0%	1.2%	0%	1.8%	0%	1.8%	1.2%

* L: Left, R: Right, T: Thru, U: U-Turn

M-59 (Highland Road) and Hill Road - TMC

Thu Sep 30, 2021

PM Peak (5 PM - 6 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877561, Location: 42.648831, -83.53738



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

[N] Hill

Total: 117

In: 57 Out: 60

57

60

1909

[W] MI 59

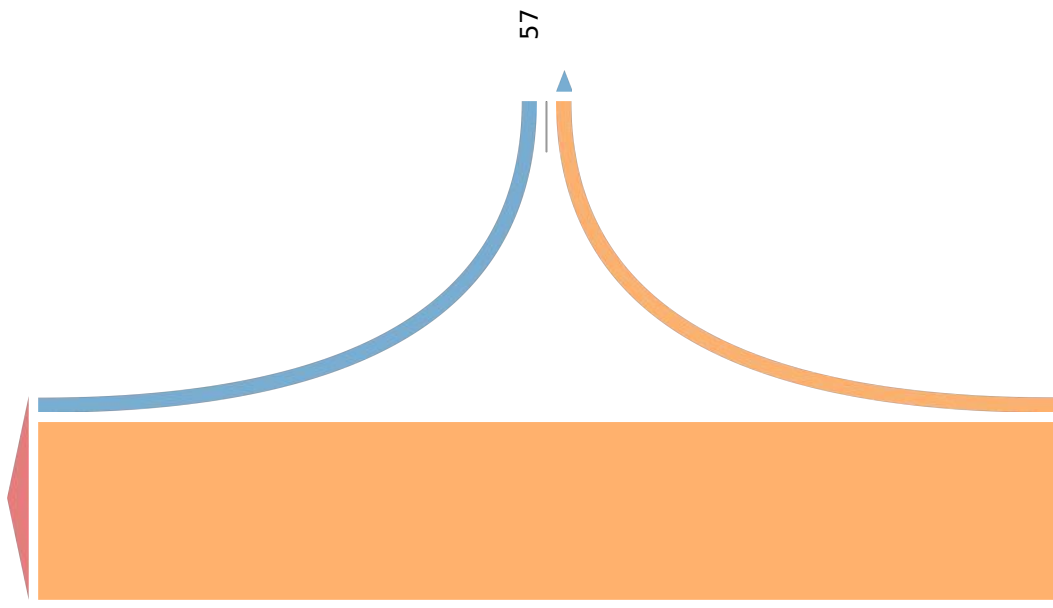
Total: 1966

In: 0 Out: 1966

Out: 0 In: 1969

Total: 1969

[E] MI 59



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 7:00AM	344	0	344	172	10	182	526
7:15AM	328	0	328	185	13	198	526
7:30AM	340	0	340	224	22	246	586
7:45AM	397	0	397	254	15	269	666
Hourly Total	1409	0	1409	835	60	895	2304
8:00AM	345	0	345	243	14	257	602
8:15AM	327	0	327	243	13	256	583
8:30AM	312	0	312	232	9	241	553
8:45AM	342	0	342	221	16	237	579
Hourly Total	1326	0	1326	939	52	991	2317
4:00PM	319	0	319	397	25	422	741
4:15PM	382	0	382	425	40	465	847
4:30PM	374	0	374	465	23	488	862
4:45PM	372	0	372	454	28	482	854
Hourly Total	1447	0	1447	1741	116	1857	3304
5:00PM	378	0	378	420	41	461	839
5:15PM	370	0	370	444	40	484	854
5:30PM	376	0	376	447	35	482	858
5:45PM	357	0	357	426	41	467	824
Hourly Total	1481	0	1481	1737	157	1894	3375
Total	5663	0	5663	5252	385	5637	11300
% Approach	100%	0%	-	93.2%	6.8%	-	-
% Total	50.1%	0%	50.1%	46.5%	3.4%	49.9%	-
Lights	5490	0	5490	5078	374	5452	10942
% Lights	96.9%	0%	96.9%	96.7%	97.1%	96.7%	96.8%
Articulated Trucks	65	0	65	56	0	56	121
% Articulated Trucks	1.1%	0%	1.1%	1.1%	0%	1.0%	1.1%
Buses and Single-Unit Trucks	108	0	108	118	11	129	237
% Buses and Single-Unit Trucks	1.9%	0%	1.9%	2.2%	2.9%	2.3%	2.1%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	340	0	340	224	22	246	586
7:45AM	397	0	397	254	15	269	666
8:00AM	345	0	345	243	14	257	602
8:15AM	327	0	327	243	13	256	583
Total	1409	0	1409	964	64	1028	2437
% Approach	100%	0%	-	93.8%	6.2%	-	-
% Total	57.8%	0%	57.8%	39.6%	2.6%	42.2%	-
PHF	0.887	-	0.887	0.949	0.727	0.955	0.915
Lights	1346	0	1346	912	60	972	2318
% Lights	95.5%	0%	95.5%	94.6%	93.8%	94.6%	95.1%
Articulated Trucks	30	0	30	17	0	17	47
% Articulated Trucks	2.1%	0%	2.1%	1.8%	0%	1.7%	1.9%
Buses and Single-Unit Trucks	33	0	33	35	4	39	72
% Buses and Single-Unit Trucks	2.3%	0%	2.3%	3.6%	6.3%	3.8%	3.0%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877565, Location: 42.648726, -83.539668



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 4:30PM	374	0	374	465	23	488	862
4:45PM	372	0	372	454	28	482	854
5:00PM	378	0	378	420	41	461	839
5:15PM	370	0	370	444	40	484	854
Total	1494	0	1494	1783	132	1915	3409
% Approach	100%	0%	-	93.1%	6.9%	-	-
% Total	43.8%	0%	43.8%	52.3%	3.9%	56.2%	-
PHF	0.988	-	0.988	0.959	0.805	0.981	0.989
Lights	1468	0	1468	1737	129	1866	3334
% Lights	98.3%	0%	98.3%	97.4%	97.7%	97.4%	97.8%
Articulated Trucks	10	0	10	17	0	17	27
% Articulated Trucks	0.7%	0%	0.7%	1.0%	0%	0.9%	0.8%
Buses and Single-Unit Trucks	16	0	16	29	3	32	48
% Buses and Single-Unit Trucks	1.1%	0%	1.1%	1.6%	2.3%	1.7%	1.4%

*T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
Thu Sep 30, 2021
PM Peak (4:30 PM - 5:30 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877565, Location: 42.648726, -83.539668



WB M-59 (Highland Road) and EB to WB crossov... - TMC

Thu Sep 30, 2021

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:00AM	339	1	340	175	10	185	525
7:15AM	339	2	341	185	13	198	539
7:30AM	353	2	355	230	22	252	607
7:45AM	407	5	412	257	15	272	684
Hourly Total	1438	10	1448	847	60	907	2355
8:00AM	344	3	347	243	13	256	603
8:15AM	340	2	342	246	13	259	601
8:30AM	309	4	313	233	9	242	555
8:45AM	341	3	344	220	16	236	580
Hourly Total	1334	12	1346	942	51	993	2339
4:00PM	322	2	324	401	25	426	750
4:15PM	378	2	380	437	40	477	857
4:30PM	370	8	378	469	23	492	870
4:45PM	368	3	371	458	27	485	856
Hourly Total	1438	15	1453	1765	115	1880	3333
5:00PM	387	4	391	438	42	480	871
5:15PM	368	9	377	459	40	499	876
5:30PM	380	3	383	463	34	497	880
5:45PM	350	4	354	446	41	487	841
Hourly Total	1485	20	1505	1806	157	1963	3468
Total	5695	57	5752	5360	383	5743	11495
% Approach	99.0%	1.0%	-	93.3%	6.7%	-	-
% Total	49.5%	0.5%	50.0%	46.6%	3.3%	50.0%	-
Lights	5541	53	5594	5183	373	5556	11150
% Lights	97.3%	93.0%	97.3%	96.7%	97.4%	96.7%	97.0%
Articulated Trucks	64	0	64	46	0	46	110
% Articulated Trucks	1.1%	0%	1.1%	0.9%	0%	0.8%	1.0%
Buses and Single-Unit Trucks	90	4	94	131	10	141	235
% Buses and Single-Unit Trucks	1.6%	7.0%	1.6%	2.4%	2.6%	2.5%	2.0%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	353	2	355	230	22	252	607
7:45AM	407	5	412	257	15	272	684
8:00AM	344	3	347	243	13	256	603
8:15AM	340	2	342	246	13	259	601
Total	1444	12	1456	976	63	1039	2495
% Approach	99.2%	0.8%	-	93.9%	6.1%	-	-
% Total	57.9%	0.5%	58.4%	39.1%	2.5%	41.6%	-
PHF	0.887	0.600	0.883	0.949	0.716	0.955	0.912
Lights	1392	11	1403	927	59	986	2389
% Lights	96.4%	91.7%	96.4%	95.0%	93.7%	94.9%	95.8%
Articulated Trucks	27	0	27	11	0	11	38
% Articulated Trucks	1.9%	0%	1.9%	1.1%	0%	1.1%	1.5%
Buses and Single-Unit Trucks	25	1	26	38	4	42	68
% Buses and Single-Unit Trucks	1.7%	8.3%	1.8%	3.9%	6.3%	4.0%	2.7%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



WB M-59 (Highland Road) and EB to WB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877564, Location: 42.64915, -83.540201



Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 4:45PM	368	3	371	458	27	485	856
	5:00PM	387	4	391	438	42	480	871
	5:15PM	368	9	377	459	40	499	876
	5:30PM	380	3	383	463	34	497	880
Total		1503	19	1522	1818	143	1961	3483
% Approach		98.8%	1.2%	-	92.7%	7.3%	-	-
% Total		43.2%	0.5%	43.7%	52.2%	4.1%	56.3%	-
PHF		0.971	0.528	0.973	0.982	0.851	0.982	0.989
Lights		1472	17	1489	1781	141	1922	3411
% Lights		97.9%	89.5%	97.8%	98.0%	98.6%	98.0%	97.9%
Articulated Trucks		12	0	12	14	0	14	26
% Articulated Trucks		0.8%	0%	0.8%	0.8%	0%	0.7%	0.7%
Buses and Single-Unit Trucks		19	2	21	23	2	25	46
% Buses and Single-Unit Trucks		1.3%	10.5%	1.4%	1.3%	1.4%	1.3%	1.3%

*T: Thru, U: U-Turn

WB M-59 (Highland Road) and EB to WB crossov... - TMC
Thu Sep 30, 2021
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 877564, Location: 42.64915, -83.540201



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

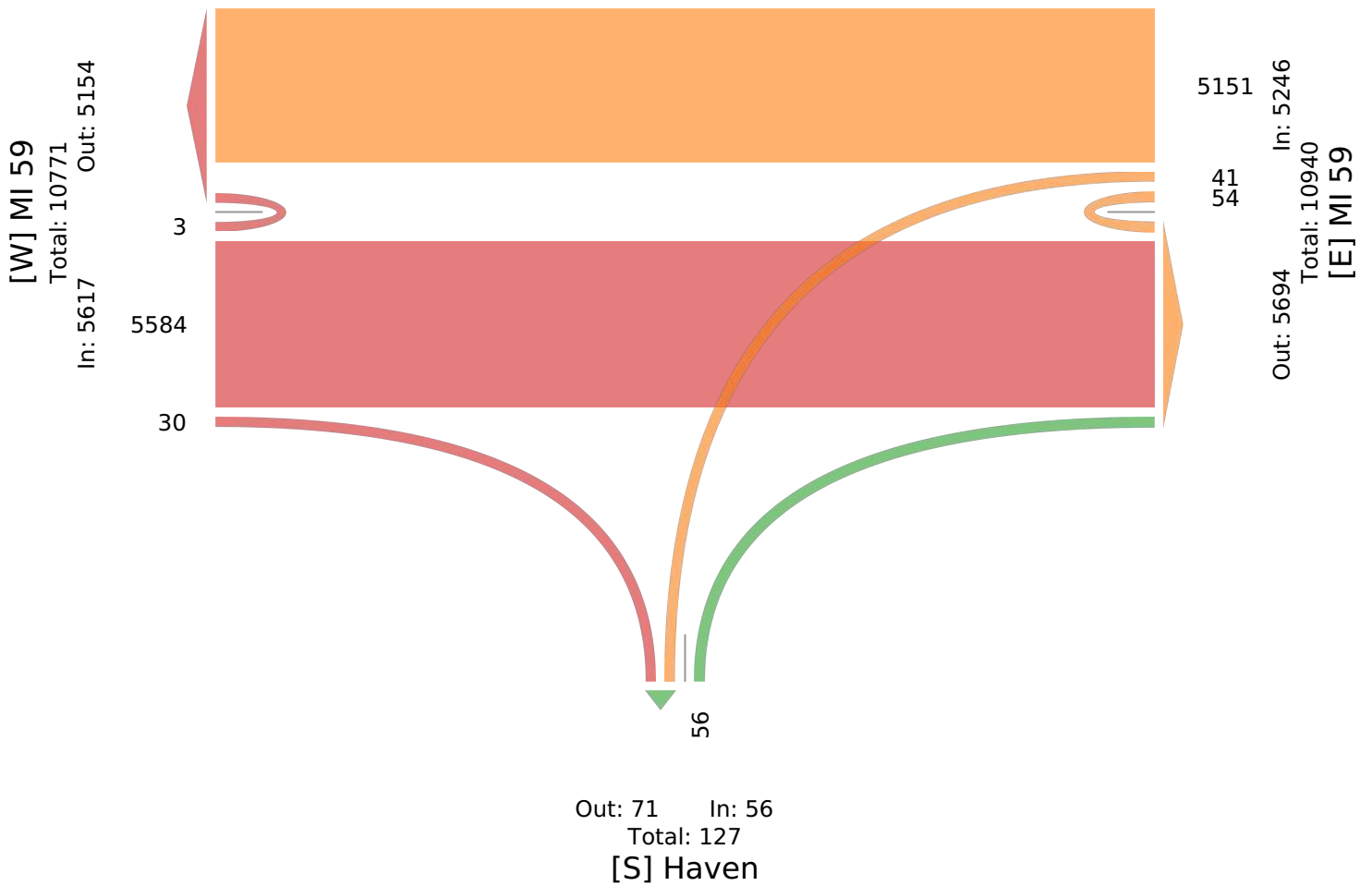


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:00AM	327	1	0	328	2	170	2	174	0	1	0	1	503
7:15AM	332	1	0	333	1	185	2	188	0	0	0	0	521
7:30AM	335	1	0	336	3	226	0	229	0	1	0	1	566
7:45AM	384	1	1	386	1	256	3	260	0	1	0	1	647
Hourly Total	1378	4	1	1383	7	837	7	851	0	3	0	3	2237
8:00AM	346	2	0	348	3	235	3	241	0	1	0	1	590
8:15AM	321	0	0	321	2	230	1	233	0	2	0	2	556
8:30AM	314	2	0	316	1	225	4	230	0	1	0	1	547
8:45AM	335	2	0	337	1	216	2	219	0	3	0	3	559
Hourly Total	1316	6	0	1322	7	906	10	923	0	7	0	7	2252
4:00PM	317	0	0	317	3	371	7	381	0	6	0	6	704
4:15PM	378	3	0	381	2	428	2	432	0	3	0	3	816
4:30PM	376	3	2	381	4	432	2	438	0	8	0	8	827
4:45PM	364	1	0	365	3	445	3	451	0	1	0	1	817
Hourly Total	1435	7	2	1444	12	1676	14	1702	0	18	0	18	3164
5:00PM	382	2	0	384	2	427	5	434	0	3	0	3	821
5:15PM	350	1	0	351	3	451	5	459	0	13	0	13	823
5:30PM	386	5	0	391	5	438	7	450	0	6	0	6	847
5:45PM	337	5	0	342	5	416	6	427	0	6	0	6	775
Hourly Total	1455	13	0	1468	15	1732	23	1770	0	28	0	28	3266
Total	5584	30	3	5617	41	5151	54	5246	0	56	0	56	10919
% Approach	99.4%	0.5%	0.1%	-	0.8%	98.2%	1.0%	-	0%	100%	0%	-	-
% Total	51.1%	0.3%	0%	51.4%	0.4%	47.2%	0.5%	48.0%	0%	0.5%	0%	0.5%	-
Lights	5412	30	3	5445	40	4979	51	5070	0	55	0	55	10570
% Lights	96.9%	100%	100%	96.9%	97.6%	96.7%	94.4%	96.6%	0%	98.2%	0%	98.2%	96.8%
Articulated Trucks	64	0	0	64	1	53	1	55	0	0	0	0	119
% Articulated Trucks	1.1%	0%	0%	1.1%	2.4%	1.0%	1.9%	1.0%	0%	0%	0%	0%	1.1%
Buses and Single-Unit Trucks	108	0	0	108	0	119	2	121	0	1	0	1	230
% Buses and Single-Unit Trucks	1.9%	0%	0%	1.9%	0%	2.3%	3.7%	2.3%	0%	1.8%	0%	1.8%	2.1%

*L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 Full Length (7 AM-9 AM, 4 PM-6 PM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

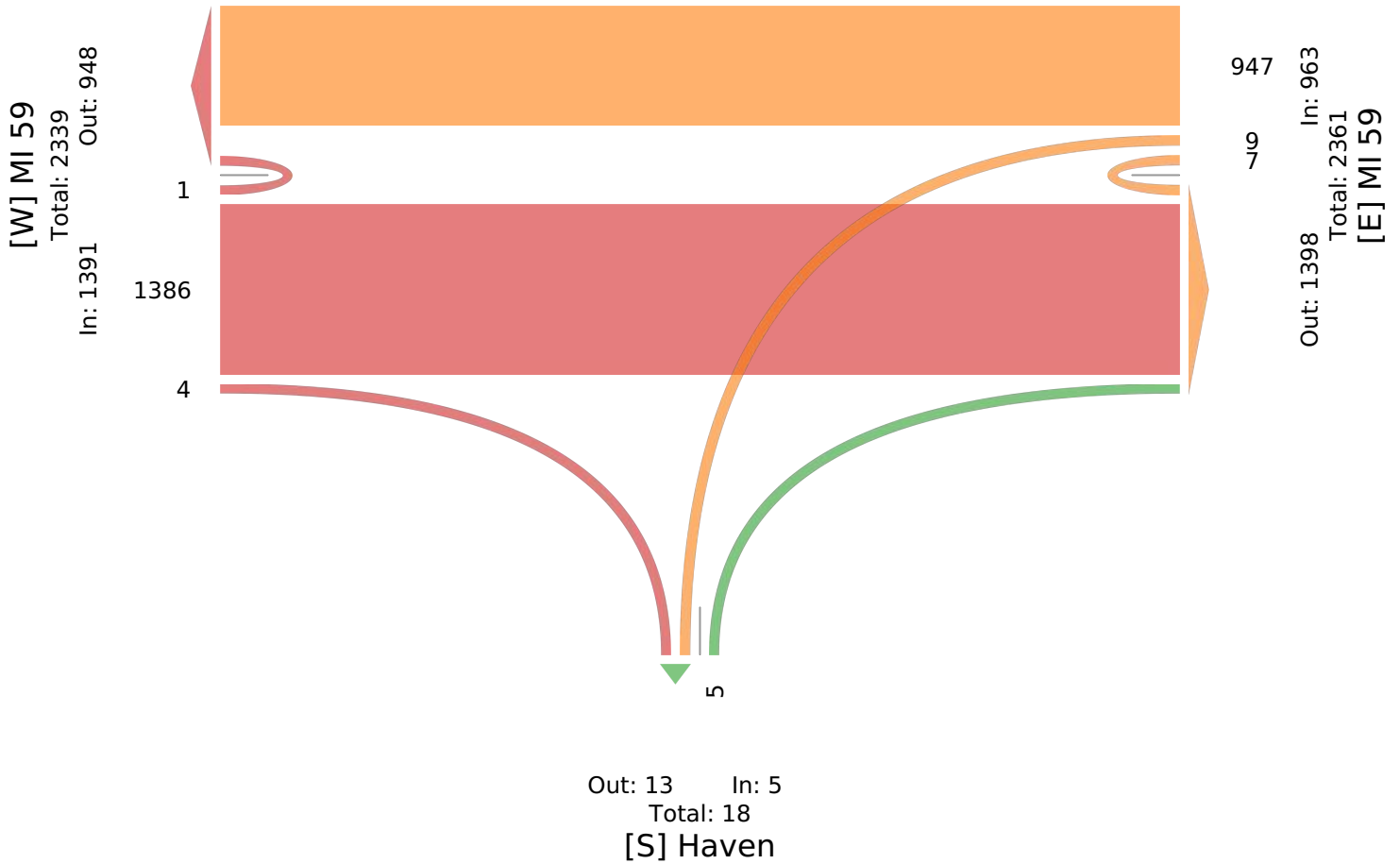


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 7:30AM	335	1	0	336	3	226	0	229	0	1	0	1	566
7:45AM	384	1	1	386	1	256	3	260	0	1	0	1	647
8:00AM	346	2	0	348	3	235	3	241	0	1	0	1	590
8:15AM	321	0	0	321	2	230	1	233	0	2	0	2	556
Total	1386	4	1	1391	9	947	7	963	0	5	0	5	2359
% Approach	99.6%	0.3%	0.1%	-	0.9%	98.3%	0.7%	-	0%	100%	0%	-	-
% Total	58.8%	0.2%	0%	59.0%	0.4%	40.1%	0.3%	40.8%	0%	0.2%	0%	0.2%	-
PHF	0.902	0.500	0.250	0.901	0.750	0.925	0.583	0.926	-	0.625	-	0.625	0.912
Lights	1321	4	1	1326	9	899	6	914	0	5	0	5	2245
% Lights	95.3%	100%	100%	95.3%	100%	94.9%	85.7%	94.9%	0%	100%	0%	100%	95.2%
Articulated Trucks	32	0	0	32	0	15	0	15	0	0	0	0	47
% Articulated Trucks	2.3%	0%	0%	2.3%	0%	1.6%	0%	1.6%	0%	0%	0%	0%	2.0%
Buses and Single-Unit Trucks	33	0	0	33	0	33	1	34	0	0	0	0	67
% Buses and Single-Unit Trucks	2.4%	0%	0%	2.4%	0%	3.5%	14.3%	3.5%	0%	0%	0%	0%	2.8%

* L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 AM Peak (7:30 AM - 8:30 AM)
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706

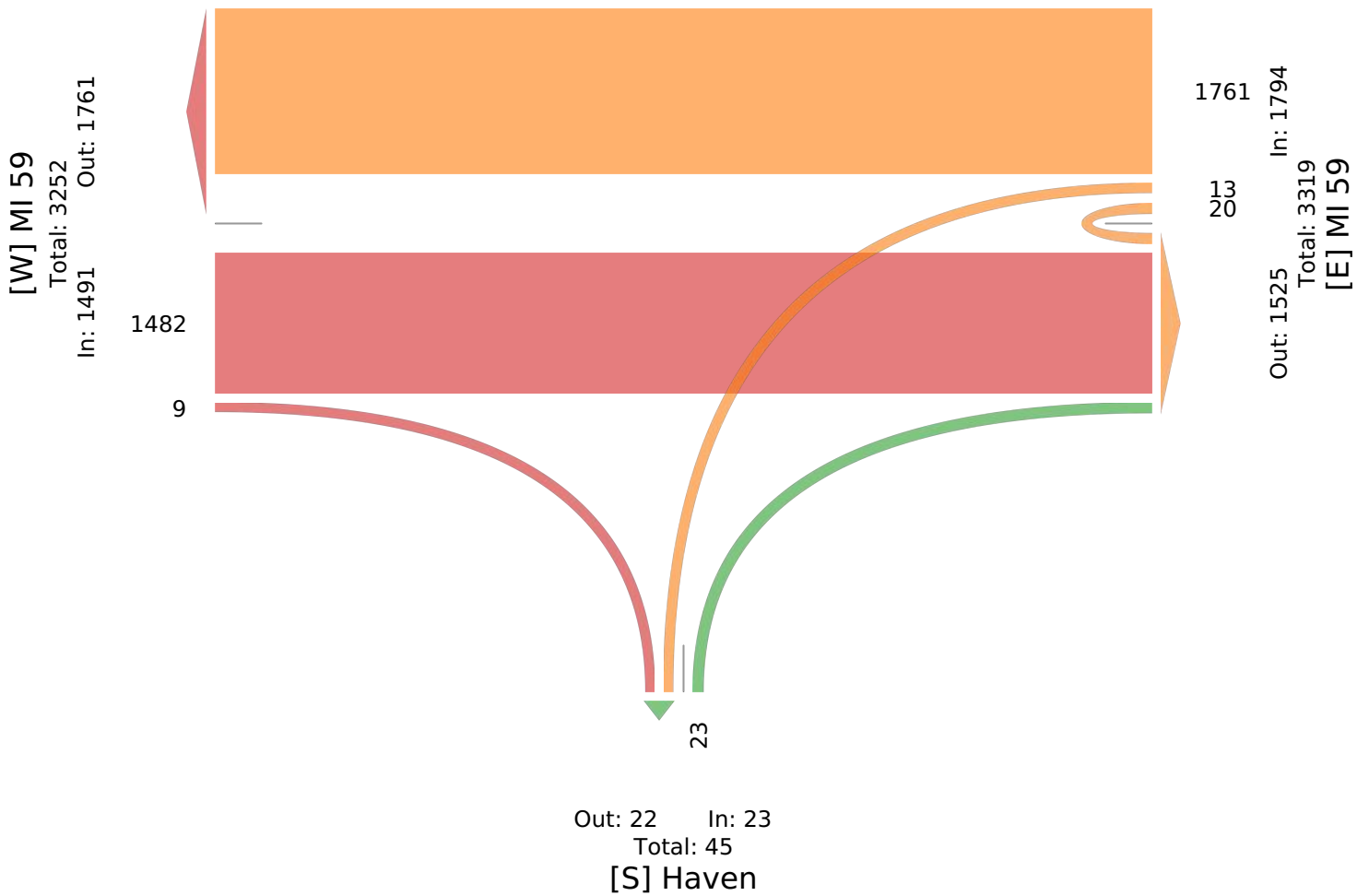


Provided by: Gewalt Hamilton Associates Inc.
 625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound				MI 59 Westbound				Haven Northbound				Int
	T	R	U	App	L	T	U	App	L	R	U	App	
2021-09-30 4:45PM	364	1	0	365	3	445	3	451	0	1	0	1	817
5:00PM	382	2	0	384	2	427	5	434	0	3	0	3	821
5:15PM	350	1	0	351	3	451	5	459	0	13	0	13	823
5:30PM	386	5	0	391	5	438	7	450	0	6	0	6	847
Total	1482	9	0	1491	13	1761	20	1794	0	23	0	23	3308
% Approach	99.4%	0.6%	0%	-	0.7%	98.2%	1.1%	-	0%	100%	0%	-	-
% Total	44.8%	0.3%	0%	45.1%	0.4%	53.2%	0.6%	54.2%	0%	0.7%	0%	0.7%	-
PHF	0.960	0.450	-	0.953	0.650	0.976	0.714	0.977	-	0.442	-	0.442	0.976
Lights	1451	9	0	1460	13	1725	19	1757	0	23	0	23	3240
% Lights	97.9%	100%	0%	97.9%	100%	98.0%	95.0%	97.9%	0%	100%	0%	100%	97.9%
Articulated Trucks	10	0	0	10	0	14	1	15	0	0	0	0	25
% Articulated Trucks	0.7%	0%	0%	0.7%	0%	0.8%	5.0%	0.8%	0%	0%	0%	0%	0.8%
Buses and Single-Unit Trucks	21	0	0	21	0	22	0	22	0	0	0	0	43
% Buses and Single-Unit Trucks	1.4%	0%	0%	1.4%	0%	1.2%	0%	1.2%	0%	0%	0%	0%	1.3%

