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PLANNING COMMISSION
MEETING AGENDA
REGULAR MEETING

David Lambert, Chairman, Marianna Perakis, Vice Chairman
Toby Buechner, Carlton Faison, Michael W. Hutson, Tom Krent,
Lakshmi Malalahalli, Sadek Rahman and John J. Tagle

April 12, 2022 **7:00 P.M.** **Council Chambers**

1. ROLL CALL

2. APPROVAL OF AGENDA

3. APPROVAL OF MINUTES – March 22, 2022

4. PUBLIC COMMENT – For Items Not on the Agenda

PRELIMINARY SITE PLAN REVIEW

5. PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0008) - Proposed Westington Phase II, South of Wattles, East of Crooks (870 Barilane Drive; PIN 88-20-21-101-009), Section 21, Currently Zoned NN (Neighborhood Node "I") District- **PETITIONER HAS REQUESTED THAT THIS ITEM BE REMOVED FROM AGENDA**

6. PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0009) - Proposed Hills West, East side of Crooks, South of Wattles (3902 Crooks; 88-20-21-101-003), Section 21, Currently Zoned NN (Neighborhood Node "I") District- **PETITIONER HAS REQUESTED THAT THIS ITEM BE REMOVED FROM AGENDA**

OTHER ITEMS

7. PUBLIC COMMENTS – For Items on the Agenda

8. PLANNING COMMISSION COMMENT

9. ADJOURN

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

Televised Live, Government Channel WTRY (10 WideOpenWest and 17 Comcast) Replayed Wednesdays 3:00 pm, 6:00 pm and 11:00 pm

Chair Lambert called the Regular meeting of the Troy City Planning Commission to order at 7:00 p.m. on March 22, 2022, in the Council Chamber of the Troy City Hall. Chair Lambert and Vice Chair Perakis presented opening remarks relative to the role of the Planning Commission and procedure of tonight's meeting.

1. ROLL CALL

Present:
Toby Buechner
Carlton M. Faison
Michael W. Hutson
Tom Krent
David Lambert
Lakshmi Malalahalli
Marianna Perakis
Sadek Rahman

Absent:
John J. Tagle

Also Present:
R. Brent Savidant, Community Development Director
Ben Carlisle, Carlisle Wortman Associates
Julie Quinlan Dufrane, Assistant City Attorney
Kathy L. Czarnecki, Recording Secretary

Mr. Buechner gave a brief introduction of himself and said he was looking forward to participating in the Planning Commission decision making.

2. APPROVAL OF AGENDA

Resolution # PC-2022-03-018
Moved by: Perakis
Support by: Malalahalli

RESOLVED, To approve the Agenda as prepared.

Yes: All present (8)
Absent: Tagle

MOTION CARRIED

3. APPROVAL OF MINUTES – March 8, 2022

Resolution # PC-2022-03-019
Moved by: Rahman
Support by: Krent

RESOLVED, To approve the minutes of the March 8, 2022 Regular meeting as submitted.

Yes: All present (8)
Absent: Tagle

MOTION CARRIED

4. PUBLIC COMMENT – For Items Not on the Agenda

There was no one present who wished to speak.

PLANNED UNIT DEVELOPMENT

5. POTENTIAL PLANNED UNIT DEVELOPMENT (PUD) APPLICATION – Concept Plan Discussion, East side of Stephenson Highway, North of Fourteen Mile (750 Stephenson), Section 35, Currently Zoned RC (Research Center) District

Mr. Carlisle reviewed the proposed site improvements of the PUD (Planned Unit Development) concept plan for 750 Stephenson. He addressed the current zoning as relates to the proposed uses, the Smart Zone Master Plan designation, Standards of the PUD option and displayed renderings provided by the applicant. Mr. Carlisle said the applicant has not identified potential users at this time and is seeking Planning Commission feedback on the concept plan.

Mr. Savidant provided an explanation of the intent of the RC zoning district. He said the district has a campus-like design with open space. He noted that recently businesses and property owners are looking to incorporate amenities such as restaurants and shopping. Mr. Savidant identified the range of uses in the RC zoning district. He shared with the Board that a PUD application is a negotiated process, and their input would be of great value to the applicant.

Present were Joe Latozas and Mike Pizzola of Designhaus Architecture and Steven Kalabat of REalta Group.

Mr. Latozas reported a market study revealed a need for climate-controlled storage units for use by corporate office and commercial users. He said their intent is to continue with the campus-like design, reduce asphalt and incorporate green space, add landscaping, and create connectivity for users within the project. He addressed shared parking among the various users. Mr. Latozas said at this time they do not know what improvements, if any, might be made to the existing 7-story office building.

Mr. Kalabat said the existing 7-story office building has been vacant for the past 2.5 years. He expressed confidence in the market study findings that climate-controlled storage units and warehousing are in demand. Mr. Kalabat said their intent is to make a cohesive project and accommodate the architectural design of users.

There was discussion on:
- Shared parking and access.
- Cohesiveness of project; consistency in building materials, colors.
- Connectivity within project; provide public pathways.
- Market study results.
  - Consideration of alternative options; residential, hotel.
- Flexibility in PUD agreement; option to revert to office use if market indicative.
- Taproom/brewery.
  - Location and visibility in relationship to I-75 Interchange.
  - Consideration to locate inside office building.
  - Brewery equipment on site.
- Architectural design.
  - Maintain bones of office building.
  - Keep integrity of RC zoning, office building.
  - Characteristics of storage facility as relates to color, logos, etc.
- Shared (mobile) office space in existing office building.
- Application options discussed with applicant; PUD, Text Amendment, Conditional Rezoning.

Mr. Savidant addressed the approval process of a PUD application.

OTHER ITEMS

6. APPLICATION TO DE-LIST 54 E. SQUARE LAKE

Mr. Savidant reviewed the procedure to remove a historic designation of a property. He stated the City has no file on record for the property located at 54 E. Square Lake and reported an outside source was contracted to prepare a Preliminary Report which was reviewed by the Historic District Study Committee (HDSC) at their October 5, 2021 meeting. Mr. Savidant read findings of the report and advised the Board that a deed research could not be accomplished because the Register of Deeds office is closed due to the pandemic. He stated the applicant affirms the request to de-list is to allow flexibility for renovating the property and there is no intent to demolish the building.

Mr. Savidant advised the Board its options are to recommend or deny the de-listing request or to take no action.

Discussion followed. Some of the comments related to:
- Reasons one might want to remove a historic designation.
- Current zoning designation of the property (Neighborhood Node).
- Improbability to obtain deed research.
- Approval process for exterior renovations; interior renovations are permitted.
- Exterior of home; modern look with vinyl siding and windows.
- Proximity of home to right-of-way; concerns with safety, minimal front yard, parking.

The consensus of the Board was to take no action.

Mr. Savidant advised the Board this evening's draft minutes would be provided to the HDSC at their March 28, 2022 meeting.

7. PUBLIC COMMENT – For Items on the Agenda

There was no one present who wished to speak.

8. PLANNING COMMISSION COMMENT

A warm welcome was extended to newly appointed Commissioner Buechner.

Mr. Savidant announced that City Council at their March 14, 2022 meeting granted approval of the Conditional Rezoning for Pine View Condominiums, a 25-unit townhome development located on the west side of Dequindre and north of Long Lake.

Mr. Savidant announced meeting dates scheduled for the Neighborhood Node Subcommittee. Meeting dates are April 5, April 13 and April 27, at 6:00 p.m. to be held in the Council Chambers. Meeting notices are posted.

Mr. Carlisle reported on City Council participation of the Neighborhood Nodes tour conducted on March 12.

9. ADJOURN

The Regular meeting of the Planning Commission adjourned at 8:34 p.m.