* L: Left, R: Right, T: Thru, U: U-Turn

EB M-59 (Highland Road) and WB to EB crossov... - TMC
 Thu Sep 30, 2021
 PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
 All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
 All Movements
 ID: 877563, Location: 42.650179, -83.543706



Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#1 - WB M-59 & EB Crossover (East of Hill Rd)	AM Peak 09/30/21		PHF	0.92			0.95			0.60											
			% Heavy	5%			6%			6%											
		2021	Existing	1516	0	0	978	0	69	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1516	0	0	978	0	69	0	0	0	0	0	0	0				
		2027	Background	0	1562	0	0	1008	0	71	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1562	0	0	1008	0	71	0	0	0	0	0	0	0				
			Site Generated		96			21		21											
			Pass By																		
			Total Site Gen	0	96	0	0	21	0	21	0	0	0	0	0	0	0				
			Total Future	0	1658	0	0	1029	0	92	0	0	0	0	0	0	0				

Count Date: 9/30/2021
Count Year: 2021
Existing Adj. Year: 2021

Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2027
Scenario: AM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#2 - EB M-59 & Le Grand Court	AM Peak 09/30/21		PHF	0.91			0.79														
			% Heavy	4%			3%														
		2021	Existing	1459	49	0	0	0	0	126	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1459	49	0	0	0	126	0	0	0	0	0	0	0				
		2027	Background	0	1503	50	0	0	0	130	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1503	51	0	0	0	130	0	0	0	0	0	0	0				
			Site Generated		117																
			Pass By																		
			Total Site Gen	0	117	0	0	0	0	0	0	0	0	0	0	0	0				
			Total Future	0	1620	51	0	0	0	130	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#3 - WB M-59 & Hill Road	AM Peak 09/30/21		PHF	0.93			0.60														
			% Heavy	6%			2%														
		2021	Existing	991	56	0	0	0	0	51	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	991	56	0	0	0	51	0	0	0	0	0	0	0				
		2027	Background	0	1021	58	0	0	0	53	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1021	58	0	0	0	53	0	0	0	0	0	0	0				
			Site Generated		7	35				104											
			Pass By																		
			Total Site Gen	0	7	35	0	0	0	104	0	0	0	0	0	0	0				
			Total Future	0	1028	93	0	0	0	157	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#4 - EB M-59 & WB Crossover (West of Hill Rd)	AM Peak 09/30/21		PHF	0.89			0.73														
			% Heavy	4%			6%														
		2021	Existing	1444	0	0	978	0	64	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	0	0	978	0	64	0	0	0	0	0	0	0				
		2027	Background	0	1488	0	0	1008	0	66	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	0	0	1008	0	66	0	0	0	0	0	0	0				
			Site Generated		53			47		64											
			Pass By																		
			Total Site Gen	0	53	0	0	47	0	64	0	0	0	0	0	0	0				
			Total Future	0	1541	0	0	1055	0	130	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#5 - WB M-59 & EB Crossover (West of Hill Rd)	AM Peak 09/30/21		PHF	0.89			0.60														
			% Heavy	4%			8%														
		2021	Existing	1444	0	0	978	12	0	0	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	0	0	978	12	0	0	0	0	0	0	0	0				
		2027	Background	0	1488	0	0	1008	12	0	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	0	0	1008	12	0	0	0	0	0	0	0	0				
			Site Generated		53			47	10												
			Pass By																		
			Total Site Gen	0	53	0	0	47	10	0	0	0	0	0	0	0	0				
			Total Future	0	1541	0	0	1055	22	0	0	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#6 - EB M-59 & Haven Road / WB Crossover	AM Peak 09/30/21		PHF	0.90			0.63			0.67											
			% Heavy	5%			0%			6%											
		2021	Existing	1444	4	0	947	5	7	9	0	0	0	0	0	0	0				
		2021	Existing Adj.	0	1444	4	0	947	5	7	9	0	0	0	0	0	0				
		2027	Background	0	1488	4	0	976	5	7	9	0	0	0	0	0	0				
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	1488	4	0	976	5	7	9	0	0	0	0	0	0				
			Site Generated		31			62		32											
			Pass By																		
			Total Site Gen	0	31	0	0	62	0	32	0	0	0	0	0	0	0				
			Total Future	0	1519	4	0	1038	5	39	9	0	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#7 - Hill Rd & Driveway 1	AM Peak 09/30/21		PHF	0.92			0.92			0.92										
			% Heavy	2%			2%			2%										
			Existing								56				51					
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0					
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Site Generated				44			1		3	15		1					
			Pass By																	
			Total Site Gen	0	0	0	44	0	1	0	3	15	0	1	0					
	Total Future	0	0	0	44	0	1	0	61	15	0	54	0							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#8 - Hill Rd & Driveway 2	AM Peak 09/30/21		PHF	0.92			0.92			0.92										
			% Heavy	2%			2%			2%										
			Existing								56				51					
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0					
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Site Generated	2		56				18	16				44	1				
			Pass By																	
			Total Site Gen	2	0	56	0	0	0	18	16	0	0	44	1					
	Total Future	2	0	56	0	0	0	18	74	0	0	97	1							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#9 - Hill Rd & Driveway 3	AM Peak 09/30/21		PHF	0.92			0.92			0.92										
			% Heavy	2%			2%			2%										
			Existing								56				51					
		2021	Existing Adj.	0	0	0	0	0	0	0	56	0	0	51	0					
		2027	Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	0	0	0	58	0	0	53	0					
			Site Generated				4			1	33	2		100						
			Pass By																	
			Total Site Gen	0	0	0	4	0	1	0	33	2	0	100	0					
	Total Future	0	0	0	4	0	1	0	91	2	0	153	0							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#10 - WB M-59 & Driveway 4	AM Peak 09/30/21		PHF	0.92			0.95			0.92			0.92							
			% Heavy	5%			6%			2%			2%							
			Existing					990												
		2021	Existing Adj.	0	0	0	0	990	0	0	0	0	0	0	0	0				
		2027	Background	0	0	0	0	1020	0	0	0	0	0	0	0	0				
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	1020	0	0	0	0	0	0	0	0				
			Site Generated				40		17						54					
			Pass By																	
			Total Site Gen	0	0	0	40	17	0	0	0	0	0	54	0					
	Total Future	0	0	0	40	17	0	0	0	0	0	54	0							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#11 - M-59 & Bogie Lake Road	AM Peak 09/30/21		PHF	0.92			0.95			0.92			0.92							
			% Heavy	5%			6%			2%			2%							
			Existing		1516			795	166		55	200		61	183					
		2021	Existing Adj.	0	1516	0	0	795	166	0	55	200	0	61	183					
		2027	Background	0	1562	0	0	819	171	0	57	206	0	63	189					
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	1562	0	0	819	171	0	57	206	0	63	189					
			Site Generated		96			21												
			Pass By																	
			Total Site Gen	0	96	0	0	21	0	0	0	0	0	63	189					
	Total Future	0	1658	0	0	840	171	0	57	206	0	63	189							

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#1 - WB M-59 & EB Crossover (East of Hill Rd)	PM Peak 09/30/21		PHF	0.92				0.95			0.71				
			% Heavy	2%				2%			5%								
		2021	Existing	1555				1933			57								
		2021	Existing Adj.	0	1555	0	0	1933	0	57	0	0	0	0	0	0			
		2027	Background	0	1602	0	0	1992	0	59	0	0	0	0	0	0			
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1602	0	0	1992	0	59	0	0	0	0	0	0			
			Site Generated		47			98		50									
			Pass By																
			Total Site Gen	0	47	0	0	98	0	50	0	0	0	0	0	0			
			Total Future	0	1649	0	0	2090	0	109	0	0	0	0	0	0			

Count Date: 9/30/2021
Count Year: 2021
Existing Adj. Year: 2021

Existing Adjustment Rate: 1.00
Growth Rate: 0.5%
Buildout Year: 2027
Scenario: PM Peak

Bckgrd. Dev. A:
Bckgrd. Dev. B:
Bckgrd. Dev. C:

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#2 - EB M-59 & Le Grand Court	PM Peak 09/30/21		PHF	0.95							0.74				
			% Heavy	2%							4%								
		2021	Existing	1505	141							107							
		2021	Existing Adj.	0	1505	141	0	0	0	0	0	107	0	0	0	0			
		2027	Background	0	1551	145	0	0	0	0	0	110	0	0	0	0			
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1551	145	0	0	0	0	0	110	0	0	0	0			
			Site Generated		97														
			Pass By																
			Total Site Gen	0	97	0	0	0	0	0	0	0	0	0	0	0			
			Total Future	0	1648	145	0	0	0	0	0	110	0	0	0	0			

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#3 - WB M-59 & Hill Road	PM Peak 09/30/21		PHF	0.95							0.71				
			% Heavy	2%							2%								
		2021	Existing	1930	60										57				
		2021	Existing Adj.	0	0	0	0	1930	60	0	0	0	0	0	57				
		2027	Background	0	0	0	0	1989	62	0	0	0	0	0	59				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	1989	62	0	0	0	0	0	59				
			Site Generated					34	114					68					
			Pass By																
			Total Site Gen	0	0	0	0	34	114	0	0	0	0	68					
			Total Future	0	0	0	0	2023	176	0	0	0	0	127					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#4 - EB M-59 & WB Crossover (West of Hill Rd)	PM Peak 09/30/21		PHF	0.95							0.81				
			% Heavy	2%							3%				2%				
		2021	Existing	1514				1855					132						
		2021	Existing Adj.	0	1514	0	0	1855	0	0	0	0	132	0	0				
		2027	Background	0	1560	0	0	1911	0	0	0	0	136	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1560	0	0	1912	0	0	0	0	136	0	0				
			Site Generated		67			72					30						
			Pass By																
			Total Site Gen	0	67	0	0	72	0	0	0	0	30	0	0				
			Total Future	0	1627	0	0	1984	0	0	0	0	166	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#5 - WB M-59 & EB Crossover (West of Hill Rd)	PM Peak 09/30/21		PHF	0.95							0.60				
			% Heavy	2%							11%								
		2021	Existing	1514	9			1855		19									
		2021	Existing Adj.	0	1514	9	0	1855	0	19	0	0	0	0	0	0			
		2027	Background	0	1560	9	0	1911	0	20	0	0	0	0	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1560	9	0	1912	0	20	0	0	0	0	0				
			Site Generated		67			72		27									
			Pass By																
			Total Site Gen	0	67	0	0	72	0	27	0	0	0	0	0				
			Total Future	0	1627	9	0	1984	0	47	0	0	0	0	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
				#6 - EB M-59 & Haven Road / WB Crossover	PM Peak 09/30/21		PHF	0.95							0.60				
			% Heavy	2%							0%				4%				
		2021	Existing	1490	9			1841				23	20	13					
		2021	Existing Adj.	0	1490	9	0	1841	0	0	0	23	20	13	0				
		2027	Background	0	1535	9	0	1897	0	0	0	24	21	13	0				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1535	9	0	1898	0	0	0	24	21	13	0				
			Site Generated		77			57					17						
			Pass By																
			Total Site Gen	0	77	0	0	57	0	0	0	0	17	0	0				
			Total Future	0	1612	9	0	1955	0	0	0	24	38	13	0				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR		
#7 - Hill Rd & Driveway 1	PM Peak 09/30/21		PHF					0.92			0.92			0.92							
			% Heavy					2%				2%			2%						
			Existing									60			57						
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0					
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0					
			Bckgrd. Dev. A																		
			Bckgrd. Dev. B																		
			Bckgrd. Dev. C																		
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0					
			Site Generated				30					1	52	1	2						
			Pass By																		
			Total Site Gen	0	0	0	30	0	0	0	0	1	52	1	2	0					
			Total Future	0	0	0	30	0	0	0	0	63	52	1	61	0					

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR	
#8 - Hill Rd & Driveway 2	PM Peak 09/30/21		PHF		0.92						0.92			0.92						
			% Heavy		2%							2%			2%					
			Existing									60			57					
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0				
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0				
			Bckgrd. Dev. A																	
			Bckgrd. Dev. B																	
			Bckgrd. Dev. C																	
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0				
			Site Generated	1		35						60	52		30	2				
			Pass By																	
			Total Site Gen	1	0	35	0	0	0	0	0	60	52	0	30	2				
			Total Future	1	0	35	0	0	0	0	0	60	114	0	89	2				

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#9 - Hill Rd & Driveway 3	PM Peak 09/30/21		PHF					0.92			0.92			0.92					
			% Heavy					2%				2%			2%				
			Existing									60			57				
		2021	Existing Adj.	0	0	0	0	0	0	0	0	60	0	0	57	0			
		2027	Background	0	0	0	0	0	0	0	0	62	0	0	59	0			
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	0	0	0	0	62	0	0	59	0			
			Site Generated				3					112	2		65				
			Pass By																
			Total Site Gen	0	0	0	3	0	0	0	0	112	2	0	65	0			
			Total Future	0	0	0	3	0	0	0	0	174	2	0	124	0			

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#10 - WB M-59 & Driveway 4	PM Peak 09/30/21		PHF					0.92			0.92			0.92					
			% Heavy					2%				2%			2%				
			Existing					1874											
		2021	Existing Adj.	0	0	0	0	1874	0	0	0	0	0	0	0	0			
		2027	Background	0	0	0	0	1931	0	0	0	0	0	0	0	0			
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	0	0	0	1932	0	0	0	0	0	0	0	0			
			Site Generated					38	61						36				
			Pass By																
			Total Site Gen	0	0	0	0	38	61	0	0	0	0	0	36	0			
			Total Future	0	0	0	0	1970	61	0	0	0	0	0	36	0			

Intersection	Time period	Year	Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	EBRR	WBRR	NBRR	SBRR
#11 - M-59 & Bogie Lake Road	PM Peak 09/30/21		PHF		0.94			0.95			0.92			0.92					
			% Heavy		2%			2%				2%			2%				
			Existing		1555			1715	225		75	200		73	218				
		2021	Existing Adj.	0	1555	0	0	1715	225	0	75	200	0	73	218				
		2027	Background	0	1602	0	0	1767	232	0	77	206	0	75	225				
			Bckgrd. Dev. A																
			Bckgrd. Dev. B																
			Bckgrd. Dev. C																
			Total Background	0	1602	0	0	1767	232	0	77	206	0	75	225				
			Site Generated		47			98											
			Pass By																
			Total Site Gen	0	47	0	0	98	0	0	0	0	0	0	0	0			
			Total Future	0	1649	0	0	1865	232	0	77	206	0	75	225				

OAKLAND COUNTY ROAD COMMISSION
 TRAFFIC - SAFETY DEPARTMENT
 SIGNAL WORK ORDER

JAN 23 2017

1-17-17

LOCATION: Bogie LK & M-59 DATE: 12/9/16
 CITY/TOWNSHIP: White Lake BY: E Labiano
 COUNTY#: 4110 STATE#: 63041-01-029 CHARGES: WO 168612

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

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

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: 5am - Midnight
 NEW: 5:30am - 11pm
 REPROGRAM TBC (Traffic Events)
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER: Rev 23 Change

MDOT RETIMING - FINAL

APPROVED BY: [Signature] DATE: 1/17/17
 DATE INSTALLED: 1/21/17
 INSTALLED BY: Richardson

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

INTERSECTION: BOGIE LAKE & M-59

CITY/VILLAGE/TOWNSHIP: WHITE LAKE

COUNTY#: 4110 MDOT#: 63041-01-029 REV#: 23 DETROIT EDISON#: 1043

DRAWN BY: E Labiano APPROVED BY: [Signature] DATE DRAWN: 1/17/17

INSTALLED BY: _____ DATE INSTLD: 1/1

HOURS OF OPERATION: 7 DAYS: 5:30AM - 11:00PM

HOURS OF FLASHING: 7 DAYS: 11:00PM - 5:30AM

2. UTILITIES - 1. ACCESS

CODE: _____: 1642 CODE: Four digits (0000 - 9999)

4. UNIT DATA - 5. RING STRUCTURE

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

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED						
PHASE 1:			1																							
PHASE 2:	1	4		1																					2	9
PHASE 3:					1																					
PHASE 4:	1	2				1																			4	10
PHASE 5:							1																			
PHASE 6:								1																		
PHASE 7:									1																	
PHASE 8:										1																
PHASE 9:											1															
PHASE 10:												1														
PHASE 11:													1													
PHASE 12:														1												
PHASE 13:															1											
PHASE 14:																1										
PHASE 15:																	1									
PHASE 16:																		1								

CODES:

RING Ring Number for Phase (1-4)
 PHNXT Phase Next In Ring (1-16)
 CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

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

3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green		10		7													00-99
Passage																	0.0-9.9
Maximum #1		92		29													000-999
Maximum #2																	000-999
Yellow Clearance		4.7		4.3													3.0-9.9
Red Clearance		2.0		6.6													0.0-9.9

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

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk		7		7													00-99
Pedest Clearance		20		12													00-99
Flashing Walk																	
Extend Ped Clear		0		0													
Act Rest in Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Initial		4		1												
NA Response																
CODES:	0		1			2		3			4					
Initial	none		inactive			red		yellow			green					
NA Response	none		to 1			to 2		both			-----					

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		3												
Pedestrian Recall		0		0												
CODES:	0		1			2		3			4					
Vehicle	none		1 call			min		max			soft					
Pedestrian	none		1 call			ped		bot N.A.			-----					

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Nonlock Memory																
Dual Entry																
Last Car Passage																
Conditional Service																
CODES:	0 = NO				1 = YES											

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

Detector # on Print	1	2	3	4	5	6	7	8
EPAC/M52 "D" Connector	1	6	7	8	4	5	2	3
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet for D-connector pin assignments

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

Detector # on Print	1	2	3	4	5	6	7	8
2070 "D" Connector	9	10	11	12	13	14	15	16
Assigned Phase								

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

See attached detection sheet for D-connector pin assignments

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

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC

1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6 ALT SEQ. 08-15

EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A				1					13
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green	4															
Trail yellow	4.3															
Trail red	2.6															
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

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

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

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

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

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

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>2</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG	END OF GREEN				
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD:					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

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

Sequence: 00 - 15 (Unit data has definition)

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

Time: 00 - 99 seconds.

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 1 / SPLIT 1 CYCLE LENGTH: **110 sccs** *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		80		24				
MODE		1		3				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: **90 sccs** *PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		60		27				
MODE		1		3				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	42		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	56		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 SECS PROGRAM CYCLE LENGTH*

PHASE	1	2	3	4	5	6	7	8
TIME		90		28				
MODE		1		3				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH: *110 SECS*

PHASE	1	2	3	4	5	6	7	8
TIME		75		35				
MODE		1		3				

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	93		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	36		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4		
MIN GREEN/WALK						
OVERRIDE	FL	1/2	2/3	3/4	4/5	5/6
STATUS						
CODES	0 = NO, 1 = YES					

7. PREEMPT DATA - PREEMPT 1

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

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

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR: _____ TRK YEL CHG: _____
 SEL YEL CHG: _____ TRK RED CLR: _____
 SEL RED CLR: _____ DWELL GREEN: _____
 TRACK GREEN: _____ RET PED CLR: _____
 TRK PED CLR: _____ RET YEL CHG: _____
 RET YEL CLR: _____

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

(0=no, 1=act, 2=min recall, 3=max recall)

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								

(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

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

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				

(0=red, 1=grn, 2=flr, 3=fly, 4=dark)

CYCLE								
-------	--	--	--	--	--	--	--	--

(0 = no, 1 = act)

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

TEST..: _____ N-LOCK.: _____ SKIP.....: _____
 DELAY: _____ EXTEND: _____ DURATION: _____
 DWELL: _____ MXCALL: _____ LOCK OUT: _____

RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	M-59	A	2	A
3				
4	BOGIE LAKE (NEAR)	B	4	R
5				
6				
7				
8				
OLA	BOGIE LAKE (FAR)	C	5	R
OLB				
OLC				
OLD				
1PED				
2PED	M-59 PED	WA	6	
3PED				
4PED	BOGIE LAKE PED	WB	8	
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
For 4 Phase EPAC
Pole Mount Cabinet

Intersection: M-59 and Bogie Lake Rd
County No: 04110
State No: 63041-01-029
Prepared By: Rachel Jones
Date: 11-30-11

Phasing:

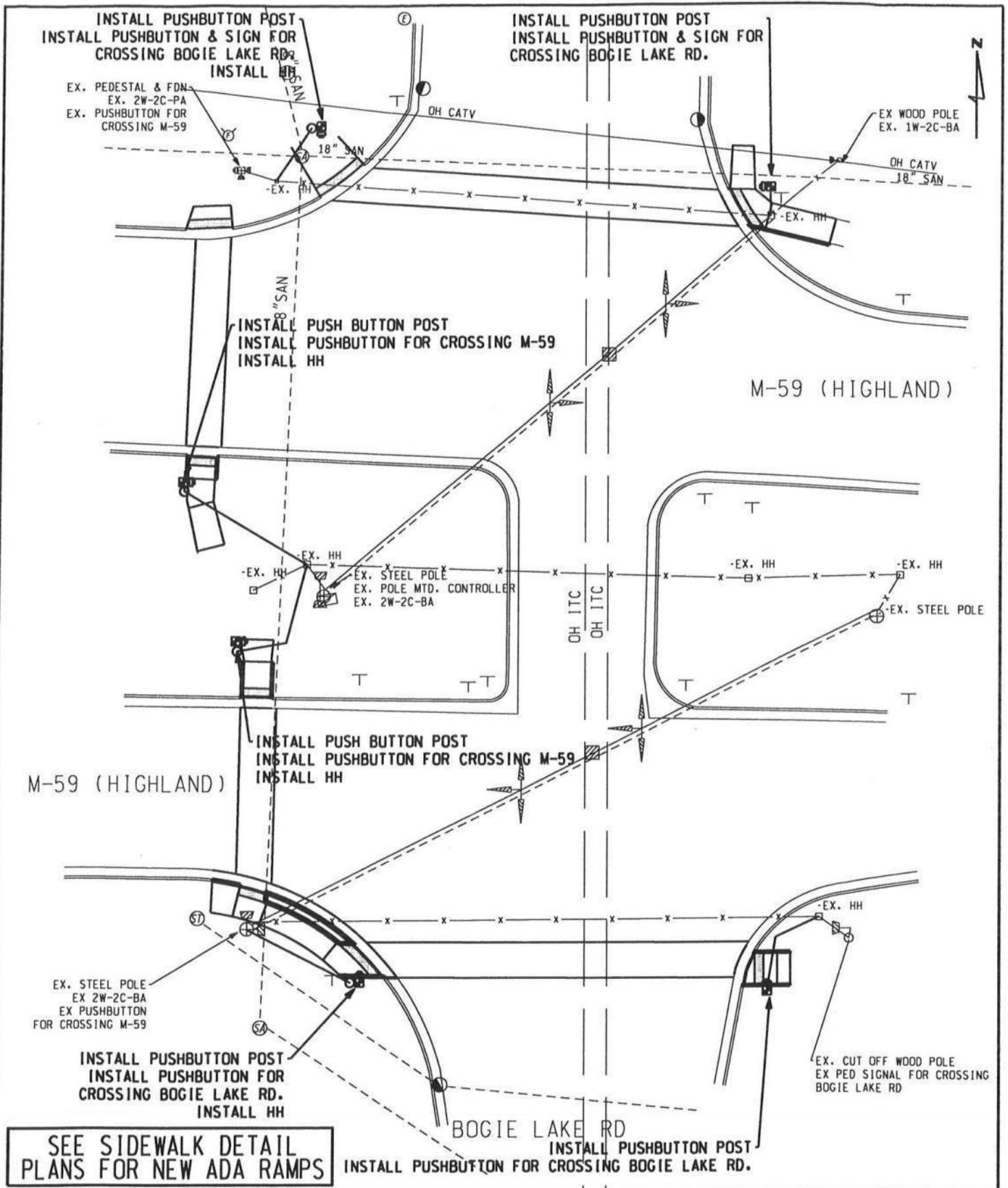
Load Switch 2:	M-59	A	FLA
Load Switch 4:	Bogie Lake Near	B	FLR
Load Switch 5:(OLA)	Bogie Lake Far	C	FLR
Load Switch 6:	M-59 Peds	WA	
Load Switch 8:	Bogie Lake Ped West	WB	

Jumpers:

121-213, 151-152, 153-154, 155-156, 158-159, 161-162, 164-165, 173-174,
175-176, 177-178, 179-180, 185-186, 223-224, 229-230, 233-PB1, 237-PB1,
241-242, 243-244, 245-246, 255-256, 257-258, 259-260, 261-262, 263-PB1,
268-269, 273-274.