Respectfully submitted,

_____

David Lambert, Chair

_____

Kathy L. Czarnecki, Recording Secretary

https://d.docs.live.net/2f7ed4fe5f664ea8/Documents/Kathy/COT Planning Commission Minutes/2022/2022 03 22 Draft.docx

DATE: April 7, 2022

TO: Planning Commission

FROM: R. Brent Savidant, Community Development Director

SUBJECT: PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0008) - Proposed The Westington II, South of Wattles, East of Crooks (870 Barilane Drive; PIN 88-20-21-101-009), Section 21, Currently Zoned NN (Neighborhood Node "I") District

The petitioner Troy Westington LLC submitted the above referenced Preliminary Site Plan application for a 20-unit, 2 ½ story multi-family apartment building. Multi-family is permitted by right in the NN (Neighborhood Node "I") Zoning District.

Westington Phase I received Preliminary Site Plan Approval on December 8, 2020 and is currently under construction. Phase I included four 3-story buildings and 102 units.

In 2021, the applicant submitted a Preliminary Site Plan application for the same parcel that included two15-unit apartment buildings. The application was denied by the Planning Commission on January 25, 2022. This is a new application.

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

Attachments:

1. Maps
2. Report prepared by Carlisle/Wortman Associates, Inc.
3. Preliminary Site Plan.
4. Westington & West Hills Development Traffic Impact Study, dated November 11, 2021.
5. Traffic Impact Study memo, prepared by OHM, dated December 6, 2021.
6. Memo from OHM dated March 2, 2022.

G:\SITE PLANS\SP JPLN2022-0008 WESTINGTON PHASE II 2022 SUBMITTAL\PC Memo 2022 04 12 Westington II.docx

PROPOSED RESOLUTION

PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0008) - Proposed The Westington II, South of Wattles, East of Crooks (870 Barilane Drive; PIN 88-20-21-101-009), Section 21, Currently Zoned NN (Neighborhood Node "I") District

Resolution # PC-2022-04-
Moved by:
Seconded by:

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed The Westington II 20-unit apartment development, South of Wattles, East of Crooks, Section 21, Currently Zoned NN (Neighborhood Node "I") District, be granted, subject to the following:

_____) or

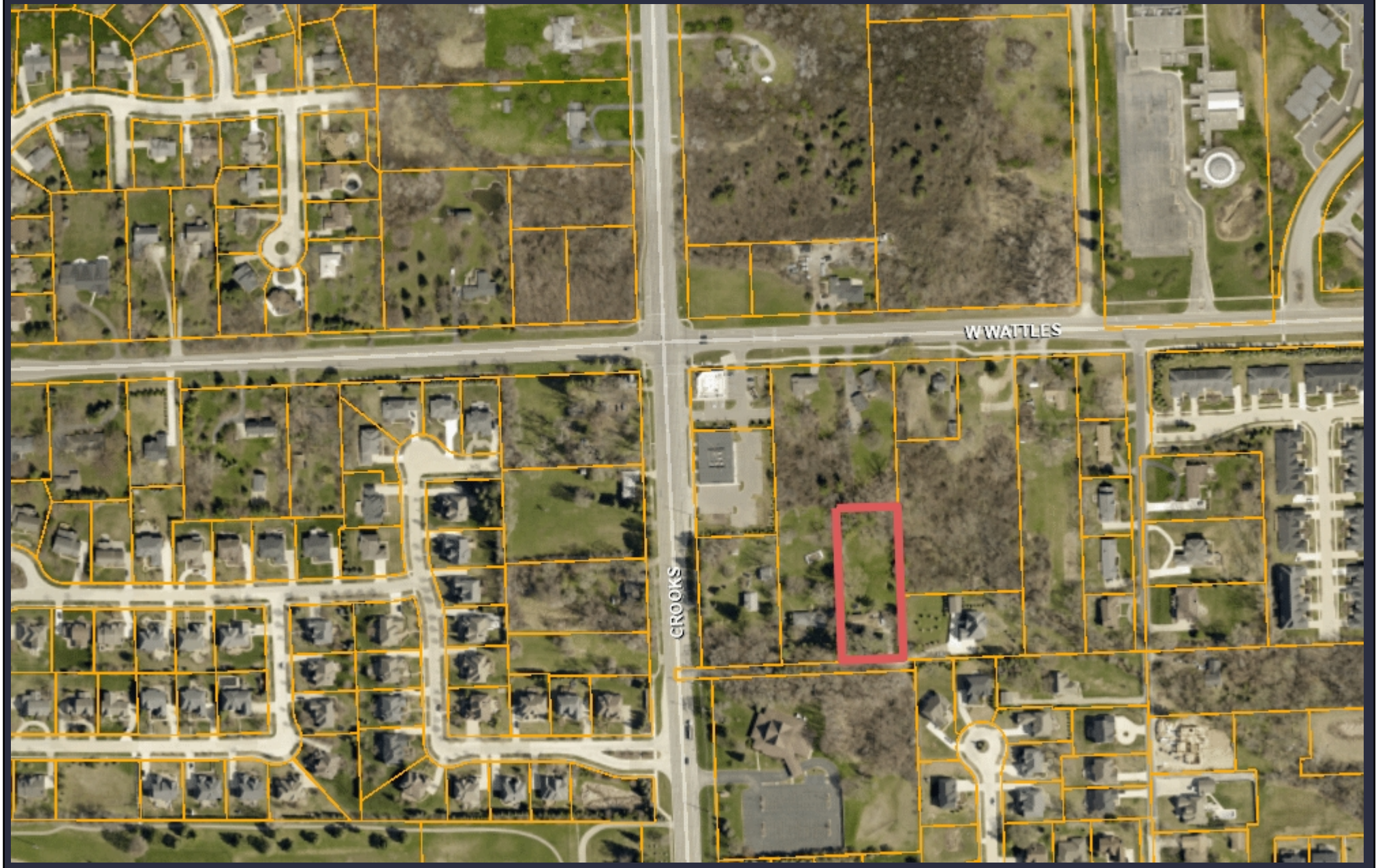
(denied, for the following reasons: _____) or

(postponed, for the following reasons: _____)

Yes:
No:

MOTION CARRIED/FAILED

GIS Online



835 0 417 835 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

GIS Online

835 0 417 835 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

Carlisle | Wortman
ASSOCIATES, INC.

117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

Date: January 13, 2022
January 20, 2022
March 22, 2022

Preliminary Site Plan Review
For
City of Troy, Michigan

Applicant: DesignHaus

Project Name: The Westington Phase 2

Plan Date: February 17, 2022

Location: Wattles Rd, just east of Crooks Rd

Zoning: Neighborhood Node (NN) – I

Action Requested: Site Plan Approval

SITE DESCRIPTION

The subject site is located on the south side of Wattles Road, just east of Crooks Road. The site is approximately 1.20 acres in area and is proposed for development as the Phase 2 component of the Westington multi-family development project. Phase 1 of the Westington project is currently under construction. The subject site is currently vacant, and the northeastern portion is located within a 100-year floodplain. Proposed Phase 2 is directly east of Phase 1.

The applicant is proposing to construct one (1) 20-unit multi-family building on the site. The building will be 2.5 stories in height. Interior drives through the Phase 1 component of the Westington project will provide access to the site, in addition to access via 3902 Crooks (proposed for the Hills West Apartment development, and cross-access with the 7-Eleven site. There is no direct access to Barilane Court. The property is zoned Neighborhood Node (NN) and multiple family residential is a permitted use.

The properties to the east and south of the subject site are zoned R1-B, One Family Residential. The adjacent R1-B properties to the northeast and southeast are in use as single-family dwellings. Most of the property to the east of the site is undeveloped woodland and is within the 100-year floodplain, which provides a natural buffer. The southern portion of the site is bounded by a private drive.

Site Location:

Proposed Uses of Subject Parcel:
Thirty (30) multi-family dwelling units.