Conflict Monitor: 4-5.

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



AUTH. NO.	DRAWN DJP
CONT. SEC. 63041	DATE 03-08-11
REF. 110761	SCALE N.T.S.
PLAN 63041-01-029	SHEET 3 OF 4

M-59 (HIGHLAND) AT BOGIE LAKE RD
WHITE LAKE TOWNSHIP
OAKLAND COUNTY

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

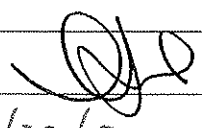
LOCATION: M-59 & X/O W/O Ormond DATE: 07/28/20
 CITY/TOWNSHIP: White Lake BY: Dawn Bierlein
 COUNTY#: 4132 STATE#: 63041-01-113 CHARGES: X00058

PLEASE PERFORM THE FOLLOWING:

ELECTRICAL DEVICE: INSTALL MODERNIZE MAINTENANCE
 UNDERGROUND: _____
 EDISON OK: YES NO JOB#: _____
 COORDINATE W/DISTRICT 7: _____

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

CHANGE BREAKOUT OR EPROM: _____
 CHANGE HOURS OF OPERATION:
 OLD: _____ JUL 30 2020
 NEW: _____
 REPROGRAM TBC
 INSTALL INTERCONNECT: TBC MINITROL TONE
 MBT OK: YES NO
 NO CHANGE - RECORD CORRECTION
 OTHER 3.5 Veh recalls-phase 4

(Rev 2) _____ (LOOPS HOOKED UP & WORKING)
 APPROVED BY:  DATE: 7/28/20
 DATE INSTALLED: 7/29/20
 INSTALLED BY: D-8

INTERSECTION: EB M-59 (HIGHLAND) & X/O W/O ORMOND

CITY/VILLAGE/TOWNSHIP: WHITE LAKE

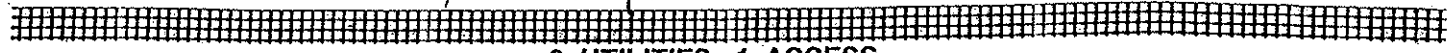
COUNTY#: 4132 MDOT#: 63041-01-113 REV#: 2 DETROIT EDISON#:

DRAWN BY: DAWN BIERLEIN APPROVED BY: _____ DATE DRAWN: 07/28/20

INSTALLED BY: _____ DATE INSTLD: 1 1

HOURS OF OPERATION: 7 DAYS: 5:30AM - 10:00pm

HOURS OF FLASHING: 7 DAYS: 10:00pm - 5:30am



2. UTILITIES - 1. ACCESS

CODE:: 1642 CODE: Four digits (0000 - 9999)



2. UTILITIES - 6. LOAD DEFAULT

C - CHANGE CURRENT SOFTWARE OPTION

SELECT SOFTWARE OPTION _____ 1- FIO (TS1 ONLY); 2- TS2 (TS2 ONLY)



4. UNIT DATA - 5. RING STRUCTURE

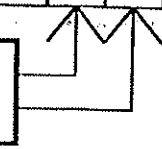
*** NOTE: INSERT ALL RING #'S FIRST, THEN NXT & CONCUR ***

CHANNEL:	RING	PHNXT	CONCURRENT PHASES																CHANNEL		
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	VEH	PED	
PHASE 1:			1																		
PHASE 2:	1	4		1																2	
PHASE 3:					1																
PHASE 4:	1	2				1														4	
PHASE 5:							1														
PHASE 6:								1													
PHASE 7:									1												
PHASE 8:										1											
PHASE 9:											1										
PHASE 10:												1									
PHASE 11:													1								
PHASE 12:														1							
PHASE 13:															1						
PHASE 14:																1					
PHASE 15:																	1				
PHASE 16:																		1			

CODES:

- RING Ring Number for Phase (1-4)
- PHNXT Phase Next in Ring (1-16)
- CONCUR PH Phases To Be Concurrent (0=NO, 1=YES)

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



3. PHASE DATA - 1. BASIC TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE
Minimum Green		10		7													00-99
Passage																	0.0-9.9
Maximum #1		96		30													000-999
Maximum #2																	000-999
Yellow Clearance		5.0		3.0													3.0-9.9
Red Clearance		1.2		2.2													0.0-9.9

3. PHASE DATA - 3. PEDESTRIAN TIMINGS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	RANGE (SEC)
Walk																	00-99
Pedest Clearance																	00-99
Flashing Walk																	
Extend Ped Clear																	(0-no, 1-Y+R, 2-Y)
Act Rest-in-Walk																	

3. PHASE DATA - 4. INITIALIZE & NON ACTUATED RESPONSE

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

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

3. PHASE DATA - 5. VEHICLE & PEDESTRIAN RECALLS

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Vehicle Recall		3		0												
Pedestrian Recall																

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

3. PHASE DATA - 6. NONLOCK & MISC CONTROLS

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

CODES: 0 = NO 1 = YES

3. PHASE DATA - 7. SPECIAL SEQUENCE

Phase	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Omit																
-Yel																
Ocal																

3. PHASE DATA - 8. SPECIAL DETECTOR - 0. SPC 1-8 (TS1 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8
Assigned Phase	4	4						
EPAC M52 D-CONNECTOR	1	6	7	8	4	5	2	3

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

3. PHASE DATA - 8. SPECIAL DETECTOR - 1. VEH 1-8 OR 2.VEH 9-16 (TS2 ONLY)

Detector # on Print	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Assigned Phase																

CODES: 0 1 2 3 4
 Operation Mode: Norm Veh Norm Ped 1 call St Bar A St Bar B

A. CONTROLS

	RANGE (SEC)
Extend Time	00-99
Delay Time	00-999

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

4. UNIT DATA - 1. STARTUP & MISCELLANEOUS

Start up time : 10 (00-99) State : 0 (0 = fl, 1 = red)
 Auto ped clear : 0 Red revert : 7.0 (2.0 - 9.9)
 Stop time reset : 0 (0 = No, 1 = Yes)

4. UNIT DATA - 2. REMOTE FLASH

Phase	1	2	3	4	5	6	7	8	A	B	C	D	E	F	G	H
FLASH																
YEL																
ALT																
ENTER				1												
EXIT		1														

Test A = Remote Flash: (0 = no & 1 = yes)

6. TIME BASE - 0. SPC FUNCTION MAPPING

FUNCTION NAME
 AS 8-15 = OLI - P FL G PHS
 AS 8-15 = OLI - P FL R PHS

SPC FUNC							
1	2	3	4	5	6	7	8

NOTE: Go up after entering to get this screen.

4. UNIT DATA - 6. ALT SEQ. 08-15
EPAC ALT SEQ (PHASE PAIR TO REVERSE)

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
08						
09						
10						
11						

SEQ	.PP1.	.PP2.	.PP3.	.PP4.	.PP5.	.PP6.
12						
13						
14						
15						

4. UNIT DATA - 3. OVERLAP STANDARD

Phase	1	2	3	4	5	6	7	8	CH#
Overlap A									
Overlap B									
Overlap C									
Overlap D									
Overlap E									
Overlap F									
Overlap G									
Overlap H									

Phase	1	2	3	4	5	6	7	8	CH#
Overlap I									
Overlap J									
Overlap K									
Overlap L									
Overlap M									
Overlap N									
Overlap O									
Overlap P									

Enter a "1" in the channel # shown.

0 = Phase not part of overlap; 1 = Phase part of overlap.

4. UNIT DATA - 4. OVERLAP SPECIAL

Overlap	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail green																
Trail yellow																
Trail red																
-Green / -yellow (-G/Y)																
+Green (+GRN)																

- * Overlap green omitted by # - phase green; Overlap yellow omitted by # - phase yellow
- * For FYA operation, '-G/Y' entry defines the phase that is the green arrow
- * For FYA operation, '+GRN' entry is the thru phase opposing the FYA phase

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

4. UNIT DATA - 8. I/O MISCELLANEOUS

Ring#	1	2	3	4	CONN	MODE
Input Response	1				"D"	
Output Select	1				"D"	

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

I/O Modes	INPUT	OUTPUT
"ABC" Connector		
"D" Connector		

Controller with Solo Detection:

EPAC300/M52 enter "1" under D Conn Input

2070 enter "0" under D Conn Input

5. COORDINATION DATA - 1. COORD SETUP

	0	1	2	3	4	5
OPER: <u>1</u>	FRE	AUT	MAN	-----	-----	-----
MODE: <u>0</u>	PRM	YLD	PYL	POM	SOM	FAC
MAX : <u>0</u>	INH	MX1	MX2	-----	-----	-----
CORR: <u>2</u>	DWL	MDW	SWY	SW+	-----	-----
OFST: _____	BEG	END OF GREEN				
FRCE: _____	PLN CYC LE TIME					
MX DWELL: _____	YIELD PERIOD:					

5. COORDINATION DATA - 2. MANUAL CONTROL

DIAL: _____ SPLIT: _____ OFFSET: _____ SYNC: _____

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

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

Sequence: 00 - 15 (Unit data has definition)

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

Time: 00 - 99 seconds.

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

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

PHASE	1	2	3	4	5	6	7	8
TIME		85		25				
MODE		1		0				

DIAL 1 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 1 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 1 CYCLE LENGTH: *90 Secs*

PHASE	1	2	3	4	5	6	7	8
TIME		60		30				
MODE		1		0				

DIAL 2 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 2 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	40		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME	31		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

5. COORDINATION DATA - 3. DIAL/SPLIT DATA

LEVEL 2

DIAL 3 / SPLIT 1 CYCLE LENGTH: *120 secs*

PHASE	1	2	3	4	5	6	7	8
TIME		96		24				
MODE		1		0				

DIAL 3 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 3 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 1 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 2 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 3 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

DIAL 4 / SPLIT 4 CYCLE LENGTH:

PHASE	1	2	3	4	5	6	7	8
TIME								
MODE								

LEVEL 1

OFFSET	1	2	3
TIME	82		
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			
OFFSET	1	2	3
TIME			
SEQUENCE			
RING 2 LAG			
RING 3 LAG			
RING 4 LAG			

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

7. PREEMPT DATA - 1. ALL PREEMPTS

RING TIMES	1	2	3	4	
MIN GREEN/WALK					
OVERRIDE	FL	1/2	2/3	3/4	4/5 5/6
STATUS					
CODES	0 = NO, 1 = YES				

7. PREEMPT DATA - PREEMPT 1

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

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

RING	1	2	3	4	5	6	7	8
EXIT								
CALLS								

2. INTERVAL TIMES:

SEL PED CLR : ___ TRK YEL CHG : ___
 SEL YEL CHG : ___ TRK RED CLR : ___
 SEL RED CLR : ___ DWELL GREEN: ___
 TRACK GREEN: ___ RET PED CLR : ___
 TRK PED CLR : ___ RET YEL CHG : ___
 RET YEL CLR : ___

3. VEHICLE STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)								
CYCLE								
(0=no, 1=act, 2=min recall, 3=max recall)								

4. PEDESTRIAN STATUS:

PHASE	1	2	3	4	5	6	7	8
TRK GRN								
DWELL								
(0=dont wlk, 1=wlk, 2=flwlk, 3=dark)								
CYCLE								
(0 = no, 1 = act, 2 = recall)								

5. OVERLAP STATUS:

OVERLAP	A	B	C	D
TRK GRN				
DWELL				
(0=red, 1=grn, 2=flr, 3=fly, 4=dark)				
CYCLE				
(0 = no, 1 = act)				

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

TEST..: ___	N-LOCK.: ___	SKIP.....: ___						
DELAY: ___	EXTEND: ___	DURATION: ___						
DWELL: ___	MXCALL: ___	LOCK OUT: ___						
RING	1	2	3	4	5	6	7	8
DWELL								
CALLS								

SIGNAL PHASING

PHASE#	ROAD	PHASE	LOAD SW	FLASH
1				
2	EB M-59	A	2	A
3				
4	X10 W10 ORMOND	B	4	R
5				
6				
7				
8				
OLA				
OLB				
OLC				
OLD				
1PED				
2PED				
3PED				
4PED				
5PED				
6PED				
7PED				
8PED				

Controller Information Sheet
4 Phase EPAC

Intersection : EB M-59 & X/O W/O Ormond
City/Twp : White Lake
State No. : 63041-01-113
County No. : 4132
Prepared By : Dawn Bierlein
Date : 07/28/20

Phasing:

Load Switch 2: EB M-59	A	FLA
Load Switch 4: X/O W/O Ormond	B	FLR

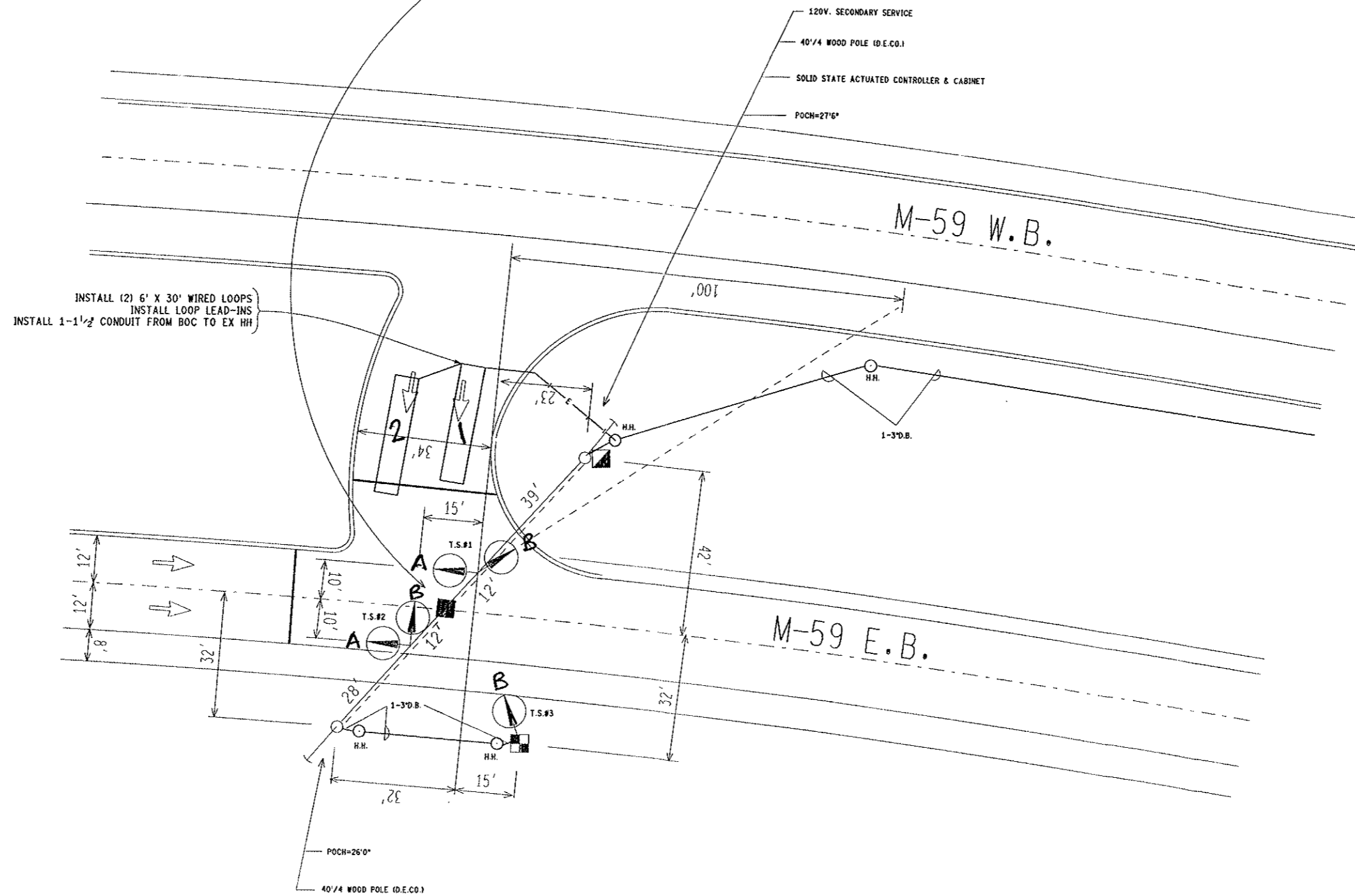
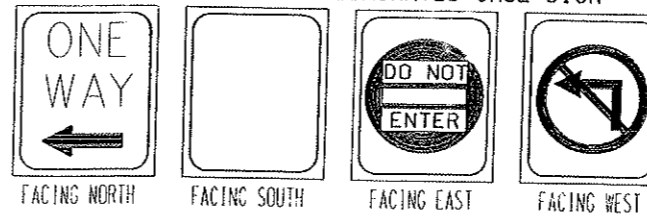
Jumpers:

121-213, 151-152, 153-154, 155-156, 173-174, 175-176, 177-178, 233-PB1, 237-PB1, 241-PB1,
255-256, 257-258, 259-260, 261-262, 263-PB1.

MMU: (MENU : SET/VIEW CONFIG)

Dual Indication Enable:	R+G: Channel 2, 4 R+Y: Channel 2, 4 G+Y: Channel 2, 4
Red Fail Enable:	Enable: Channel 2 & 4
Y & R Clearance Disable:	Channel 2 & 4 Enabled
Unit Options:	All OFF except: Recurrent pulse Program Memory Card
Program Card:	Compatible Channels: None Min Flash Time : 4+2+1 Min Yellow Change Disable: None Voltage Monitor Latch: NONE

24"X30" 4-WAY ILLUMINATED CASE SIGN

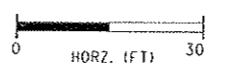


INSTALL (2) 6' X 30' WIRED LOOPS
 INSTALL LOOP LEAD-INS
 INSTALL 1-1/2" CONDUIT FROM BOC TO EX HH

- 120V. SECONDARY SERVICE
- 40/4 WOOD POLE (D.E.CO.)
- SOLID STATE ACTUATED CONTROLLER & CABINET
- POCH=27'6"

64132

FINAL ROW PLAN REVISIONS		SUBMITTAL DATE:	
NO.	DATE	NO.	DATE



DATE: 2/27/20	CS: 63041
DESIGN UNIT: SIGNALS	JN:
TSC: OAKLAND	TWA#17774

TRAFFIC SIGNAL CONSTRUCTION SHEET	
M-59 (HIGHLAND) EB @ X-OVER W OF ORMOND RD	
WHITE LAKE TWP, OAKLAND COUNTY	
DRAWING	SHEET
SIGNAL	SECT 1
M-59	CON001

SIGNALS	
OPENINGS:	19
CYCLIC WATTS:	2250
STEADY WATTS:	300
PLAN: 63041-01-113	

Appendix 2

Existing LOS Output Reports

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗	
Traffic Vol, veh/h	0	0	0	978	69	0
Future Vol, veh/h	0	0	0	978	69	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	92
Heavy Vehicles, %	2	2	6	6	6	5
Mvmt Flow	0	0	0	1029	115	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 515
Stage 1	-	- 0
Stage 2	-	- 515
Critical Hdwy	-	- 6.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	- 5.92
Follow-up Hdwy	-	- 3.56
Pot Cap-1 Maneuver	0	- 480
Stage 1	0	-
Stage 2	0	- 553
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 480
Mov Cap-2 Maneuver	-	- 480
Stage 1	-	-
Stage 2	-	- 553

Approach	WB	NB
HCM Control Delay, s	0	14.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	480	-
HCM Lane V/C Ratio	0.24	-
HCM Control Delay (s)	14.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.9	-

Intersection						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1459	49	0	0	0	126
Future Vol, veh/h	1459	49	0	0	0	126
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1603	54	0	0	0	159

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	802
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	325
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	325
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	26.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	325	-	-
HCM Lane V/C Ratio	0.491	-	-
HCM Control Delay (s)	26.3	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.6	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	991	56	0	51
Future Vol, veh/h	0	0	991	56	0	51
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	6	6	2	2
Mvmt Flow	0	0	1066	60	0	85

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.9
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	491
HCM Lane V/C Ratio	-	-	0.173
HCM Control Delay (s)	-	-	13.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2021 Existing Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1444	0	0	64	0
Future Vol, veh/h	0	1444	0	0	64	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	89	89	92	92	73	95
Heavy Vehicles, %	4	4	2	2	6	6
Mvmt Flow	0	1622	0	0	88	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	811	-
Stage 1	-	-	0	-
Stage 2	-	-	811	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	309	0
Stage 1	0	-	-	0
Stage 2	0	-	387	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	309	-
Mov Cap-2 Maneuver	-	-	309	-
Stage 1	-	-	-	-
Stage 2	-	-	387	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	309
HCM Lane V/C Ratio	-	0.284
HCM Control Delay (s)	-	21.2
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	1.1

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	978	12	0
Future Vol, veh/h	0	0	0	978	12	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1029	20	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 515
Stage 1	-	- 0
Stage 2	-	- 515
Critical Hdwy	-	- 6.96
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.96
Follow-up Hdwy	-	- 3.58
Pot Cap-1 Maneuver	0	- 475 0
Stage 1	0	- - 0
Stage 2	0	- 548 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 475 -
Mov Cap-2 Maneuver	-	- 475 -
Stage 1	-	- - -
Stage 2	-	- 548 -

Approach	WB	NB
HCM Control Delay, s	0	12.9
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	475	-
HCM Lane V/C Ratio	0.042	-
HCM Control Delay (s)	12.9	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.1	-

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1444	4	0	0	0	0	0	5	7	9	0
Future Vol, veh/h	0	1444	4	0	0	0	0	0	5	7	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	14688	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1604	4	0	0	0	0	0	8	10	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	802	802	1608	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	802	1608	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	331	268	100	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	335	156	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	331	262	100	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	262	100	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	327	156	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.1	36.7
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	331	-	-	137
HCM Lane V/C Ratio	0.024	-	-	0.174
HCM Control Delay (s)	16.1	-	-	36.7
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	76
Average Queue (ft)	34
95th Queue (ft)	63
Link Distance (ft)	32
Upstream Blk Time (%)	13
Queuing Penalty (veh)	10
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	127
Average Queue (ft)	44
95th Queue (ft)	92
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	71
Average Queue (ft)	20
95th Queue (ft)	46
Link Distance (ft)	450
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	82
Average Queue (ft)	33
95th Queue (ft)	66
Link Distance (ft)	34
Upstream Blk Time (%)	13
Queuing Penalty (veh)	9
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	44
Average Queue (ft)	9
95th Queue (ft)	34
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	29	56
Average Queue (ft)	4	15
95th Queue (ft)	18	44
Link Distance (ft)	507	51
Upstream Blk Time (%)		1
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	10
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	12
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	10
Average Queue (ft)	0
95th Queue (ft)	7
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 19

Intersection						
Int Delay, s/veh	1.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1933	57	0
Future Vol, veh/h	0	0	0	1933	57	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	94
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2035	80	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	1018
Stage 1	-	0
Stage 2	-	1018
Critical Hdwy	-	6.9
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.9
Follow-up Hdwy	-	3.55
Pot Cap-1 Maneuver	0	228
Stage 1	0	-
Stage 2	0	303
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	228
Mov Cap-2 Maneuver	-	228
Stage 1	-	-
Stage 2	-	303

Approach	WB	NB
HCM Control Delay, s	0	29.1
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	228	-
HCM Lane V/C Ratio	0.352	-
HCM Control Delay (s)	29.1	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	1.5	-

Intersection						
Int Delay, s/veh	1.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1505	141	0	0	0	107
Future Vol, veh/h	1505	141	0	0	0	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1584	148	0	0	0	145

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	792
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	328
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	328
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	24.4
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	328	-	-
HCM Lane V/C Ratio	0.441	-	-
HCM Control Delay (s)	24.4	-	-
HCM Lane LOS	C	-	-
HCM 95th %tile Q(veh)	2.2	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1930	60	0	57
Future Vol, veh/h	0	0	1930	60	0	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	3	3	2	2
Mvmt Flow	0	0	2032	63	0	80

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1016
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 236
Stage 1	-	0 -
Stage 2	-	0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 236
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	27.9
HCM LOS		D

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	236
HCM Lane V/C Ratio	-	-	0.34
HCM Control Delay (s)	-	-	27.9
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.4

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2021 Existing Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	2.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1514	0	0	132	0
Future Vol, veh/h	0	1514	0	0	132	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	95
Heavy Vehicles, %	2	2	2	2	2	3
Mvmt Flow	0	1594	0	0	163	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	797	-
Stage 1	-	-	0	-
Stage 2	-	-	797	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	324	0
Stage 1	0	-	-	0
Stage 2	0	-	404	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	324	-
Mov Cap-2 Maneuver	-	-	324	-
Stage 1	-	-	-	-
Stage 2	-	-	404	-

Approach	EB	SB
HCM Control Delay, s	0	26.8
HCM LOS		D

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	324
HCM Lane V/C Ratio	-	0.503
HCM Control Delay (s)	-	26.8
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	2.7

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1855	19	0
Future Vol, veh/h	0	0	0	1855	19	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	95
Heavy Vehicles, %	2	2	2	2	11	2
Mvmt Flow	0	0	0	1953	32	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 977
Stage 1	-	- 0
Stage 2	-	- 977
Critical Hdwy	-	- 7.02
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.02
Follow-up Hdwy	-	- 3.61
Pot Cap-1 Maneuver	0	- 233 0
Stage 1	0	- - 0
Stage 2	0	- 305 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 233 -
Mov Cap-2 Maneuver	-	- 233 -
Stage 1	-	- - -
Stage 2	-	- 305 -

Approach	WB	NB
HCM Control Delay, s	0	22.9
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	233	-
HCM Lane V/C Ratio	0.136	-
HCM Control Delay (s)	22.9	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.5	-

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1490	9	0	0	0	0	0	23	20	13	0
Future Vol, veh/h	0	1490	9	0	0	0	0	0	23	20	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	16224	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	60	60	60	68	68	92
Heavy Vehicles, %	2	2	2	2	2	2	0	0	0	4	4	2
Mvmt Flow	0	1568	9	0	0	0	0	0	38	29	19	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	784	784	1577	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	784	1577	-
Critical Hdwy	-	-	-	-	-	6.9	7.58	6.58	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.58	5.58	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.54	4.04	-
Pot Cap-1 Maneuver	0	-	-	0	0	340	280	106	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	348	165	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	340	248	106	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	248	106	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	309	165	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.5
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	340	-	-	162
HCM Lane V/C Ratio	0.113	-	-	0.3
HCM Control Delay (s)	16.9	-	-	36.5
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	1.2

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	90
Average Queue (ft)	43
95th Queue (ft)	83
Link Distance (ft)	32
Upstream Blk Time (%)	38
Queuing Penalty (veh)	22
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	128
Average Queue (ft)	39
95th Queue (ft)	85
Link Distance (ft)	270
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	127
Average Queue (ft)	35
95th Queue (ft)	88
Link Distance (ft)	941
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	55
95th Queue (ft)	88
Link Distance (ft)	34
Upstream Blk Time (%)	41
Queuing Penalty (veh)	55
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	58
Average Queue (ft)	16
95th Queue (ft)	47
Link Distance (ft)	48
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	EB	NB	SB
Directions Served	R	R	LT
Maximum Queue (ft)	4	41	56
Average Queue (ft)	0	14	23
95th Queue (ft)	3	38	51
Link Distance (ft)		507	51
Upstream Blk Time (%)			2
Queuing Penalty (veh)			1
Storage Bay Dist (ft)	280		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	4
95th Queue (ft)	23
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	84
Average Queue (ft)	7
95th Queue (ft)	41
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	37
Average Queue (ft)	2
95th Queue (ft)	18
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	31
Average Queue (ft)	1
95th Queue (ft)	13
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 79

Appendix 3

Background LOS Output Reports

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Background Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↔	
Traffic Vol, veh/h	0	0	0	1008	71	0
Future Vol, veh/h	0	0	0	1008	71	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	2	6	5	5
Mvmt Flow	0	0	0	1061	77	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	531
Stage 1	-	0
Stage 2	-	531
Critical Hdwy	-	6.9
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.9
Follow-up Hdwy	-	3.55
Pot Cap-1 Maneuver	0	471
Stage 1	0	0
Stage 2	0	546
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	471
Mov Cap-2 Maneuver	-	471
Stage 1	-	-
Stage 2	-	546

Approach	WB	NB
HCM Control Delay, s	0	14.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	471	-
HCM Lane V/C Ratio	0.164	-
HCM Control Delay (s)	14.1	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.6	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Background Condition
AM Peak Hour

Intersection						
Int Delay, s/veh	2.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1503	51	0	0	0	130
Future Vol, veh/h	1503	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1652	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	826
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	313
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	313
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	28.6
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	313	-	-
HCM Lane V/C Ratio	0.526	-	-
HCM Control Delay (s)	28.6	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.9	-	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1021	58	0	53
Future Vol, veh/h	0	0	1021	58	0	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	6	6	2	2
Mvmt Flow	0	0	1098	62	0	88

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	14.2
HCM LOS		B

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	480
HCM Lane V/C Ratio	-	-	0.184
HCM Control Delay (s)	-	-	14.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.7

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1488	0	0	66	0
Future Vol, veh/h	0	1488	0	0	66	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1672	0	0	90	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	836	-
Stage 1	-	-	0	-
Stage 2	-	-	836	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	298	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	298	-
Mov Cap-2 Maneuver	-	-	298	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

Approach	EB	SB
HCM Control Delay, s	0	22.3
HCM LOS		C

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	298
HCM Lane V/C Ratio	-	0.303
HCM Control Delay (s)	-	22.3
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	1.2

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1008	12	0
Future Vol, veh/h	0	0	0	1008	12	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1061	20	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 531
Stage 1	-	- 0
Stage 2	-	- 531
Critical Hdwy	-	- 6.96
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.96
Follow-up Hdwy	-	- 3.58
Pot Cap-1 Maneuver	0	- 464 0
Stage 1	0	- - 0
Stage 2	0	- 537 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 464 -
Mov Cap-2 Maneuver	-	- 464 -
Stage 1	-	- - -
Stage 2	-	- 537 -

Approach	WB	NB
HCM Control Delay, s	0	13.1
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	464	-
HCM Lane V/C Ratio	0.043	-
HCM Control Delay (s)	13.1	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.1	-

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1488	4	0	0	0	0	0	5	7	9	0
Future Vol, veh/h	0	1488	4	0	0	0	0	0	5	7	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084909568	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	92
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	2
Mvmt Flow	0	1653	4	0	0	0	0	0	8	10	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	827	827	1657	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	827	1657	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	319	257	93	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	324	147	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	319	251	93	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	251	93	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	316	147	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.6	39.5
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	319	-	-	128
HCM Lane V/C Ratio	0.025	-	-	0.187
HCM Control Delay (s)	16.6	-	-	39.5
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	0.7

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	87
Average Queue (ft)	36
95th Queue (ft)	68
Link Distance (ft)	32
Upstream Blk Time (%)	15
Queuing Penalty (veh)	11
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	136
Average Queue (ft)	52
95th Queue (ft)	104
Link Distance (ft)	270
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	89
Average Queue (ft)	22
95th Queue (ft)	59
Link Distance (ft)	449
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	EB	SB
Directions Served	T	L
Maximum Queue (ft)	7	81
Average Queue (ft)	0	36
95th Queue (ft)	5	63
Link Distance (ft)	133	33
Upstream Blk Time (%)		18
Queuing Penalty (veh)		13
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	40
Average Queue (ft)	8
95th Queue (ft)	32
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	28	54
Average Queue (ft)	6	12
95th Queue (ft)	24	39
Link Distance (ft)	507	53
Upstream Blk Time (%)		0
Queuing Penalty (veh)		0
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	17
Average Queue (ft)	1
95th Queue (ft)	11
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	26
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	
Directions Served	
Maximum Queue (ft)	
Average Queue (ft)	
95th Queue (ft)	
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement

Directions Served

Maximum Queue (ft)

Average Queue (ft)

95th Queue (ft)

Link Distance (ft)

Upstream Blk Time (%)

Queuing Penalty (veh)

Storage Bay Dist (ft)

Storage Blk Time (%)

Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 24

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Background Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗	
Traffic Vol, veh/h	0	0	0	1992	59	0
Future Vol, veh/h	0	0	0	1992	59	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	94
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2097	83	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1049
Stage 1	-	- 0
Stage 2	-	- 1049
Critical Hdwy	-	- 6.9
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.9
Follow-up Hdwy	-	- 3.55
Pot Cap-1 Maneuver	0	- 218
Stage 1	0	- - 0
Stage 2	0	- 292
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 218
Mov Cap-2 Maneuver	-	- 218
Stage 1	-	- -
Stage 2	-	- 292

Approach	WB	NB
HCM Control Delay, s	0	31.3
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	218	-
HCM Lane V/C Ratio	0.381	-
HCM Control Delay (s)	31.3	-
HCM Lane LOS	D	-
HCM 95th %tile Q(veh)	1.7	-

Intersection						
Int Delay, s/veh	2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1551	145	0	0	0	110
Future Vol, veh/h	1551	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1633	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	817
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	315
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	315
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	26.2
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	315	-	-
HCM Lane V/C Ratio	0.472	-	-
HCM Control Delay (s)	26.2	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.4	-	-

Intersection						
Int Delay, s/veh	1.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1989	62	0	59
Future Vol, veh/h	0	0	1989	62	0	59
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2094	65	0	83

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1047
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	- 0 225
Stage 1	-	- 0 -
Stage 2	-	- 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 225
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	30.1
HCM LOS		D

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	225
HCM Lane V/C Ratio	-	-	0.369
HCM Control Delay (s)	-	-	30.1
HCM Lane LOS	-	-	D
HCM 95th %tile Q(veh)	-	-	1.6

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Background Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1560	0	0	136	0
Future Vol, veh/h	0	1560	0	0	136	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1642	0	0	168	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	821	-
Stage 1	-	-	0	-
Stage 2	-	-	821	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	313	0
Stage 1	0	-	-	0
Stage 2	0	-	393	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	313	-
Mov Cap-2 Maneuver	-	-	313	-
Stage 1	-	-	-	-
Stage 2	-	-	393	-

Approach	EB	SB
HCM Control Delay, s	0	29.1
HCM LOS		D

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	313
HCM Lane V/C Ratio	-	0.536
HCM Control Delay (s)	-	29.1
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	3

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1912	20	0
Future Vol, veh/h	0	0	0	1912	20	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	95
Heavy Vehicles, %	2	2	2	2	11	2
Mvmt Flow	0	0	0	2013	33	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1007
Stage 1	-	- 0
Stage 2	-	- 1007
Critical Hdwy	-	- 7.02
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.02
Follow-up Hdwy	-	- 3.61
Pot Cap-1 Maneuver	0	- 222 0
Stage 1	0	- - 0
Stage 2	0	- 294 0
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 222 -
Mov Cap-2 Maneuver	-	- 222 -
Stage 1	-	- - -
Stage 2	-	- 294 -

Approach	WB	NB
HCM Control Delay, s	0	24.1
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	222	-
HCM Lane V/C Ratio	0.15	-
HCM Control Delay (s)	24.1	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.5	-

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1535	9	0	0	0	0	0	24	21	13	0
Future Vol, veh/h	0	1535	9	0	0	0	0	0	24	21	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	16736	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	95	95	92	92	92	60	60	60	95	95	92
Heavy Vehicles, %	2	2	2	2	2	2	0	0	0	2	2	2
Mvmt Flow	0	1616	9	0	0	0	0	0	40	22	14	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	808	808	1625	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	808	1625	-
Critical Hdwy	-	-	-	-	-	6.9	7.54	6.54	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.52	4.02	-
Pot Cap-1 Maneuver	0	-	-	0	0	328	272	101	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	341	159	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	328	239	101	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	239	101	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	299	159	-

Approach	EB	NB	SB
HCM Control Delay, s	0	17.5	34.6
HCM LOS		C	D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	328	-	-	157
HCM Lane V/C Ratio	0.122	-	-	0.228
HCM Control Delay (s)	17.5	-	-	34.6
HCM Lane LOS	C	-	-	D
HCM 95th %tile Q(veh)	0.4	-	-	0.8

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	98
Average Queue (ft)	41
95th Queue (ft)	82
Link Distance (ft)	32
Upstream Blk Time (%)	36
Queuing Penalty (veh)	22
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	126
Average Queue (ft)	43
95th Queue (ft)	89
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	100
Average Queue (ft)	32
95th Queue (ft)	76
Link Distance (ft)	940
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	91
Average Queue (ft)	55
95th Queue (ft)	91
Link Distance (ft)	34
Upstream Blk Time (%)	37
Queuing Penalty (veh)	51
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	56
Average Queue (ft)	18
95th Queue (ft)	48
Link Distance (ft)	48
Upstream Blk Time (%)	2
Queuing Penalty (veh)	1
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	38	53
Average Queue (ft)	11	25
95th Queue (ft)	32	51
Link Distance (ft)	507	51
Upstream Blk Time (%)		1
Queuing Penalty (veh)		1
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	43
Average Queue (ft)	3
95th Queue (ft)	24
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	74
Average Queue (ft)	7
95th Queue (ft)	38
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	23
Average Queue (ft)	2
95th Queue (ft)	18
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	27
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 75

Appendix 4

Trip Generation Calculations

Land Use: 210

Single-Family Detached Housing

Description

A single-family detached housing site includes any single-family detached home on an individual lot. A typical site surveyed is a suburban subdivision.

Specialized Land Use

Data have been submitted for several single-family detached housing developments with homes that are commonly referred to as patio homes. A patio home is a detached housing unit that is located on a small lot with little (or no) front or back yard. In some subdivisions, communal maintenance of outside grounds is provided for the patio homes. The three patio home sites total 299 dwelling units with overall weighted average trip generation rates of 5.35 vehicle trips per dwelling unit for weekday, 0.26 for the AM adjacent street peak hour, and 0.47 for the PM adjacent street peak hour. These patio home rates based on a small sample of sites are lower than those for single-family detached housing (Land Use 210), lower than those for single-family attached housing (Land Use 251), and higher than those for senior adult housing -- single-family (Land Use 251). Further analysis of this housing type will be conducted in a future edition of *Trip Generation Manual*.

Additional Data

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For 30 of the study sites, data on the number of residents and number of household vehicles are available. The overall averages for the 30 sites are 3.6 residents per dwelling unit and 1.5 vehicles per dwelling unit.

The sites were surveyed in the 1980s, the 1990s, the 2000s, and the 2010s in Arizona, California, Connecticut, Delaware, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Minnesota, Montana, New Jersey, North Carolina, Ohio, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Vermont, Virginia, and West Virginia.

Source Numbers

100, 105, 114, 126, 157, 167, 177, 197, 207, 211, 217, 267, 275, 293, 300, 319, 320, 356, 357, 367, 384, 387, 407, 435, 522, 550, 552, 579, 598, 601, 603, 614, 637, 711, 716, 720, 728, 735, 868, 869, 903, 925, 936, 1005, 1007, 1008, 1010, 1033, 1066, 1077, 1078, 1079

Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

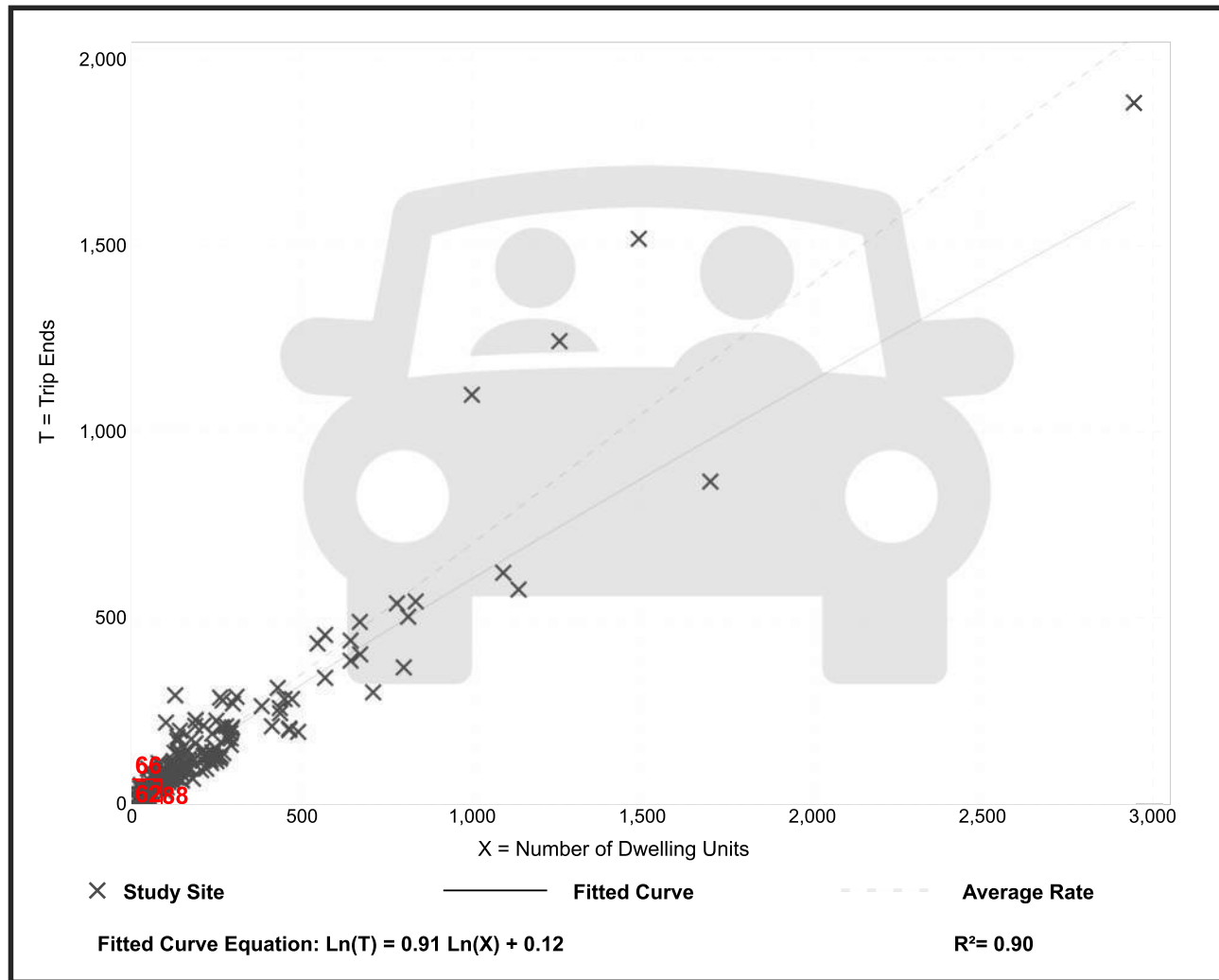
Setting/Location: General Urban/Suburban

Number of Studies: 192
 Avg. Num. of Dwelling Units: 226
 Directional Distribution: 26% entering, 74% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.70	0.27 - 2.27	0.24

Data Plot and Equation



Single-Family Detached Housing (210)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

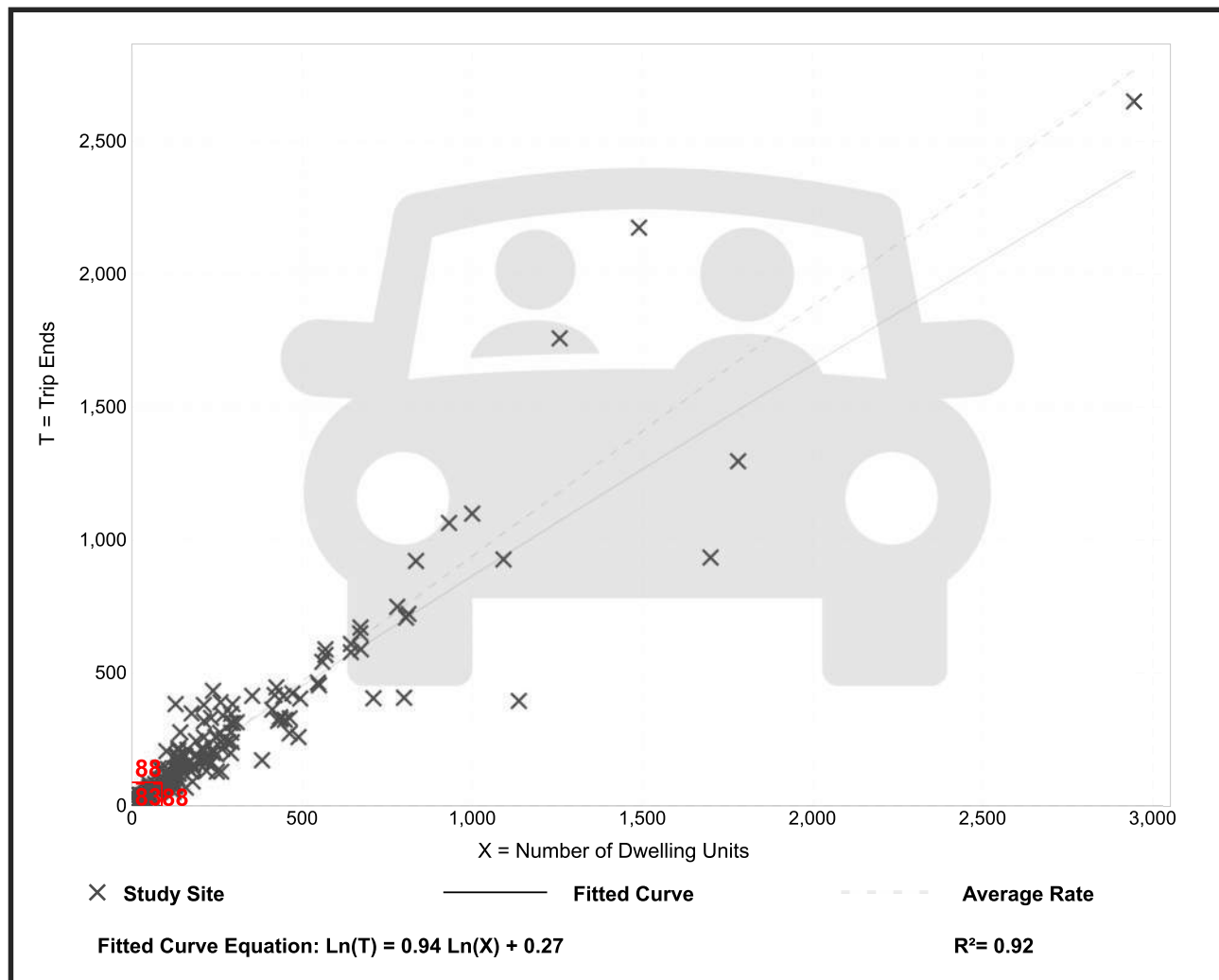
Setting/Location: General Urban/Suburban

Number of Studies: 208
 Avg. Num. of Dwelling Units: 248
 Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.94	0.35 - 2.98	0.31

Data Plot and Equation



Single-Family Detached Housing (210)

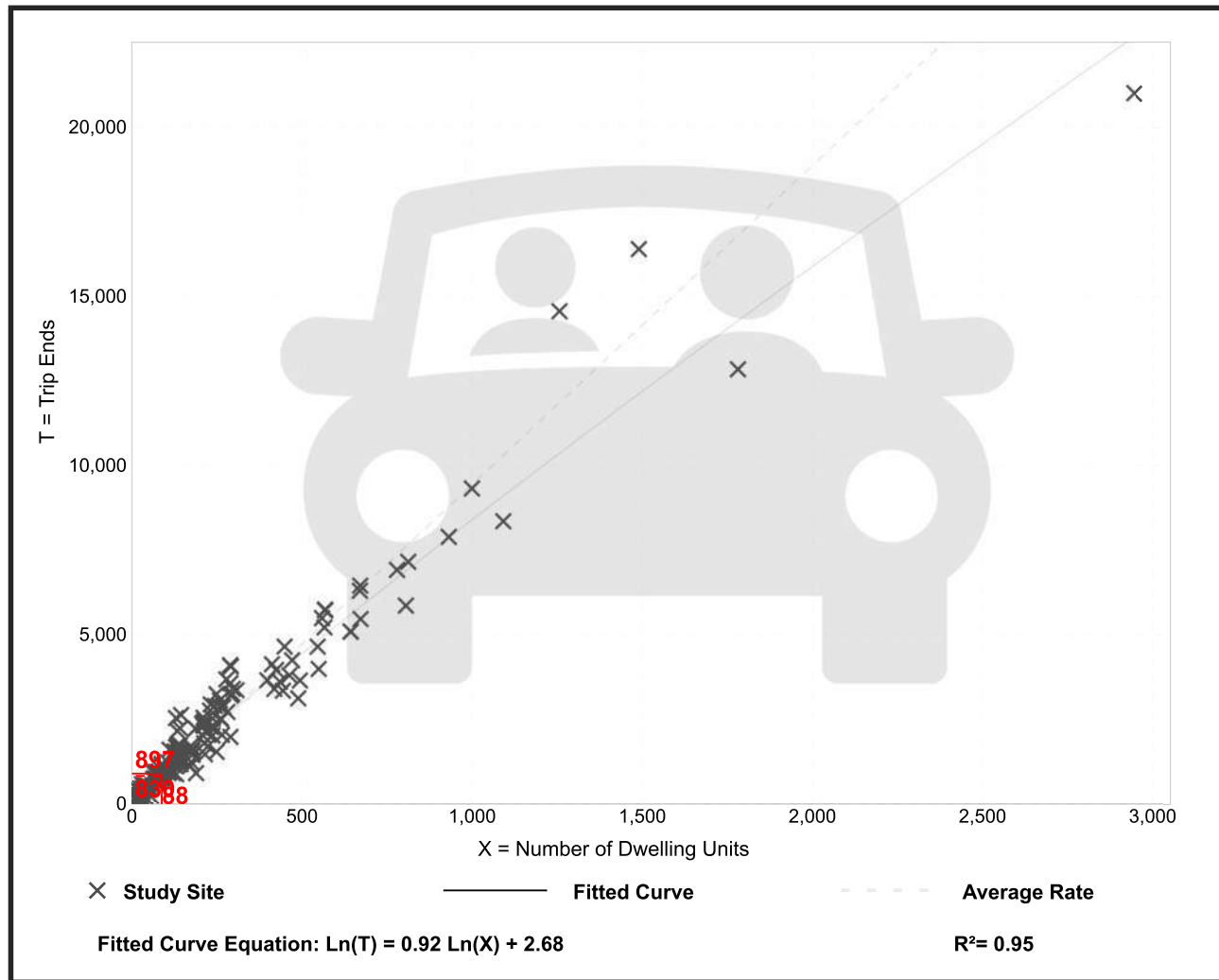
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 174
Avg. Num. of Dwelling Units: 246
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.43	4.45 - 22.61	2.13

Data Plot and Equation



Land Use: 220

Multifamily Housing (Low-Rise)

Description

Low-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have two or three floors (levels). Various configurations fit this description, including walkup apartment, mansion apartment, and stacked townhouse.

- A walkup apartment typically is two or three floors in height with dwelling units that are accessed by a single or multiple entrances with stairways and hallways.
- A mansion apartment is a single structure that contains several apartments within what appears to be a single-family dwelling unit.
- A fourplex is a single two-story structure with two matching dwelling units on the ground and second floors. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.
- A stacked townhouse is designed to match the external appearance of a townhouse. But, unlike a townhouse dwelling unit that only shares walls with an adjoining unit, the stacked townhouse units share both floors and walls. Access to the individual units is typically internal to the structure and provided through a central entry and stairway.

Multifamily housing (mid-rise) (Land Use 221), multifamily housing (high-rise) (Land Use 222), affordable housing (Land Use 223), and off-campus student apartment (low-rise) (Land Use 225) are related land uses.

Land Use Subcategory

Data are presented for two subcategories for this land use: (1) not close to rail transit and (2) close to rail transit. A site is considered close to rail transit if the walking distance between the residential site entrance and the closest rail transit station entrance is $\frac{1}{2}$ mile or less.

Additional Data

For the three sites for which both the number of residents and the number of occupied dwelling units were available, there were an average of 2.72 residents per occupied dwelling unit.

For the two sites for which the numbers of both total dwelling units and occupied dwelling units were available, an average of 96.2 percent of the total dwelling units were occupied.

The technical appendices provide supporting information on time-of-day distributions for this land use. The appendices can be accessed through either the ITETripGen web app or the trip

generation resource page on the ITE website (<https://www.ite.org/technical-resources/topics/trip-and-parking-generation/>).

For the three sites for which data were provided for both occupied dwelling units and residents, there was an average of 2.72 residents per occupied dwelling unit.

It is expected that the number of bedrooms and number of residents are likely correlated to the trips generated by a residential site. To assist in future analysis, trip generation studies of all multifamily housing should attempt to obtain information on occupancy rate and on the mix of residential unit sizes (i.e., number of units by number of bedrooms at the site complex).

The sites were surveyed in the 1980s, the 1990s, the 2000s, the 2010s, and the 2020s in British Columbia (CAN), California, Delaware, Florida, Georgia, Illinois, Indiana, Maine, Maryland, Massachusetts, Minnesota, New Jersey, Ontario (CAN), Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, and Washington.

Source Numbers

188, 204, 237, 300, 305, 306, 320, 321, 357, 390, 412, 525, 530, 579, 583, 638, 864, 866, 896, 901, 903, 904, 936, 939, 944, 946, 947, 948, 963, 964, 966, 967, 1012, 1013, 1014, 1036, 1047, 1056, 1071, 1076

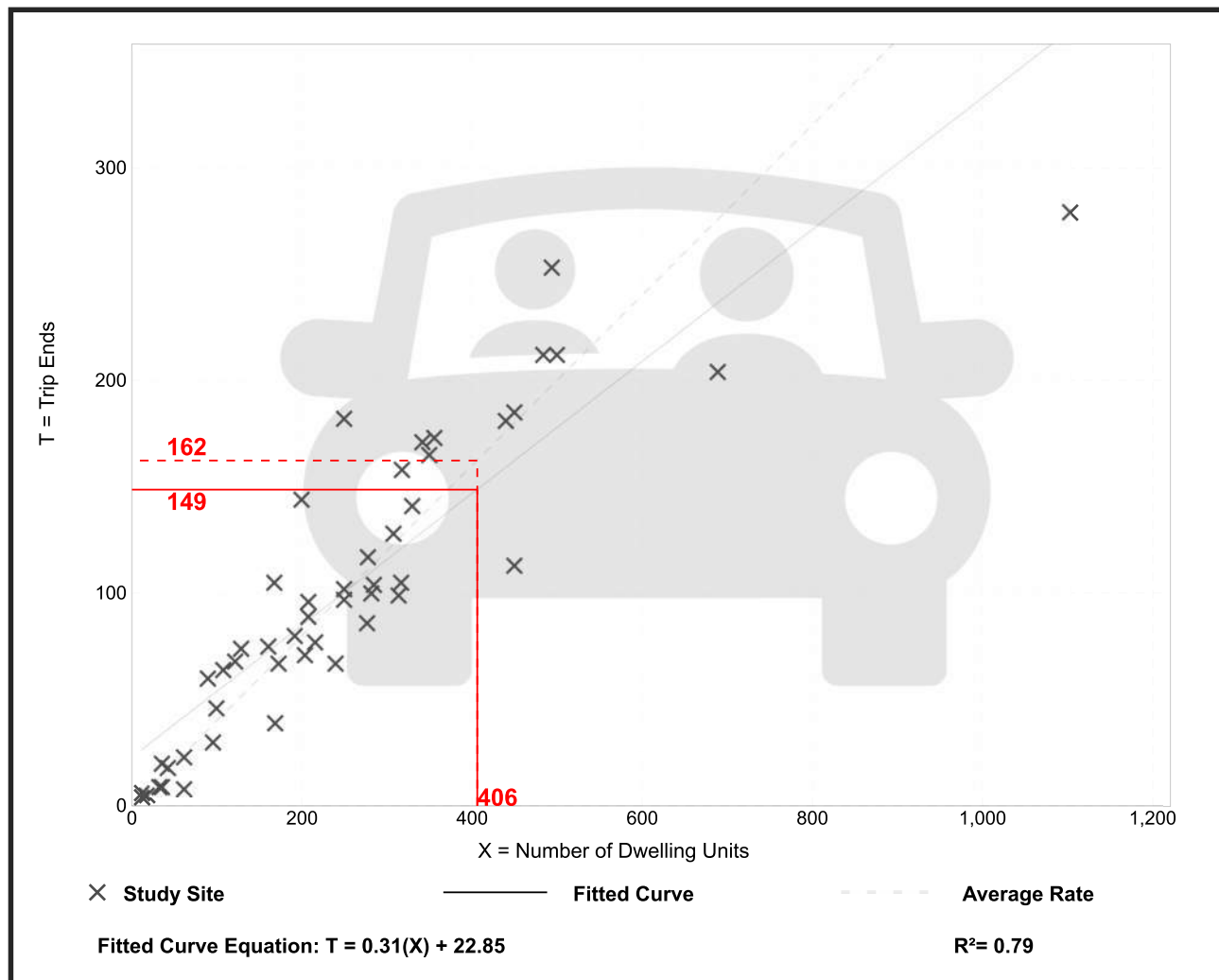
Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 49
 Avg. Num. of Dwelling Units: 249
 Directional Distribution: 24% entering, 76% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.40	0.13 - 0.73	0.12

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

Vehicle Trip Ends vs: Dwelling Units
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

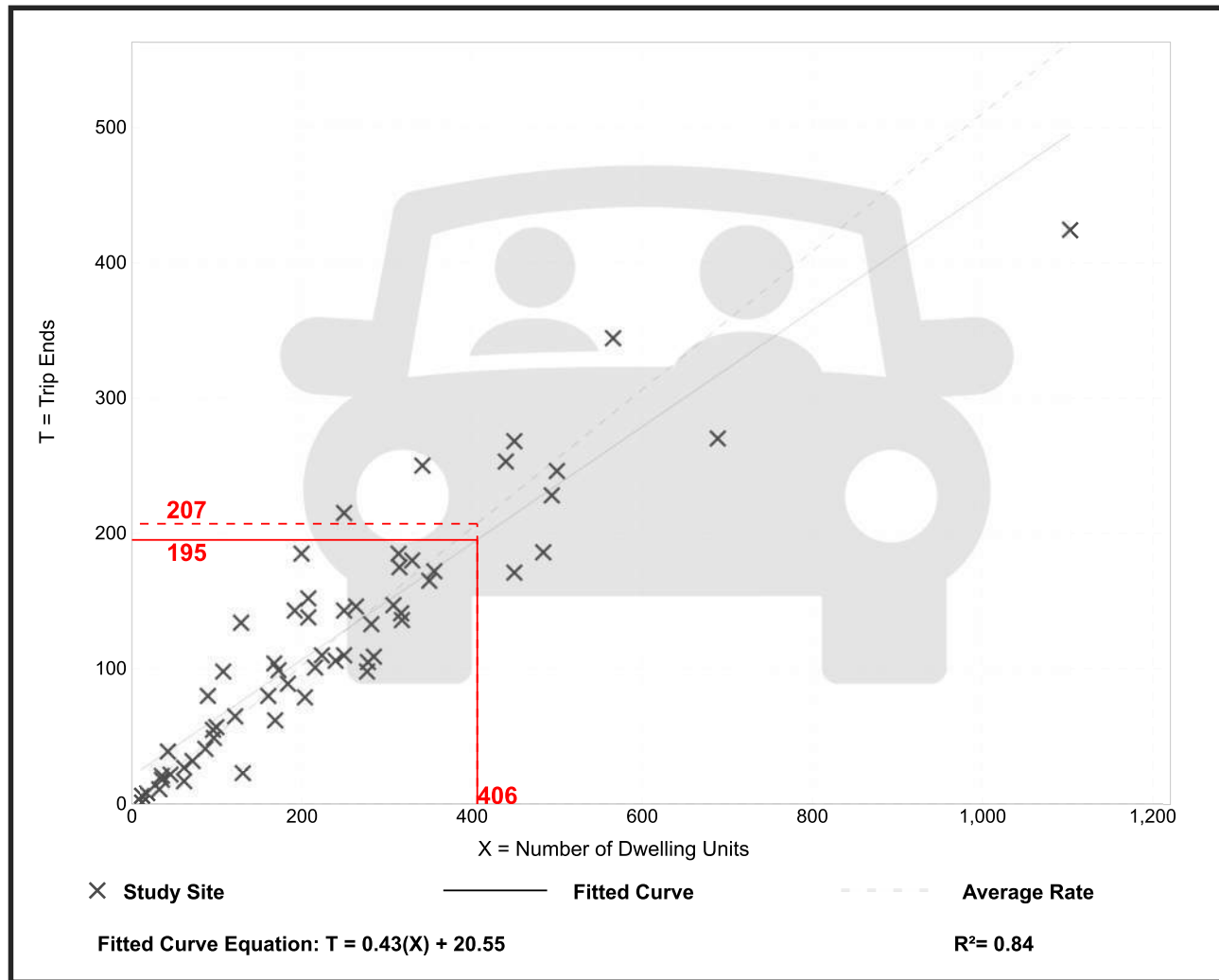
Setting/Location: General Urban/Suburban

Number of Studies: 59
 Avg. Num. of Dwelling Units: 241
 Directional Distribution: 63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.51	0.08 - 1.04	0.15

Data Plot and Equation



Multifamily Housing (Low-Rise) Not Close to Rail Transit (220)

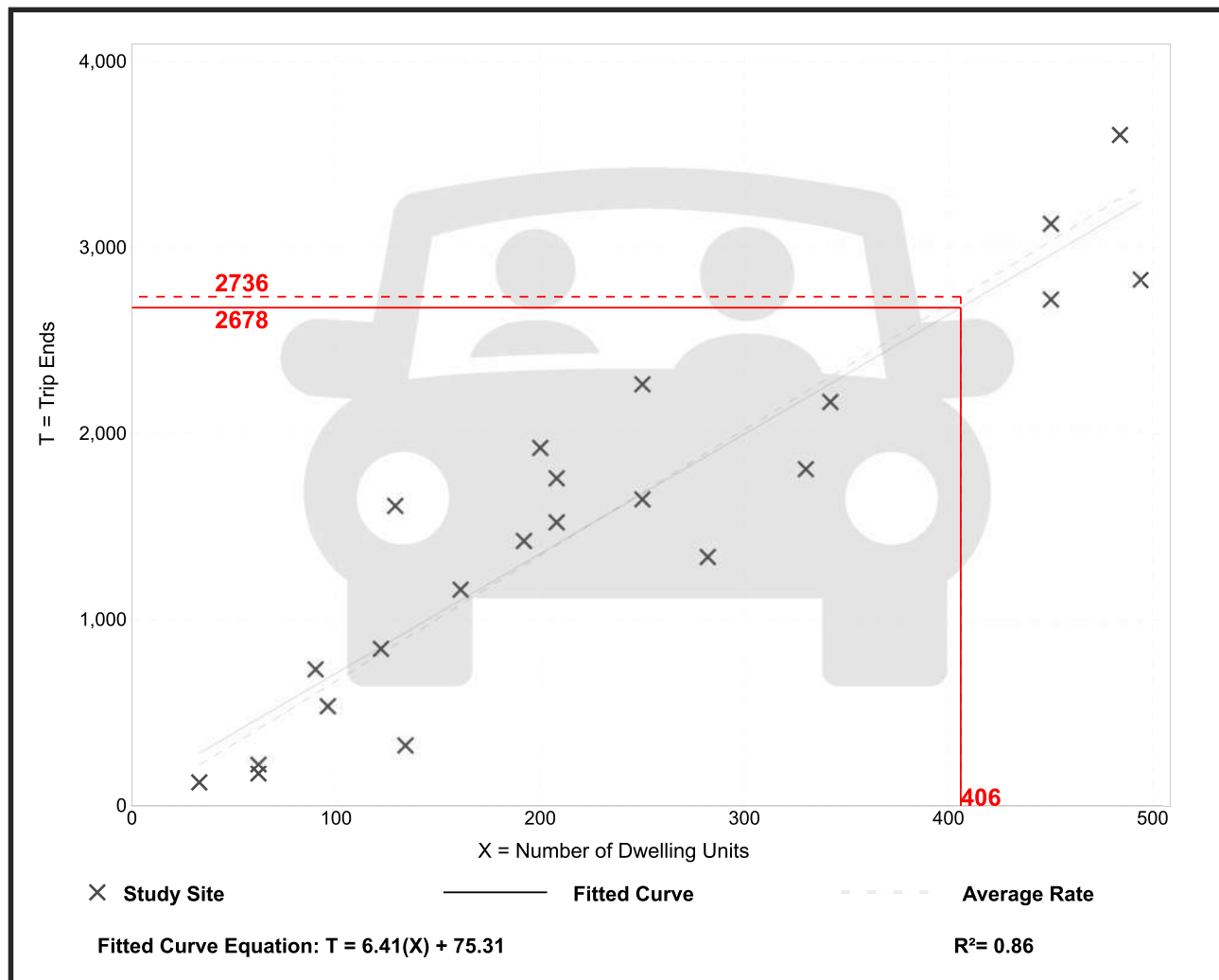
Vehicle Trip Ends vs: Dwelling Units
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 22
Avg. Num. of Dwelling Units: 229
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

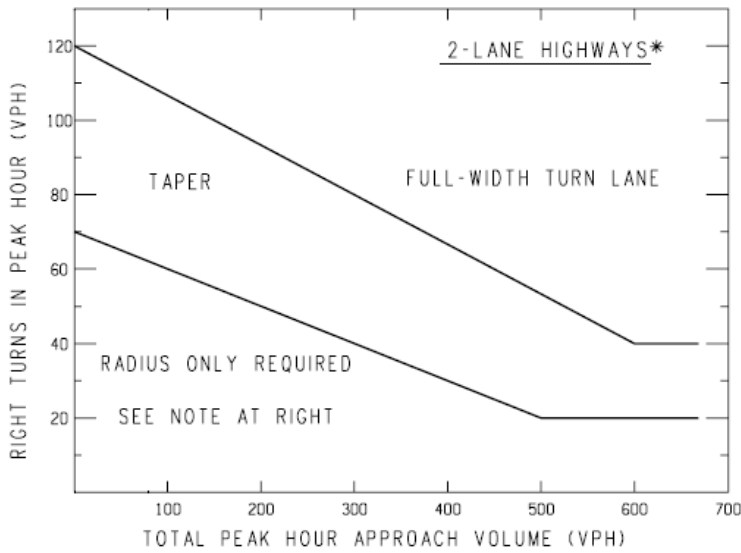
Average Rate	Range of Rates	Standard Deviation
6.74	2.46 - 12.50	1.79

Data Plot and Equation



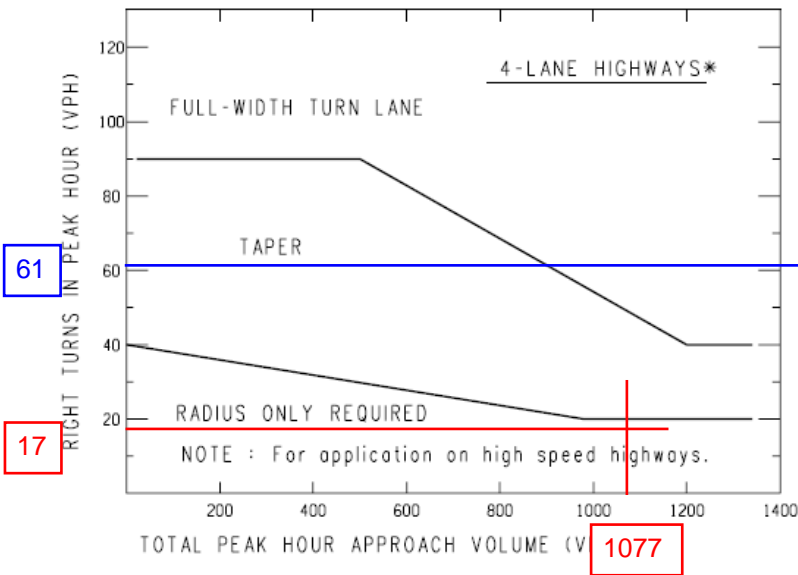
Appendix 5

Turn Lane Warrant



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



WB M-59 (Highland Road) and Driveway 4
 AM Peak Hour
 PM Peak Hour

*If a center left-turn lane exists (ie 3 or 5 lane roadway), 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.

Appendix 6

Future LOS Output Reports

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	1029	92	0
Future Vol, veh/h	0	0	0	1029	92	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	60	92
Heavy Vehicles, %	2	2	2	6	6	5
Mvmt Flow	0	0	0	1083	153	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 542
Stage 1	-	- 0
Stage 2	-	- 542
Critical Hdwy	-	- 6.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	- 5.92
Follow-up Hdwy	-	- 3.56
Pot Cap-1 Maneuver	0	- 461
Stage 1	0	-
Stage 2	0	- 536
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 461
Mov Cap-2 Maneuver	-	- 461
Stage 1	-	-
Stage 2	-	- 536

Approach	WB	NB
HCM Control Delay, s	0	16.7
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	461	-
HCM Lane V/C Ratio	0.333	-
HCM Control Delay (s)	16.7	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.4	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Condition
AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1620	51	0	0	0	130
Future Vol, veh/h	1620	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1780	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	890
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	284
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	284
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	33.8
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	284	-	-
HCM Lane V/C Ratio	0.579	-	-
HCM Control Delay (s)	33.8	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	3.4	-	-

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1028	93	0	157
Future Vol, veh/h	0	0	1028	93	0	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	8	8	2	2
Mvmt Flow	0	0	1105	100	0	262

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	21.3
HCM LOS		C

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	477
HCM Lane V/C Ratio	-	-	0.549
HCM Control Delay (s)	-	-	21.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	3.3

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1541	0	0	130	0
Future Vol, veh/h	0	1541	0	0	130	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1731	0	0	178	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	866	-
Stage 1	-	-	0	-
Stage 2	-	-	866	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	285	0
Stage 1	0	-	-	0
Stage 2	0	-	362	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	285	-
Mov Cap-2 Maneuver	-	-	285	-
Stage 1	-	-	-	-
Stage 2	-	-	362	-

Approach	EB	SB
HCM Control Delay, s	0	36.6
HCM LOS		E

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	285
HCM Lane V/C Ratio	-	0.625
HCM Control Delay (s)	-	36.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	3.9

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1055	22	0
Future Vol, veh/h	0	0	0	1055	22	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1111	37	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 444
Stage 1	-	- 0
Stage 2	-	- 444
Critical Hdwy	-	- 5.86
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.16
Follow-up Hdwy	-	- 3.88
Pot Cap-1 Maneuver	0	- 567
Stage 1	0	- - 0
Stage 2	0	- 546
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 567
Mov Cap-2 Maneuver	-	- 567
Stage 1	-	- -
Stage 2	-	- 546

Approach	WB	NB
HCM Control Delay, s	0	11.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	567	-
HCM Lane V/C Ratio	0.065	-
HCM Control Delay (s)	11.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
Future Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084905472	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1688	4	0	0	0	0	0	8	58	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	844	844	1692	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	844	1692	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	311	250	88	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	316	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	311	244	88	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	88	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	308	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.8
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	311	-	-	183
HCM Lane V/C Ratio	0.026	-	-	0.391
HCM Control Delay (s)	16.9	-	-	36.8
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	1.7

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	1	61	15	0	54
Future Vol, veh/h	44	1	61	15	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	1	66	16	0	59

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	133	74	0	0	82	0
Stage 1	74	-	-	-	-	-
Stage 2	59	-	-	-	-	-
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	861	988	-	-	1515	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	861	988	-	-	1515	-
Mov Cap-2 Maneuver	861	-	-	-	-	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	863	1515
HCM Lane V/C Ratio	-	-	0.057	-
HCM Control Delay (s)	-	-	9.4	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	56	18	74	97	1
Future Vol, veh/h	2	56	18	74	97	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	61	20	80	105	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	226	106	106	0	0
Stage 1	106	-	-	-	-
Stage 2	120	-	-	-	-
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	762	948	1485	-	-
Stage 1	918	-	-	-	-
Stage 2	905	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	751	948	1485	-	-
Mov Cap-2 Maneuver	751	-	-	-	-
Stage 1	905	-	-	-	-
Stage 2	905	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1485	-	940	-	-
HCM Lane V/C Ratio	0.013	-	0.067	-	-
HCM Control Delay (s)	7.5	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	4	1	91	2	0	153
Future Vol, veh/h	4	1	91	2	0	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	1	99	2	0	166

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	266	100	0	0	101	0
Stage 1	100	-	-	-	-	-
Stage 2	166	-	-	-	-	-
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	723	956	-	-	1491	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	723	956	-	-	1491	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	760	1491
HCM Lane V/C Ratio	-	-	0.007	-
HCM Control Delay (s)	-	-	9.8	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1060	17	0	54
Future Vol, veh/h	0	0	1060	17	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	1116	18	0	59

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	473
HCM Lane V/C Ratio	-	0.124
HCM Control Delay (s)	-	13.7
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	83
Average Queue (ft)	39
95th Queue (ft)	68
Link Distance (ft)	32
Upstream Blk Time (%)	18
Queuing Penalty (veh)	16
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	185
Average Queue (ft)	61
95th Queue (ft)	132
Link Distance (ft)	269
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	99
Average Queue (ft)	41
95th Queue (ft)	77
Link Distance (ft)	924
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	107
Average Queue (ft)	60
95th Queue (ft)	102
Link Distance (ft)	34
Upstream Blk Time (%)	40
Queuing Penalty (veh)	54
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	17
95th Queue (ft)	44
Link Distance (ft)	49
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	21	64
Average Queue (ft)	2	30
95th Queue (ft)	13	59
Link Distance (ft)	507	53
Upstream Blk Time (%)		4
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	55
Average Queue (ft)	25
95th Queue (ft)	49
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	58	17
Average Queue (ft)	28	1
95th Queue (ft)	52	8
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	4
95th Queue (ft)	20
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	WB
Directions Served	T
Maximum Queue (ft)	6
Average Queue (ft)	0
95th Queue (ft)	4
Link Distance (ft)	64
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	19
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB	WB
Directions Served	L	T
Maximum Queue (ft)	136	57
Average Queue (ft)	18	2
95th Queue (ft)	94	41
Link Distance (ft)		564
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	250	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	2	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement

Directions Served
 Maximum Queue (ft)
 Average Queue (ft)
 95th Queue (ft)
 Link Distance (ft)
 Upstream Blk Time (%)
 Queuing Penalty (veh)
 Storage Bay Dist (ft)
 Storage Blk Time (%)
 Queuing Penalty (veh)

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	48
Average Queue (ft)	3
95th Queue (ft)	24
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 75

HCM 6th TWSC
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↘	
Traffic Vol, veh/h	0	0	0	2090	109	0
Future Vol, veh/h	0	0	0	2090	109	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	-	-	-	-	0	-
Veh in Median Storage, #	2	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	95	95	71	92
Heavy Vehicles, %	2	2	2	2	5	2
Mvmt Flow	0	0	0	2200	154	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 1100
Stage 1	-	- 0
Stage 2	-	- 1100
Critical Hdwy	-	- 6.9
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 5.9
Follow-up Hdwy	-	- 3.55
Pot Cap-1 Maneuver	0	- 202
Stage 1	0	- - 0
Stage 2	0	- 274
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 202
Mov Cap-2 Maneuver	-	- 202
Stage 1	-	- -
Stage 2	-	- 274

Approach	WB	NB
HCM Control Delay, s	0	63.7
HCM LOS		F

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	202	-
HCM Lane V/C Ratio	0.76	-
HCM Control Delay (s)	63.7	-
HCM Lane LOS	F	-
HCM 95th %tile Q(veh)	5.1	-

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Condition
PM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1648	145	0	0	0	110
Future Vol, veh/h	1648	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1735	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	868
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	292
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	292
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	29.4
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	292	-	-
HCM Lane V/C Ratio	0.509	-	-
HCM Control Delay (s)	29.4	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.7	-	-

Intersection						
Int Delay, s/veh	4.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	2023	176	0	127
Future Vol, veh/h	0	0	2023	176	0	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2129	185	0	179

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1065
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- - 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- - 3.32
Pot Cap-1 Maneuver	-	- 0 219
Stage 1	-	- 0 -
Stage 2	-	- 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- - 219
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	68.2
HCM LOS		F

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	219
HCM Lane V/C Ratio	-	-	0.817
HCM Control Delay (s)	-	-	68.2
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	6.1

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1627	0	0	166	0
Future Vol, veh/h	0	1627	0	0	166	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1713	0	0	205	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	857	-
Stage 1	-	-	0	-
Stage 2	-	-	857	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	296
HCM Lane V/C Ratio	-	0.692
HCM Control Delay (s)	-	40.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	4.8

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1984	47	0
Future Vol, veh/h	0	0	0	1984	47	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	2	11	4
Mvmt Flow	0	0	0	2088	78	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	835
Stage 1	-	0
Stage 2	-	835
Critical Hdwy	-	5.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	6.22
Follow-up Hdwy	-	3.91
Pot Cap-1 Maneuver	0	355
Stage 1	0	-
Stage 2	0	331
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	355
Mov Cap-2 Maneuver	-	355
Stage 1	-	-
Stage 2	-	331

Approach	WB	NB
HCM Control Delay, s	0	18
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	355	-
HCM Lane V/C Ratio	0.221	-
HCM Control Delay (s)	18	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.8	-

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
Future Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	17248	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	63	63	60	68	68	68
Heavy Vehicles, %	5	2	2	2	2	2	0	0	0	4	4	4
Mvmt Flow	0	1697	9	0	0	0	0	0	40	56	19	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	849	849	1706	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	849	1706	-
Critical Hdwy	-	-	-	-	-	6.9	7.58	6.58	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.58	5.58	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.54	4.04	-
Pot Cap-1 Maneuver	0	-	-	0	0	308	251	89	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	318	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	308	218	89	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	218	89	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	277	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	46.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	308	-	-	159
HCM Lane V/C Ratio	0.13	-	-	0.472
HCM Control Delay (s)	18.4	-	-	46.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	2.2

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	0	63	52	1	61
Future Vol, veh/h	30	0	63	52	1	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	0	68	57	1	66

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	165	97	0	0	125	0
Stage 1	97	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	826	959	-	-	1462	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	959	-	-	1462	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	825	1462
HCM Lane V/C Ratio	-	-	0.04	0.001
HCM Control Delay (s)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	35	60	114	89	2
Future Vol, veh/h	1	35	60	114	89	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	38	65	124	97	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	352	98	99	0	0
Stage 1	98	-	-	-	-
Stage 2	254	-	-	-	-
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	646	958	1494	-	-
Stage 1	926	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	616	958	1494	-	-
Mov Cap-2 Maneuver	616	-	-	-	-
Stage 1	882	-	-	-	-
Stage 2	788	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1494	-	943	-	-
HCM Lane V/C Ratio	0.044	-	0.041	-	-
HCM Control Delay (s)	7.5	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	3	0	174	2	0	124
Future Vol, veh/h	3	0	174	2	0	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	0	189	2	0	135

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	325	190	0	0	191	0
Stage 1	190	-	-	-	-	-
Stage 2	135	-	-	-	-	-
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	669	852	-	-	1383	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	669	852	-	-	1383	-
Mov Cap-2 Maneuver	669	-	-	-	-	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	669	1383
HCM Lane V/C Ratio	-	-	0.005	-
HCM Control Delay (s)	-	-	10.4	0
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1970	61	0	36
Future Vol, veh/h	0	0	1970	61	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	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	0	0	2141	66	0	39

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1071
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 0 217
Stage 1	-	0 0 -
Stage 2	-	0 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 217
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	25.2
HCM LOS		D

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	217
HCM Lane V/C Ratio	-	0.18
HCM Control Delay (s)	-	25.2
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	111
Average Queue (ft)	67
95th Queue (ft)	111
Link Distance (ft)	32
Upstream Blk Time (%)	67
Queuing Penalty (veh)	77
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	174
Average Queue (ft)	53
95th Queue (ft)	135
Link Distance (ft)	269
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	345
Average Queue (ft)	130
95th Queue (ft)	314
Link Distance (ft)	933
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	96
Average Queue (ft)	61
95th Queue (ft)	96
Link Distance (ft)	34
Upstream Blk Time (%)	49
Queuing Penalty (veh)	83
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	WB	NB
Directions Served	T	L
Maximum Queue (ft)	6	68
Average Queue (ft)	0	36
95th Queue (ft)	4	67
Link Distance (ft)	131	49
Upstream Blk Time (%)		13
Queuing Penalty (veh)		7
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	38	55
Average Queue (ft)	13	31
95th Queue (ft)	33	59
Link Distance (ft)	507	51
Upstream Blk Time (%)		7
Queuing Penalty (veh)		4
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	51
Average Queue (ft)	19
95th Queue (ft)	46
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	44	35
Average Queue (ft)	23	5
95th Queue (ft)	48	23
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	24
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	WB	SB
Directions Served	T	R
Maximum Queue (ft)	8	19
Average Queue (ft)	0	1
95th Queue (ft)	5	10
Link Distance (ft)	64	288
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB	EB	EB
Directions Served	L	T	T
Maximum Queue (ft)	205	162	117
Average Queue (ft)	46	11	6
95th Queue (ft)	168	103	79
Link Distance (ft)		465	465
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	0
Storage Bay Dist (ft)	250		
Storage Blk Time (%)	3	0	
Queuing Penalty (veh)	22	0	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	89
Average Queue (ft)	14
95th Queue (ft)	56
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	80
Average Queue (ft)	11
95th Queue (ft)	50
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	51
Average Queue (ft)	5
95th Queue (ft)	29
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 192

Appendix 7

Future Improvement LOS Output Reports

HCM 6th Signalized Intersection Summary
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 AM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑				
Traffic Volume (veh/h)	0	0	0	0	1029	0	92	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	1029	0	92	0	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach				No			No					
Adj Sat Flow, veh/h/ln				0	1906	0	1906	1969	0			
Adj Flow Rate, veh/h				0	1083	0	153	0	0			
Peak Hour Factor				0.95	0.95	0.92	0.60	0.92	0.92			
Percent Heavy Veh, %				0	6	0	6	2	0			
Cap, veh/h				0	2776	0	201	0	0			
Arrive On Green				0.00	0.25	0.00	0.11	0.00	0.00			
Sat Flow, veh/h				0	3813	0	1875	0	0			
Grp Volume(v), veh/h				0	1083	0	153	0	0			
Grp Sat Flow(s),veh/h/ln				0	1811	0	1875	0	0			
Q Serve(g_s), s				0.0	22.3	0.0	7.1	0.0	0.0			
Cycle Q Clear(g_c), s				0.0	22.3	0.0	7.1	0.0	0.0			
Prop In Lane				0.00		0.00	1.00		0.00			
Lane Grp Cap(c), veh/h				0	2776	0	201	0	0			
V/C Ratio(X)				0.00	0.39	0.00	0.76	0.00	0.00			
Avail Cap(c_a), veh/h				0	2776	0	517	0	0			
HCM Platoon Ratio				1.00	0.33	1.00	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.93	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh				0.0	16.2	0.0	39.1	0.0	0.0			
Incr Delay (d2), s/veh				0.0	0.4	0.0	5.9	0.0	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	10.6	0.0	3.6	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	16.6	0.0	45.0	0.0	0.0			
LnGrp LOS				A	B	A	D	A	A			
Approach Vol, veh/h					1083			153				
Approach Delay, s/veh					16.6			45.0				
Approach LOS					B			D				
Timer - Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		75.2		14.8								
Change Period (Y+Rc), s		* 6.2		* 5.2								
Max Green Setting (Gmax), s		* 54		* 25								
Max Q Clear Time (g_c+I1), s		24.3		9.1								
Green Ext Time (p_c), s		7.7		0.7								
Intersection Summary												
HCM 6th Ctrl Delay				20.1								
HCM 6th LOS				C								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
 2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1620	51	0	0	0	130
Future Vol, veh/h	1620	51	0	0	0	130
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	92	92	79	79
Heavy Vehicles, %	4	4	2	2	3	3
Mvmt Flow	1780	56	0	0	0	165

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	890
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.96
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.33
Pot Cap-1 Maneuver	-	-	0	284
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	284
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	33.8
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	284	-	-
HCM Lane V/C Ratio	0.579	-	-
HCM Control Delay (s)	33.8	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	3.4	-	-

Intersection						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1028	93	0	157
Future Vol, veh/h	0	0	1028	93	0	157
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	93	93	60	60
Heavy Vehicles, %	2	2	8	8	2	2
Mvmt Flow	0	0	1105	100	0	262

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	21.3
HCM LOS		C

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	477
HCM Lane V/C Ratio	-	-	0.549
HCM Control Delay (s)	-	-	21.3
HCM Lane LOS	-	-	C
HCM 95th %tile Q(veh)	-	-	3.3

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	3.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↘	
Traffic Vol, veh/h	0	1541	0	0	130	0
Future Vol, veh/h	0	1541	0	0	130	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	89	92	92	73	92
Heavy Vehicles, %	2	4	2	2	6	2
Mvmt Flow	0	1731	0	0	178	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	866	-
Stage 1	-	-	0	-
Stage 2	-	-	866	-
Critical Hdwy	-	-	6.92	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.92	-
Follow-up Hdwy	-	-	3.56	-
Pot Cap-1 Maneuver	0	-	285	0
Stage 1	0	-	-	0
Stage 2	0	-	362	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	285	-
Mov Cap-2 Maneuver	-	-	285	-
Stage 1	-	-	-	-
Stage 2	-	-	362	-

Approach	EB	SB
HCM Control Delay, s	0	36.6
HCM LOS		E

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	285
HCM Lane V/C Ratio	-	0.625
HCM Control Delay (s)	-	36.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	3.9

HCM 6th TWSC
 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 AM Peak Hour

Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1055	22	0
Future Vol, veh/h	0	0	0	1055	22	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	5	8	4
Mvmt Flow	0	0	0	1111	37	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	- 444
Stage 1	-	- 0
Stage 2	-	- 444
Critical Hdwy	-	- 5.86
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- 6.16
Follow-up Hdwy	-	- 3.88
Pot Cap-1 Maneuver	0	- 567
Stage 1	0	- - 0
Stage 2	0	- 546
Platoon blocked, %		-
Mov Cap-1 Maneuver	-	- 567
Mov Cap-2 Maneuver	-	- 567
Stage 1	-	- -
Stage 2	-	- 546

Approach	WB	NB
HCM Control Delay, s	0	11.8
HCM LOS		B

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	567	-
HCM Lane V/C Ratio	0.065	-
HCM Control Delay (s)	11.8	-
HCM Lane LOS	B	-
HCM 95th %tile Q(veh)	0.2	-

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
Future Vol, veh/h	0	1519	4	0	0	0	0	0	5	39	9	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	1084905472	-	-	0	-	-	0	-	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	90	90	90	92	92	92	63	63	63	67	67	67
Heavy Vehicles, %	5	5	5	2	2	2	0	0	0	6	6	6
Mvmt Flow	0	1688	4	0	0	0	0	0	8	58	13	0

Major/Minor	Major1			Minor1			Minor2		
Conflicting Flow All	-	0	0	-	-	844	844	1692	-
Stage 1	-	-	-	-	-	-	0	0	-
Stage 2	-	-	-	-	-	-	844	1692	-
Critical Hdwy	-	-	-	-	-	6.9	7.62	6.62	-
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.62	5.62	-
Follow-up Hdwy	-	-	-	-	-	3.3	3.56	4.06	-
Pot Cap-1 Maneuver	0	-	-	0	0	311	250	88	0
Stage 1	0	-	-	0	0	-	-	-	0
Stage 2	0	-	-	0	0	-	316	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	311	244	88	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	244	88	-
Stage 1	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	308	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	16.9	36.8
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	311	-	-	183
HCM Lane V/C Ratio	0.026	-	-	0.391
HCM Control Delay (s)	16.9	-	-	36.8
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	1.7

Intersection						
Int Delay, s/veh	2.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	44	1	61	15	0	54
Future Vol, veh/h	44	1	61	15	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	1	66	16	0	59

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	133	74	0	0	82	0
Stage 1	74	-	-	-	-	-
Stage 2	59	-	-	-	-	-
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	861	988	-	-	1515	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	861	988	-	-	1515	-
Mov Cap-2 Maneuver	861	-	-	-	-	-
Stage 1	949	-	-	-	-	-
Stage 2	964	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.4	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	863	1515
HCM Lane V/C Ratio	-	-	0.057	-
HCM Control Delay (s)	-	-	9.4	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	56	18	74	97	1
Future Vol, veh/h	2	56	18	74	97	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	61	20	80	105	1

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	226	106	106	0	0
Stage 1	106	-	-	-	-
Stage 2	120	-	-	-	-
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	762	948	1485	-	-
Stage 1	918	-	-	-	-
Stage 2	905	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	751	948	1485	-	-
Mov Cap-2 Maneuver	751	-	-	-	-
Stage 1	905	-	-	-	-
Stage 2	905	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9.1	1.5	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1485	-	940	-	-
HCM Lane V/C Ratio	0.013	-	0.067	-	-
HCM Control Delay (s)	7.5	0	9.1	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection						
Int Delay, s/veh	0.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	4	1	91	2	0	153
Future Vol, veh/h	4	1	91	2	0	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	4	1	99	2	0	166

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	266	100	0	0	101	0
Stage 1	100	-	-	-	-	-
Stage 2	166	-	-	-	-	-
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	723	956	-	-	1491	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	723	956	-	-	1491	-
Mov Cap-2 Maneuver	723	-	-	-	-	-
Stage 1	924	-	-	-	-	-
Stage 2	863	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	760	1491
HCM Lane V/C Ratio	-	-	0.007	-
HCM Control Delay (s)	-	-	9.8	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1060	17	0	54
Future Vol, veh/h	0	0	1060	17	0	54
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	92	92
Heavy Vehicles, %	2	2	5	5	2	2
Mvmt Flow	0	0	1116	18	0	59

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	0
Stage 1	-	0
Stage 2	-	0
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

Approach	WB	SB
HCM Control Delay, s	0	13.7
HCM LOS		B

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	473
HCM Lane V/C Ratio	-	0.124
HCM Control Delay (s)	-	13.7
HCM Lane LOS	-	B
HCM 95th %tile Q(veh)	-	0.4

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	WB	WB	NB
Directions Served	T	T	LT
Maximum Queue (ft)	38	50	84
Average Queue (ft)	3	4	41
95th Queue (ft)	21	23	73
Link Distance (ft)	2262	2262	35
Upstream Blk Time (%)			17
Queuing Penalty (veh)			16
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	142
Average Queue (ft)	54
95th Queue (ft)	107
Link Distance (ft)	269
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	122
Average Queue (ft)	44
95th Queue (ft)	90
Link Distance (ft)	924
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	104
Average Queue (ft)	54
95th Queue (ft)	94
Link Distance (ft)	34
Upstream Blk Time (%)	36
Queuing Penalty (veh)	49
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	52
Average Queue (ft)	16
95th Queue (ft)	45
Link Distance (ft)	49
Upstream Blk Time (%)	1
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	29	62
Average Queue (ft)	4	32
95th Queue (ft)	19	61
Link Distance (ft)	507	53
Upstream Blk Time (%)		4
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	50
Average Queue (ft)	23
95th Queue (ft)	47
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	50	34
Average Queue (ft)	28	2
95th Queue (ft)	51	15
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	31
Average Queue (ft)	5
95th Queue (ft)	24
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	SB
Directions Served	R
Maximum Queue (ft)	22
Average Queue (ft)	1
95th Queue (ft)	16
Link Distance (ft)	288
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	5
Average Queue (ft)	0
95th Queue (ft)	5
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	200
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	66
Average Queue (ft)	7
95th Queue (ft)	38
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement

Directions Served
 Maximum Queue (ft)
 Average Queue (ft)
 95th Queue (ft)
 Link Distance (ft)
 Upstream Blk Time (%)
 Queuing Penalty (veh)
 Storage Bay Dist (ft)
 Storage Blk Time (%)
 Queuing Penalty (veh)

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	60
Average Queue (ft)	4
95th Queue (ft)	26
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 68

HCM 6th Signalized Intersection Summary
 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↑↑			↑				
Traffic Volume (veh/h)	0	0	0	0	2090	0	109	0	0	0	0	0
Future Volume (veh/h)	0	0	0	0	2090	0	109	0	0	0	0	0
Initial Q (Qb), veh				0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		1.00			
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00			
Work Zone On Approach				No			No					
Adj Sat Flow, veh/h/ln				0	1969	0	1922	1969	0			
Adj Flow Rate, veh/h				0	2200	0	154	0	0			
Peak Hour Factor				0.95	0.95	0.92	0.71	0.92	0.92			
Percent Heavy Veh, %				0	2	0	5	2	0			
Cap, veh/h				0	3005	0	191	0	0			
Arrive On Green				0.00	0.27	0.00	0.10	0.00	0.00			
Sat Flow, veh/h				0	3938	0	1875	0	0			
Grp Volume(v), veh/h				0	2200	0	154	0	0			
Grp Sat Flow(s),veh/h/ln				0	1870	0	1875	0	0			
Q Serve(g_s), s				0.0	64.4	0.0	9.6	0.0	0.0			
Cycle Q Clear(g_c), s				0.0	64.4	0.0	9.6	0.0	0.0			
Prop In Lane				0.00		0.00	1.00		0.00			
Lane Grp Cap(c), veh/h				0	3005	0	191	0	0			
V/C Ratio(X)				0.00	0.73	0.00	0.81	0.00	0.00			
Avail Cap(c_a), veh/h				0	3005	0	388	0	0			
HCM Platoon Ratio				1.00	0.33	1.00	1.00	1.00	1.00			
Upstream Filter(I)				0.00	0.58	0.00	1.00	0.00	0.00			
Uniform Delay (d), s/veh				0.0	32.3	0.0	52.7	0.0	0.0			
Incr Delay (d2), s/veh				0.0	0.9	0.0	7.8	0.0	0.0			
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(50%),veh/ln				0.0	32.1	0.0	5.0	0.0	0.0			
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh				0.0	33.3	0.0	60.5	0.0	0.0			
LnGrp LOS				A	C	A	E	A	A			
Approach Vol, veh/h					2200			154				
Approach Delay, s/veh					33.3			60.5				
Approach LOS					C			E				
Timer - Assigned Phs		2		4								
Phs Duration (G+Y+Rc), s		102.6		17.4								
Change Period (Y+Rc), s		* 6.2		* 5.2								
Max Green Setting (Gmax), s		* 84		* 25								
Max Q Clear Time (g_c+I1), s		66.4		11.6								
Green Ext Time (p_c), s		13.7		0.6								
Intersection Summary												
HCM 6th Ctrl Delay				35.1								
HCM 6th LOS				D								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 6th TWSC
2: Le Grand Court & EB M-59 (Highland Road)

2027 Future Improved Condition
PM Peak Hour

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↑				↑
Traffic Vol, veh/h	1648	145	0	0	0	110
Future Vol, veh/h	1648	145	0	0	0	110
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	92	92	74	74
Heavy Vehicles, %	2	2	2	2	4	4
Mvmt Flow	1735	153	0	0	0	149

Major/Minor	Major1		Minor1	
Conflicting Flow All	0	0	-	868
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	6.98
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.34
Pot Cap-1 Maneuver	-	-	0	292
Stage 1	-	-	0	-
Stage 2	-	-	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	292
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	NB
HCM Control Delay, s	0	29.4
HCM LOS		D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR
Capacity (veh/h)	292	-	-
HCM Lane V/C Ratio	0.509	-	-
HCM Control Delay (s)	29.4	-	-
HCM Lane LOS	D	-	-
HCM 95th %tile Q(veh)	2.7	-	-

Intersection						
Int Delay, s/veh	4.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	2023	176	0	127
Future Vol, veh/h	0	0	2023	176	0	127
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	300	-	0
Veh in Median Storage, #	-	1	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	95	95	71	71
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	2129	185	0	179

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1065
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 219
Stage 1	-	0 -
Stage 2	-	0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- 219
Mov Cap-2 Maneuver	-	- -
Stage 1	-	- -
Stage 2	-	- -

Approach	WB	SB
HCM Control Delay, s	0	68.2
HCM LOS		F

Minor Lane/Major Mvmt	WBT	WBR	SBLn1
Capacity (veh/h)	-	-	219
HCM Lane V/C Ratio	-	-	0.817
HCM Control Delay (s)	-	-	68.2
HCM Lane LOS	-	-	F
HCM 95th %tile Q(veh)	-	-	6.1

HCM 6th TWSC
 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

2027 Future Improved Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑↑			↑	
Traffic Vol, veh/h	0	1627	0	0	166	0
Future Vol, veh/h	0	1627	0	0	166	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	92	92	81	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	1713	0	0	205	0

Major/Minor	Major1		Minor2	
Conflicting Flow All	-	0	857	-
Stage 1	-	-	0	-
Stage 2	-	-	857	-
Critical Hdwy	-	-	6.84	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	5.84	-
Follow-up Hdwy	-	-	3.52	-
Pot Cap-1 Maneuver	0	-	296	0
Stage 1	0	-	-	0
Stage 2	0	-	376	0
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	296	-
Mov Cap-2 Maneuver	-	-	296	-
Stage 1	-	-	-	-
Stage 2	-	-	376	-

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

Minor Lane/Major Mvmt	EBT	SBLn1
Capacity (veh/h)	-	296
HCM Lane V/C Ratio	-	0.692
HCM Control Delay (s)	-	40.6
HCM Lane LOS	-	E
HCM 95th %tile Q(veh)	-	4.8

HCM 6th TWSC
 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

2027 Future Improved Condition
 PM Peak Hour

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑↑	↑	
Traffic Vol, veh/h	0	0	0	1984	47	0
Future Vol, veh/h	0	0	0	1984	47	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	-	-	-	-	0	-
Veh in Median Storage, #	3	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	95	60	88
Heavy Vehicles, %	2	2	5	2	11	4
Mvmt Flow	0	0	0	2088	78	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	835
Stage 1	-	0
Stage 2	-	835
Critical Hdwy	-	5.92
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	6.22
Follow-up Hdwy	-	3.91
Pot Cap-1 Maneuver	0	355
Stage 1	0	-
Stage 2	0	331
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	355
Mov Cap-2 Maneuver	-	355
Stage 1	-	-
Stage 2	-	331

Approach	WB	NB
HCM Control Delay, s	0	18
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	355	-
HCM Lane V/C Ratio	0.221	-
HCM Control Delay (s)	18	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	0.8	-

Intersection												
Int Delay, s/veh	2.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↑						↑		↑	
Traffic Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
Future Vol, veh/h	0	1612	9	0	0	0	0	0	24	38	13	0
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	-	-	280	-	-	-	-	-	0	-	-	-
Veh in Median Storage, #	-	0	-	10849	17248	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	92	92	92	63	63	60	68	68	68
Heavy Vehicles, %	5	2	2	2	2	2	0	0	0	4	4	4
Mvmt Flow	0	1697	9	0	0	0	0	0	40	56	19	0

Major/Minor	Major1			Minor1			Minor2					
Conflicting Flow All	-	0	0	-	-	-	849	849	1706	-		
Stage 1	-	-	-	-	-	-	-	0	0	-		
Stage 2	-	-	-	-	-	-	-	849	1706	-		
Critical Hdwy	-	-	-	-	-	-	6.9	7.58	6.58	-		
Critical Hdwy Stg 1	-	-	-	-	-	-	-	-	-	-		
Critical Hdwy Stg 2	-	-	-	-	-	-	-	6.58	5.58	-		
Follow-up Hdwy	-	-	-	-	-	-	3.3	3.54	4.04	-		
Pot Cap-1 Maneuver	0	-	-	-	-	-	0	0	308	251	89	0
Stage 1	0	-	-	-	-	-	0	0	-	-	-	0
Stage 2	0	-	-	-	-	-	0	0	-	318	142	0
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	-	-	-	-	-	308	218	89	-
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	-	-	218	89	-
Stage 1	-	-	-	-	-	-	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-	-	-	-	277	142	-

Approach	EB	NB	SB
HCM Control Delay, s	0	18.4	46.4
HCM LOS		C	E

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	SBLn1
Capacity (veh/h)	308	-	-	159
HCM Lane V/C Ratio	0.13	-	-	0.472
HCM Control Delay (s)	18.4	-	-	46.4
HCM Lane LOS	C	-	-	E
HCM 95th %tile Q(veh)	0.4	-	-	2.2

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	0	63	52	1	61
Future Vol, veh/h	30	0	63	52	1	61
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	33	0	68	57	1	66

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	165	97	0	0	125	0
Stage 1	97	-	-	-	-	-
Stage 2	68	-	-	-	-	-
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	826	959	-	-	1462	-
Stage 1	927	-	-	-	-	-
Stage 2	955	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	825	959	-	-	1462	-
Mov Cap-2 Maneuver	825	-	-	-	-	-
Stage 1	927	-	-	-	-	-
Stage 2	954	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	825	1462
HCM Lane V/C Ratio	-	-	0.04	0.001
HCM Control Delay (s)	-	-	9.5	7.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	35	60	114	89	2
Future Vol, veh/h	1	35	60	114	89	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	38	65	124	97	2

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	352	98	99	0	0
Stage 1	98	-	-	-	-
Stage 2	254	-	-	-	-
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	646	958	1494	-	-
Stage 1	926	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	616	958	1494	-	-
Mov Cap-2 Maneuver	616	-	-	-	-
Stage 1	882	-	-	-	-
Stage 2	788	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	9	2.6	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1494	-	943	-	-
HCM Lane V/C Ratio	0.044	-	0.041	-	-
HCM Control Delay (s)	7.5	0	9	-	-
HCM Lane LOS	A	A	A	-	-
HCM 95th %tile Q(veh)	0.1	-	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	0	174	2	0	124
Future Vol, veh/h	3	0	174	2	0	124
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	3	0	189	2	0	135

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	325	190	0	0	191	0
Stage 1	190	-	-	-	-	-
Stage 2	135	-	-	-	-	-
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	669	852	-	-	1383	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	669	852	-	-	1383	-
Mov Cap-2 Maneuver	669	-	-	-	-	-
Stage 1	842	-	-	-	-	-
Stage 2	891	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	669	1383
HCM Lane V/C Ratio	-	-	0.005	-
HCM Control Delay (s)	-	-	10.4	0
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0	0

Intersection						
Int Delay, s/veh	0.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations			↑↑	↑		↑
Traffic Vol, veh/h	0	0	1970	61	0	36
Future Vol, veh/h	0	0	1970	61	0	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	Free	-	Stop
Storage Length	-	-	-	0	-	0
Veh in Median Storage, #	-	1	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	0	0	2141	66	0	39

Major/Minor	Major2	Minor2
Conflicting Flow All	-	0 - 1071
Stage 1	-	- -
Stage 2	-	- -
Critical Hdwy	-	- 6.94
Critical Hdwy Stg 1	-	- -
Critical Hdwy Stg 2	-	- -
Follow-up Hdwy	-	- 3.32
Pot Cap-1 Maneuver	-	0 0 217
Stage 1	-	0 0 -
Stage 2	-	0 0 -
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	- - 217
Mov Cap-2 Maneuver	-	- - -
Stage 1	-	- - -
Stage 2	-	- - -

Approach	WB	SB
HCM Control Delay, s	0	25.2
HCM LOS		D

Minor Lane/Major Mvmt	WBT	SBLn1
Capacity (veh/h)	-	217
HCM Lane V/C Ratio	-	0.18
HCM Control Delay (s)	-	25.2
HCM Lane LOS	-	D
HCM 95th %tile Q(veh)	-	0.6

Intersection: 1: EB to WB Crossover - East of Hill & WB M-59 (Highland Rd)

Movement	WB	WB	NB
Directions Served	T	T	LT
Maximum Queue (ft)	186	192	101
Average Queue (ft)	61	73	62
95th Queue (ft)	147	167	101
Link Distance (ft)	2252	2252	35
Upstream Blk Time (%)			49
Queuing Penalty (veh)			54
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 2: Le Grand Court & EB M-59 (Highland Road)

Movement	NB
Directions Served	R
Maximum Queue (ft)	170
Average Queue (ft)	49
95th Queue (ft)	119
Link Distance (ft)	269
Upstream Blk Time (%)	0
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 3: WB M-59 (Highland Rd) & Hill Rd

Movement	SB
Directions Served	R
Maximum Queue (ft)	231
Average Queue (ft)	94
95th Queue (ft)	203
Link Distance (ft)	933
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 4: EB M-59 (Highland Road) & WB to EB Crossover West of Hill Rd

Movement	EB	SB
Directions Served	T	L
Maximum Queue (ft)	10	102
Average Queue (ft)	0	68
95th Queue (ft)	7	101
Link Distance (ft)	133	34
Upstream Blk Time (%)		58
Queuing Penalty (veh)		98
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 5: EB to WB Crossover WEst of Hill & WB M-59 (Highland Rd)

Movement	NB
Directions Served	L
Maximum Queue (ft)	69
Average Queue (ft)	37
95th Queue (ft)	67
Link Distance (ft)	49
Upstream Blk Time (%)	14
Queuing Penalty (veh)	8
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 6: Haven Rd & EB M-59 (Highland Road)

Movement	NB	SB
Directions Served	R	LT
Maximum Queue (ft)	35	56
Average Queue (ft)	12	28
95th Queue (ft)	32	57
Link Distance (ft)	507	51
Upstream Blk Time (%)		3
Queuing Penalty (veh)		2
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Hill Rd & Driveway 1

Movement	WB
Directions Served	LR
Maximum Queue (ft)	44
Average Queue (ft)	22
95th Queue (ft)	46
Link Distance (ft)	575
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 8: Hill Rd & Driveway 2

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (ft)	58	40
Average Queue (ft)	24	6
95th Queue (ft)	52	28
Link Distance (ft)	330	422
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 9: Hill Rd & Driveway 3

Movement	WB
Directions Served	LR
Maximum Queue (ft)	29
Average Queue (ft)	2
95th Queue (ft)	13
Link Distance (ft)	280
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 10: WB M-59 (Highland Rd) & Driveway 4

Movement	SB
Directions Served	R
Maximum Queue (ft)	20
Average Queue (ft)	1
95th Queue (ft)	10
Link Distance (ft)	288
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 100: EB M-59 (Highland Road) & EB to WB Crossover - East of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	90
Average Queue (ft)	15
95th Queue (ft)	62
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 400: WB to EB Crossover West of Hill Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	122
Average Queue (ft)	23
95th Queue (ft)	90
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 500: EB M-59 (Highland Road) & EB to WB Crossover WEst of Hill

Movement	EB
Directions Served	L
Maximum Queue (ft)	63
Average Queue (ft)	7
95th Queue (ft)	34
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	250
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 600: Haven Rd & WB M-59 (Highland Rd)

Movement	WB
Directions Served	L
Maximum Queue (ft)	35
Average Queue (ft)	2
95th Queue (ft)	14
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	300
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 162

Appendix 8

Signal Warrants

Summary of Warrants

Spot Number:	0		
Major Street:	WB M-59	Minor Street:	X-over east of Hill Road
Intersection:	WB M-59 at X-over east of Hill Road		
City/Twp:	White Lake Twp		
Date Performed:	5/25/2022	Performed By:	Fishbeck
Date Volumes Collected:	9/30/2021		

Warrant	Condition	Is Warrant Met
Data Validation Error		NO
WARRANT 1: Eight-Hour Vehicular Volume		YES
	Condition A	NO
	Condition B	YES
	Condition A&B	N/A
WARRANT 2: Four-Hour Vehicular Volume	(70%)	YES
WARRANT 3: Peak-Hour Vehicular Volume	(70%)	YES
	Condition A	NO
	Condition B	YES
WARRANT 4: Pedestrian Volume	(70%)	NO
	Four Hour	N/A
	Peak Hour	N/A
	(Threshold)	HAWK NO
	(Threshold)	RRFB NO
WARRANT 5: School Crossing		NO
WARRANT 6: Coordinated Signal System		NO
WARRANT 7: Crash Experience		NO
	Condition A	NO
	Condition B	NO
WARRANT 8: Roadway Network		NO
WARRANT 9: Intersection Near a Grade Crossing		#N/A

Issue to Be Addressed by Signalization:

0

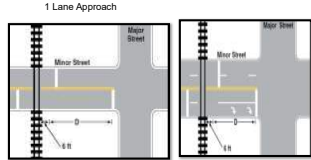
TRAFFIC SIGNAL WARRANT ANALYSIS DATA ENTRY
ONLY ENTER DATA IN YELLOW CELLS

Spot Number			
MAJOR STREET	MINOR STREET		
Intersection of	WB M-59	at	over east of Hill Rd
Analysis Date	5/25/2022	by	Postback
DIRECTION	E-W		N-S
Data Collection Date	9/30/2021		
City/Twp	White Lake Twp		

Is the intersection within an isolated community? Yes or No	NO
DO NOT ENTER ANY VALUE IN THIS BOX	
Discount for Right Turn Volume (or Lefts at Crossovers)?	NO
Percent Reduction in NB Right Turn Volumes	
Percent Reduction in SB Right Turn Volumes	
Percent Reduction in EB Right Turn Volumes	
Percent Reduction in WB Right Turn Volumes	
Have Other Remedial Measures Been Tried (Warrant 1 A&B)?	NO
Have Other Remedial Measures Been Tried (Warrant 7)?	NO
Are there 5 or more Crashes Susceptible to Correction by Signalization in a 12 Month Period?	
Review Peak Hour Warrant?	YES
Peak Hour Stop Delay (Vehicle Hours)	0.1
Number of Intersection Approaches	2
Peak Hour	17:00 - 18:00
Has a Study been Conducted that Demonstrates a Need for Signalization Based on a Lack of Signal Coordination (Warrant 6)?	NO
Has a Study been Conducted that Demonstrates a Need for Signalization Based on a the Need to Encourage Concentration and Organization of Traffic Flow (Warrant 8)?	NO

Pedestrian Warrant Information	
Distance to nearest Signal or Stop Sign on Major Road (ft)	
Is the 15th Percentile Speed of Pedestrians Less than 3.5ft/sec?	
DO NOT ENTER ANY VALUE IN THIS BOX	
Number of Gaps for School Crossings	
Duration of Gap Study (minutes)	
Width of Street (feet)	
Number of School Children per Group	
Number of School Children	
Crosswalk Length	
Is Pedestrian Sight Distance Sufficient?	

Grade Crossing Information	
Clear Storage Distance (Enter Greater than 140 if no Railroad Present)	
Number of Approach Lanes Crossing Tracks	
Peak Hour for Train Crossings (If not known, use Peak Vehicle Hour)	
Trains Crossings per Day? (Use 3-5 if Unknown)	
Percentage of High Occupancy Buses (Use 0% if Unknown)?	
Percentage of Tractor Trailers? (Use 7.6% to 12.5% if Unknown)	



Issue to Be Addressed by Signalization:

	X-over east of Hill Road				WB M-59			
	NORTHBOUND		SOUTHBOUND		EASTBOUND		WESTBOUND	
Number of lanes	1		0		0		2	
SPEED LIMIT OR 85th Percentile MPH	25						55	
	Direction # NB		Direction # SB		Direction # EB		Direction # WB	
	Machine #1	Manual Counts	Machine #1	Manual Counts	Machine #1	Manual Counts	Machine #1	Manual Counts
Traffic Counts	Machine Minor Vol #1	PED COUNT S+L+EG	Machine Minor Vol #2	PED COUNT N+L+EG	Machine Major Vol #3	PED COUNT W+LEG	Machine Major Vol #4	PED COUNT S+L+EG
00:01 - 01:00								
01:00 - 02:00								
02:00 - 03:00								
03:00 - 04:00								
04:00 - 05:00								
05:00 - 06:00								
06:00 - 07:00	54						518	
07:00 - 08:00	104						883	
08:00 - 09:00	51						989	
09:00 - 10:00	75						986	
10:00 - 11:00	58						958	
11:00 - 12:00	79						1071	
12:00 - 13:00	67						1302	
13:00 - 14:00	73						1303	
14:00 - 15:00	96						1495	
15:00 - 16:00	94						1803	
16:00 - 17:00	119						2035	
17:00 - 18:00	150						2566	
18:00 - 19:00	116						1695	
19:00 - 20:00								
20:00 - 21:00								
21:00 - 22:00								
22:00 - 23:00								
23:00 - 00:00								

Were the machine and manual counts taken on the same day?

Ratio	MANUAL#1 / Machine NB	MANUAL#1 / Machine SB	MANUAL#1 / Machine EB	MANUAL#1 / Machine WB
	1.00	1.00	1.00	1.00
Input Check: Is data correct?	<input type="checkbox"/> YES	<input type="checkbox"/> YES	<input type="checkbox"/> YES	<input type="checkbox"/> YES

HELP

If a count has been input during at least one of the hours, if otherwise blank, ignore this error. Input may need to be fixed calculation.

Check Machine Counts - A 25-70 has been entered for at least one hour. Vol#s are correct, ignore this error. Ratio may need to be fixed calculated.

Check Manual Counts - The ratio between the manual counts and machine counts is out of normal range. Please check vol#s. If otherwise blank, ignore this error.

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

Intersection:	WB M-59 @ X-over east of Hill Road		
Date	5/25/2022	by	Fishbeck

2	: No. of Lanes on Major St?
1	: No. of Lanes on Minor St?
55	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an isolated community?
0	: 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

Time	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?
00:01 - 01:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
01:00 - 02:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
02:00 - 03:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
03:00 - 04:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
04:00 - 05:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
05:00 - 06:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
06:00 - 07:00	516	64	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
07:00 - 08:00	893	104	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
08:00 - 09:00	989	63	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
09:00 - 10:00	986	75	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
10:00 - 11:00	928	66	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
11:00 - 12:00	1071	79	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
12:00 - 13:00	1302	67	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
13:00 - 14:00	1303	77	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
14:00 - 15:00	1495	96	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
15:00 - 16:00	1803	94	420	105	NO	630	53	YES	N/A	N/A	N/A	N/A	N/A
16:00 - 17:00	2005	119	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
17:00 - 18:00	2066	150	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
18:00 - 19:00	1595	116	420	105	YES	630	53	YES	N/A	N/A	N/A	N/A	N/A
19:00 - 20:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
20:00 - 21:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
21:00 - 22:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
22:00 - 23:00	0	0	420	105	NO	630	53	NO	N/A	N/A	N/A	N/A	N/A
23:00 - 00:00	0	0	420	105	NO	630	53	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 =	12
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)	YES
C. Combination of Warrants A and B Criteria Met?	N/A

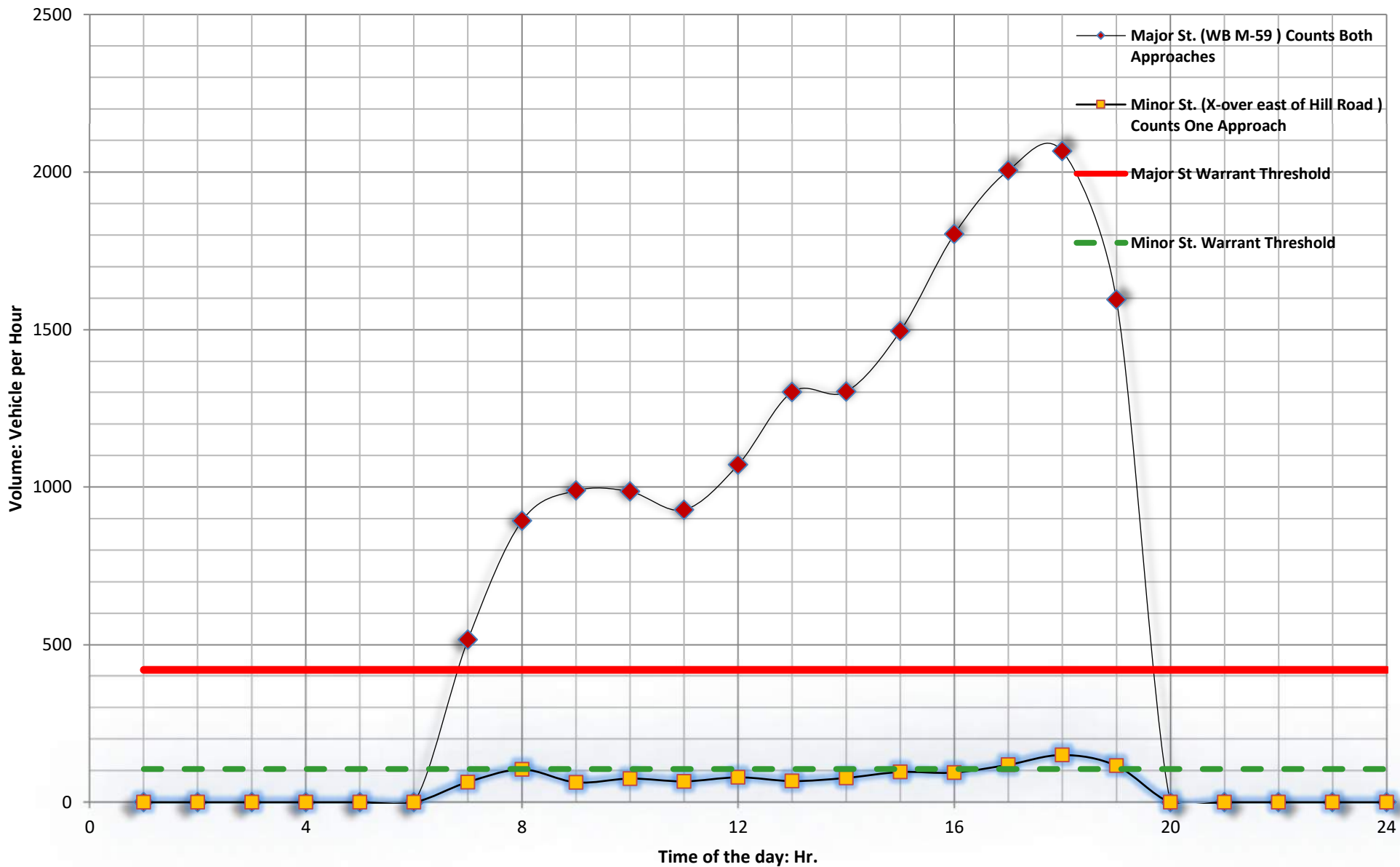


FIGURE 1: WARRANT 1A

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:

WB M-59 @ X-over east of Hill Road

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 3

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

Data Collection Date: 9/30/2021

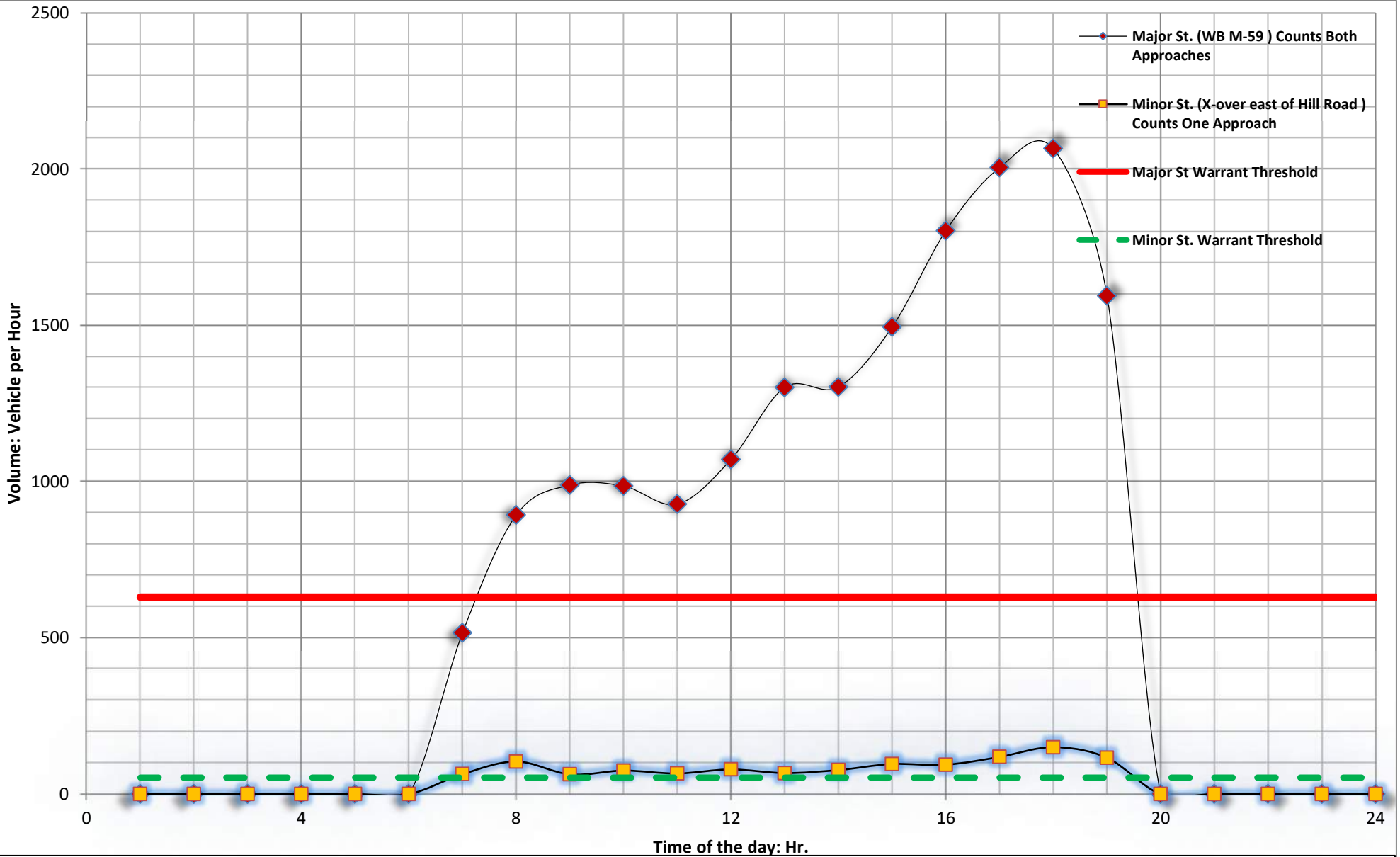


FIGURE 1: WARRANT 1B

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:

WB M-59 @ X-over east of Hill Road

NO. OF LANES ON MAJOR ST.? 2

NO. OF LANES ON MINOR ST.? 1

Number of Hours that met the Warrant: 12

Does this intersection meet Warrant 1B for signal installation? YES

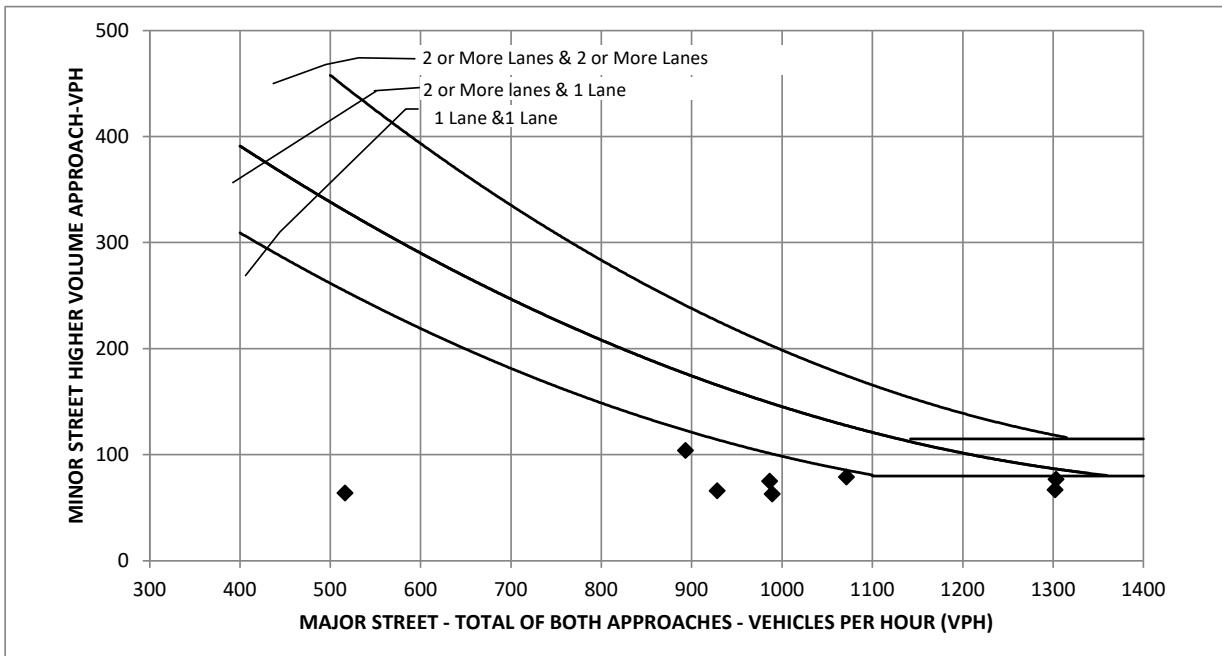
Data Collection Date: 9/30/2021

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

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/20222 by Fishbeck

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

DO NOT USE THIS GRAPH - USE 70% GRAPH

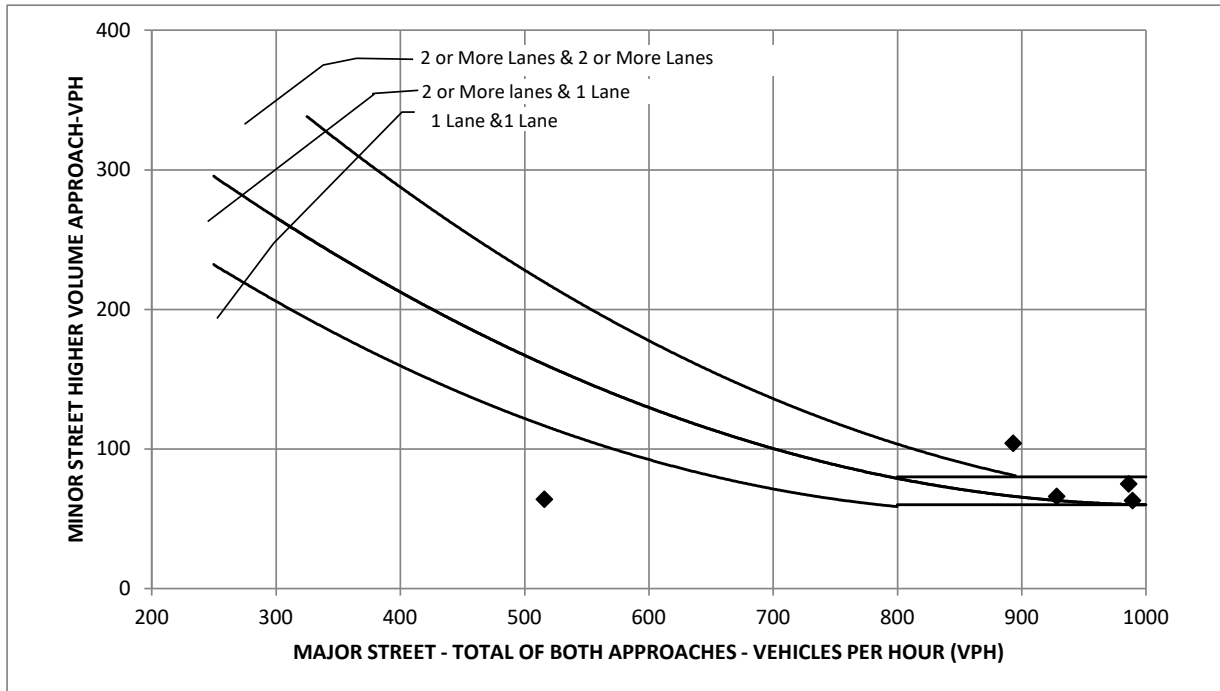


How Many Hours Are Met	5
Is Warrant 2 (100%) Met?	N/A

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

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/20222 by Fishbeck

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



How Many Hours Are Met

12

Is Warrant (70%) Met?

YES

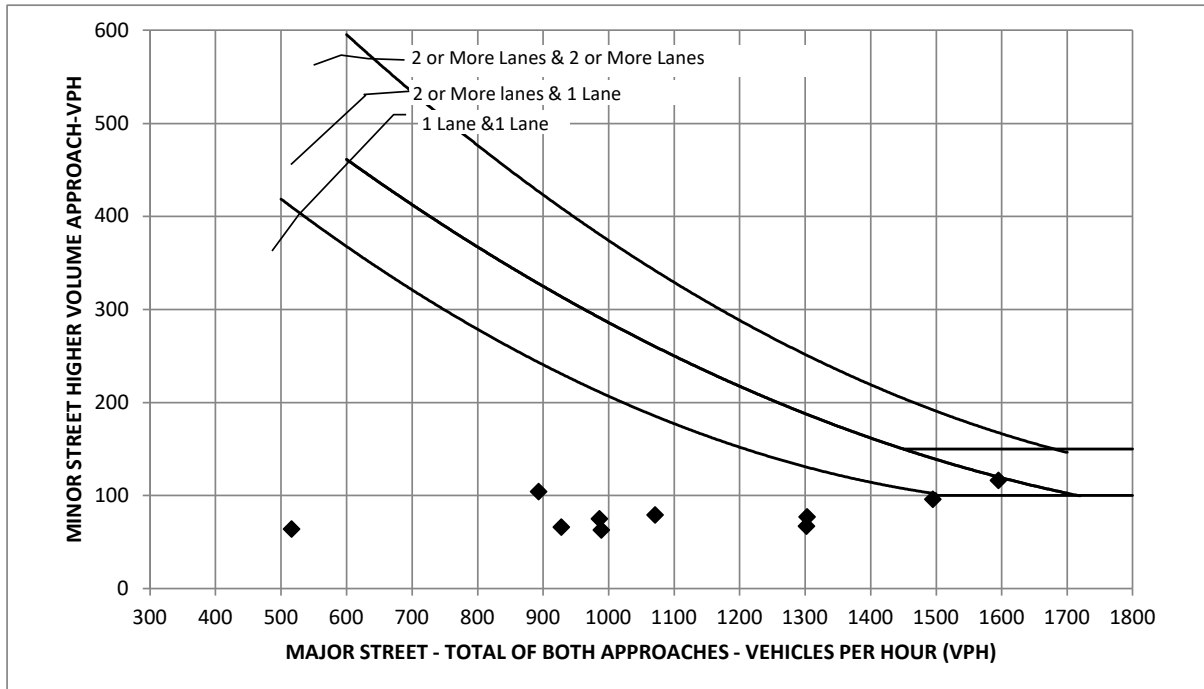
Michigan Manual of Uniform Traffic Control Devices Worksheet for Signal Warrants (Section 4C) WARRANT 3 A: Peak-Hour Vehicular Volume														
Spot Number:	0													
Intersection:	WB M-59 @ X-over east of Hill Road													
Date	5/25/2022	by Fishbeck												
NOT MET	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">0.13</td> <td>: Total Stop Time Delay (hrs)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>: Minor Street Approach Lanes</td> </tr> <tr> <td style="text-align: center;">2</td> <td>: Total Approaches</td> </tr> <tr> <td style="text-align: center;">150</td> <td>: Minor Approach Volume</td> </tr> <tr> <td style="text-align: center;">2216</td> <td>: Total Entering Volume</td> </tr> <tr> <td style="text-align: center;">17:00 - 18:00</td> <td>: Peak Hour</td> </tr> </table>		0.13	: Total Stop Time Delay (hrs)	1	: Minor Street Approach Lanes	2	: Total Approaches	150	: Minor Approach Volume	2216	: Total Entering Volume	17:00 - 18:00	: Peak Hour
0.13	: Total Stop Time Delay (hrs)													
1	: Minor Street Approach Lanes													
2	: Total Approaches													
150	: Minor Approach Volume													
2216	: Total Entering Volume													
17:00 - 18:00	: Peak Hour													
Is Warrant 3 A Met?		NO												

**Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(100%): Peak-Hour Vehicular Volume**

Spot Number:	0
Intersection:	WB M-59 @ X-over east of Hill Road
Date	5/25/20222 by Fishbeck

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

DO NOT USE THIS GRAPH - USE 70% GRAPH



How Many Hours Are Met

3

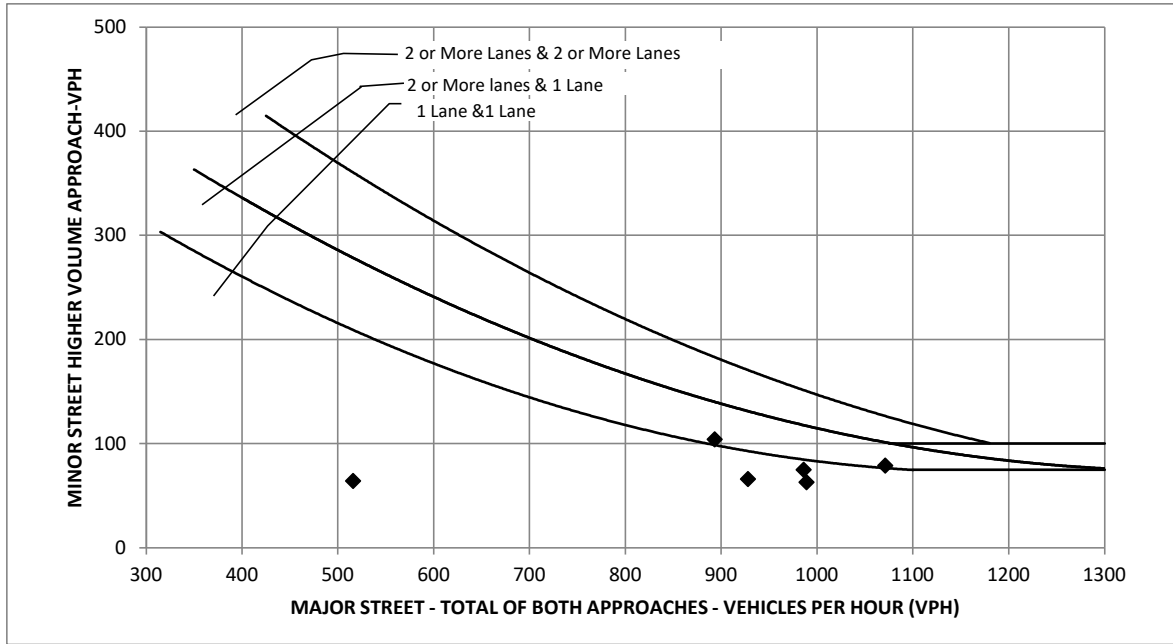
Is Warrant 3 B (100%) Met?

YES

**Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(70%): Peak-Hour Vehicular Volume**

Spot Number:	0		
Intersection:	WB M-59 @ X-over east of Hill Road		
Date	5/25/20222	by	Fishbeck

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



How Many Hours Are Met	8
Is Warrant (70%) Met?	YES

WB M-59 Merged - TMC

Thu Sep 30, 2021

Full Length ()

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
2021-09-30 6:00AM	159	4	163	71	0	71	234
6:15AM	223	5	228	120	0	120	348
6:30AM	282	4	286	119	0	119	405
6:45AM	338	8	346	163	0	163	509
Hourly Total	1002	21	1023	473	0	473	1496
7:00AM	357	12	369	164	0	164	533
7:15AM	354	8	362	188	0	188	550
7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
Hourly Total	1440	69	1509	844	0	844	2353
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
8:30AM	306	4	310	225	0	225	535
8:45AM	362	8	370	229	0	229	599
Hourly Total	1356	32	1388	940	0	940	2328
9:00AM	320	10	330	240	0	240	570
9:15AM	299	5	304	232	0	232	536
9:30AM	299	6	305	232	0	232	537
9:45AM	284	11	295	225	0	225	520
Hourly Total	1202	32	1234	929	0	929	2163
10:00AM	236	5	241	182	0	182	423
10:15AM	249	7	256	212	0	212	468
10:30AM	253	2	255	253	0	253	508
10:45AM	251	10	261	226	0	226	487
Hourly Total	989	24	1013	873	0	873	1886
11:00AM	263	4	267	223	0	223	490
11:15AM	254	10	264	236	0	236	500
11:30AM	293	8	301	251	0	251	552
11:45AM	251	8	259	297	0	297	556
Hourly Total	1061	30	1091	1007	0	1007	2098
12:00PM	262	4	266	322	0	322	588
12:15PM	295	11	306	289	0	289	595
12:30PM	334	6	340	313	0	313	653
12:45PM	219	9	228	295	0	295	523
Hourly Total	1110	30	1140	1219	0	1219	2359
1:00PM	257	12	269	299	0	299	568
1:15PM	277	11	288	302	0	302	590
1:30PM	248	6	254	299	0	299	553
1:45PM	275	11	286	320	0	320	606
Hourly Total	1057	40	1097	1220	0	1220	2317
2:00PM	289	8	297	297	0	297	594
2:15PM	272	15	287	372	0	372	659
2:30PM	322	12	334	363	0	363	697
2:45PM	334	16	350	365	0	365	715
Hourly Total	1217	51	1268	1397	0	1397	2665
3:00PM	315	13	328	403	0	403	731
3:15PM	325	17	342	399	0	399	741
3:30PM	337	5	342	458	0	458	800
3:45PM	313	8	321	428	0	428	749
Hourly Total	1290	43	1333	1688	0	1688	3021
4:00PM	297	9	306	423	0	423	729
4:15PM	372	8	380	463	0	463	843
4:30PM	345	9	354	497	0	497	851
4:45PM	348	14	362	466	0	466	828

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
Hourly Total	1362	40	1402	1849	0	1849	3251
5:00PM	416	9	425	478	0	478	903
5:15PM	396	20	416	490	0	490	906
5:30PM	377	14	391	499	0	499	890
5:45PM	364	15	379	426	0	426	805
Hourly Total	1553	58	1611	1893	0	1893	3504
6:00PM	301	14	315	438	0	438	753
6:15PM	319	12	331	360	0	360	691
6:30PM	281	13	294	368	0	368	662
6:45PM	258	14	272	306	0	306	578
Hourly Total	1159	53	1212	1472	0	1472	2684
Total	15798	523	16321	15804	0	15804	32125
% Approach	96.8%	3.2%	-	100%	0%	-	-
% Total	49.2%	1.6%	50.8%	49.2%	0%	49.2%	-
Lights	15281	499	15780	15227	0	15227	31007
% Lights	96.7%	95.4%	96.7%	96.3%	0%	96.3%	96.5%
Articulated Trucks	161	3	164	186	0	186	350
% Articulated Trucks	1.0%	0.6%	1.0%	1.2%	0%	1.2%	1.1%
Buses and Single-Unit Trucks	356	21	377	391	0	391	768
% Buses and Single-Unit Trucks	2.3%	4.0%	2.3%	2.5%	0%	2.5%	2.4%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

Full Length ()

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int
	T	U	App	T	U	App	
Time							
2021-09-30 7:30AM	354	19	373	236	0	236	609
7:45AM	375	30	405	256	0	256	661
8:00AM	365	10	375	238	0	238	613
8:15AM	323	10	333	248	0	248	581
Total	1417	69	1486	978	0	978	2464
% Approach	95.4%	4.6%	-	100%	0%	-	-
% Total	57.5%	2.8%	60.3%	39.7%	0%	39.7%	-
PHF	0.945	0.575	0.917	0.955	-	0.955	0.932
Lights	1354	65	1419	923	0	923	2342
% Lights	95.6%	94.2%	95.5%	94.4%	0%	94.4%	95.0%
Articulated Trucks	27	0	27	20	0	20	47
% Articulated Trucks	1.9%	0%	1.8%	2.0%	0%	2.0%	1.9%
Buses and Single-Unit Trucks	36	4	40	35	0	35	75
% Buses and Single-Unit Trucks	2.5%	5.8%	2.7%	3.6%	0%	3.6%	3.0%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

AM Peak (7:30 AM - 8:30 AM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

Midday Peak (11:45 AM - 12:45 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 11:45AM	251	8	259	297	0	297	556
	12:00PM	262	4	266	322	0	322	588
	12:15PM	295	11	306	289	0	289	595
	12:30PM	334	6	340	313	0	313	653
Total		1142	29	1171	1221	0	1221	2392
% Approach		97.5%	2.5%	-	100%	0%	-	-
% Total		47.7%	1.2%	49.0%	51.0%	0%	51.0%	-
PHF		0.855	0.659	0.861	0.948	-	0.948	0.916
Lights		1098	27	1125	1171	0	1171	2296
% Lights		96.1%	93.1%	96.1%	95.9%	0%	95.9%	96.0%
Articulated Trucks		16	0	16	21	0	21	37
% Articulated Trucks		1.4%	0%	1.4%	1.7%	0%	1.7%	1.5%
Buses and Single-Unit Trucks		28	2	30	29	0	29	59
% Buses and Single-Unit Trucks		2.5%	6.9%	2.6%	2.4%	0%	2.4%	2.5%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

Midday Peak (11:45 AM - 12:45 PM)

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 Merged - TMC

Thu Sep 30, 2021

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US

Leg Direction	MI 59 Eastbound			MI 59 Westbound			Int	
	T	U	App	T	U	App		
Time								
	2021-09-30 4:45PM	348	14	362	466	0	466	828
	5:00PM	416	9	425	478	0	478	903
	5:15PM	396	20	416	490	0	490	906
	5:30PM	377	14	391	499	0	499	890
	Total	1537	57	1594	1933	0	1933	3527
	% Approach	96.4%	3.6%	-	100%	0%	-	-
	% Total	43.6%	1.6%	45.2%	54.8%	0%	54.8%	-
	PHF	0.924	0.713	0.938	0.968	-	0.968	0.973
	Lights	1506	54	1560	1897	0	1897	3457
	% Lights	98.0%	94.7%	97.9%	98.1%	0%	98.1%	98.0%
	Articulated Trucks	11	1	12	16	0	16	28
	% Articulated Trucks	0.7%	1.8%	0.8%	0.8%	0%	0.8%	0.8%
	Buses and Single-Unit Trucks	20	2	22	20	0	20	42
	% Buses and Single-Unit Trucks	1.3%	3.5%	1.4%	1.0%	0%	1.0%	1.2%

*T: Thru, U: U-Turn

WB M-59 Merged - TMC

Thu Sep 30, 2021

PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour

All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)

All Movements

ID: 917131, Location: 42.648859, -83.535424



Provided by: Gewalt Hamilton Associates Inc.
625 Forest Edge Drive, Vernon Hills, IL, 60061, US



WB M-59 at EB to WB X-over, east of Hill Road

Leg	MI 59			MI 59			Growth to 2027		Growth Rate
	Eastbound		App Total	Westbound		App Total	X-over east of Hill Road	M-59	
Direction	Thru	U-Turn		Thru	U-Turn		LT	WB	
Start Time			App Total			App Total	Int	Thru	
2021-09-30 06:00:00	1002	21	1023	473	0	473	1496	22	487
2021-09-30 07:00:00	1440	69	1509	844	0	844	2353	71	870
2021-09-30 08:00:00	1356	32	1388	940	0	940	2328	33	969
2021-09-30 09:00:00	1202	32	1234	929	0	929	2163	33	957
2021-09-30 10:00:00	989	24	1013	873	0	873	1886	25	900
2021-09-30 11:00:00	1061	30	1091	1007	0	1007	2098	31	1038
2021-09-30 12:00:00	1110	30	1140	1219	0	1219	2359	31	1256
2021-09-30 13:00:00	1057	40	1097	1220	0	1220	2317	41	1257
2021-09-30 14:00:00	1217	51	1268	1397	0	1397	2665	53	1439
2021-09-30 15:00:00	1290	43	1333	1688	0	1688	3021	44	1739
2021-09-30 16:00:00	1362	40	1402	1849	0	1849	3251	41	1905
2021-09-30 17:00:00	1553	58	1611	1893	0	1893	3504	60	1951
2021-09-30 18:00:00	1159	53	1212	1472	0	1472	2684	55	1517
Grand Total	15798	523	16321	15804	0	15804	32125		
% Approach	96.8%	3.2%		100.0%	0.0%				
% Total	49.2%	1.6%	50.8%	49.2%	0.0%	49.2%			
Lights	15281	499	15780	15227	0	15227	31007		
% Lights	96.7%	95.4%	96.7%	96.3%	0.0%	96.3%	96.5%		
Articulated Trucks	161	3	164	186	0	186	350		
% Articulated Trucks	1.0%	0.6%	1.0%	1.2%	0.0%	1.2%	1.1%		
Buses and Single-Unit Trucks	356	21	377	391	0	391	768		
% Buses and Single-Unit Trucks	2.3%	4.0%	2.3%	2.5%	0.0%	2.5%	2.4%		

Daily Trip Generation for Mixed Use Development

Land Use Code	210			220			210			220		
	Single-Family Detached Housing			Multifamily Housing (Low-Rise)			Single-Family Detached Housing			Multifamily Housing (Low-Rise)		
Subcategory				Not Close to Rail Transit								
Setting	General Urban/Suburban			General Urban/Suburban								
Time Period	Weekday			Weekday								
# Data Sites	7			6								
	% of 24-Hour Vehicle Trips			% of 24-Hour Vehicle Trips								
Time	Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting
12:00 - 1:00 AM	0.3%	0.5%	0.2%	0.7%	0.9%	0.4%						
1:00 - 2:00 AM	0.2%	0.2%	0.1%	0.4%	0.5%	0.3%						
2:00 - 3:00 AM	0.2%	0.3%	0.1%	0.4%	0.4%	0.4%						
3:00 - 4:00 AM	0.2%	0.2%	0.2%	0.4%	0.4%	0.3%						
4:00 - 5:00 AM	0.6%	0.3%	0.8%	0.9%	0.3%	1.4%						
5:00 - 6:00 AM	1.2%	0.5%	2.0%	1.6%	0.5%	2.6%						
6:00 - 7:00 AM	3.7%	1.6%	5.8%	4.2%	1.4%	6.9%	33	17	16	111	56	55
7:00 - 8:00 AM	6.5%	3.1%	10.0%	6.5%	2.0%	10.8%	59	15	44	173	42	131
8:00 - 9:00 AM	6.2%	3.8%	8.5%	5.8%	3.1%	8.5%	55	14	41	156	37	119
9:00 - 10:00 AM	4.6%	3.3%	5.8%	3.9%	2.9%	4.9%	41	21	20	104	52	52
10:00 - 11:00 AM	4.9%	4.2%	5.6%	3.6%	2.4%	4.8%	44	22	22	96	48	48
11:00 - 12:00 PM	5.3%	5.4%	5.1%	4.3%	3.8%	4.7%	47	24	23	115	58	57
12:00 - 1:00 PM	5.7%	5.7%	5.7%	4.3%	4.5%	4.1%	51	26	25	116	58	58
1:00 - 2:00 PM	6.1%	6.1%	6.0%	4.2%	4.0%	4.4%	54	27	27	112	56	56
2:00 - 3:00 PM	6.6%	7.1%	6.1%	5.2%	5.6%	4.9%	59	30	29	141	71	70
3:00 - 4:00 PM	7.5%	8.7%	6.2%	6.1%	6.9%	5.3%	67	34	33	164	82	82
4:00 - 5:00 PM	8.9%	10.5%	7.4%	7.9%	10.1%	5.6%	80	50	30	210	132	78
5:00 - 6:00 PM	8.7%	10.0%	7.3%	9.5%	11.4%	7.6%	78	49	29	254	160	94
6:00 - 7:00 PM	7.2%	8.5%	5.9%	8.2%	9.7%	6.7%	64	32	32	220	110	110
7:00 - 8:00 PM	5.1%	6.1%	4.2%	6.4%	8.1%	4.7%						
8:00 - 9:00 PM	4.6%	6.1%	3.1%	5.9%	7.7%	4.2%						
9:00 - 10:00 PM	3.3%	4.4%	2.3%	4.4%	6.0%	2.7%						
10:00 - 11:00 PM	1.6%	2.1%	1.0%	3.5%	4.7%	2.4%						
11:00 - 12:00 AM	1.0%	1.3%	0.6%	1.9%	2.5%	1.4%						

LUC	Number of Units	Weekday, number of trips	Peak hour	Distribution (Entering/ Exiting)
210	88	897	AM	26/74
			PM	63/37
220	406	2678	AM	24/76
			PM	63/37

		AM		PM	
		Entering	Exiting	Entering	Exiting
East	M-59	0.4	0.6	0.55	0.45
West	M-59	0.58	0.38	0.43	0.54

Using crossover

WB entering

EB Entering

Total			EB	WB
Total	Entering	Exiting	Entering	Entering
144	73	71	42	29
232	57	175	33	23
211	51	160	30	20
145	73	72	42	29
140	70	70	41	28
162	82	80	48	33
167	84	83	36	46
166	83	83	36	46
200	101	99	43	56
231	116	115	50	64
290	182	108	78	100
332	209	123	90	115
284	142	142	61	78

Summary of Traffic Counts for Traffic Signal Warrant for WB M-59 and Crossover east of Hill Road

	2027		Trip Generation		Total	
	WB	NB	WB	NB	WB	NB
6:00:00	487	22	29	42	516	64
7:00:00	870	71	23	33	893	104
8:00:00	969	33	20	30	989	63
9:00:00	957	33	29	42	986	75
10:00:00	900	25	28	41	928	66
11:00:00	1038	31	33	48	1071	79
12:00:00	1256	31	46	36	1302	67
13:00:00	1257	41	46	36	1303	77
14:00:00	1439	53	56	43	1495	96
15:00:00	1739	44	64	50	1803	94
16:00:00	1905	41	100	78	2005	119
17:00:00	1951	60	115	90	2066	150
18:00:00	1517	55	78	61	1595	116