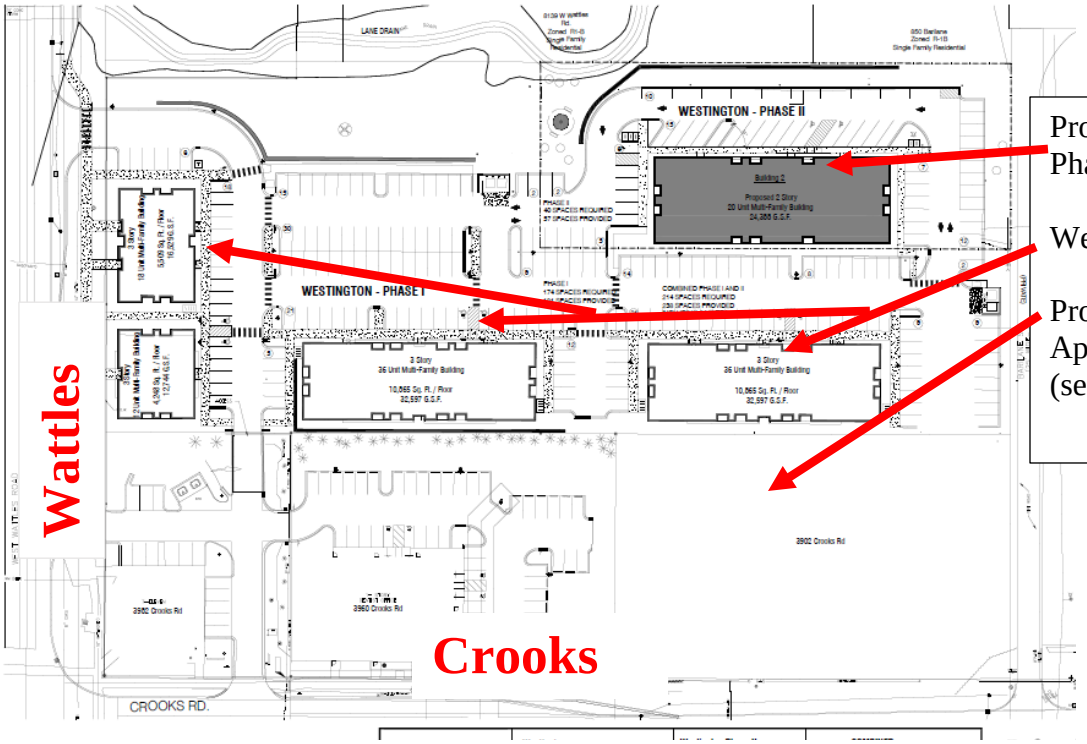
Current Use of Subject Property:
Single Family Home

Current Zoning:
The property is currently zoned NN, Neighborhood Node District.

Surrounding Property Details:

Direction	Zoning	Use
North	NN, Neighborhood Node	Multi-Family Residential
South	R1-B, Single Family	Single Family Residential / Place of Worship
East	R1-B, Single Family	Single Family Residential / Vacant
West	NN, Neighborhood Node	Multi-Family Residential

SITE CONTEXT



PREVIOUS PLANNING COMMISSION REVIEW

The Planning Commission discussed the project at the January 25, 2022 meeting. There was lengthy discussion on a variety of topics including traffic, guest parking, tree mitigation, open space/landscaping calculations, compliance with Design Standards, compliance with Site Plan Review Standards, cross-access, Neighborhood Node zoning designations, intensity of Site Type A and Site Type B.

See the January 22 meeting minutes for more details.

After discussion, the Planning Commission, the Planning Commission moved:

That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed The Westington II 30-unit apartment development, South of Wattles, East of Crooks, (870 Barilane Drive; PIN 88-20-21-101- 009), Section 21, Currently Zoned NN (Neighborhood Node "I") District, be denied, for the following reasons:

1. *The Planning Commission does not approve the tree mitigation requirement.*
2. *The open space fails the Zoning Ordinance calculations.*
3. *The site Design Standards fail to promote public health, safety and welfare, primarily due to traffic issues.*

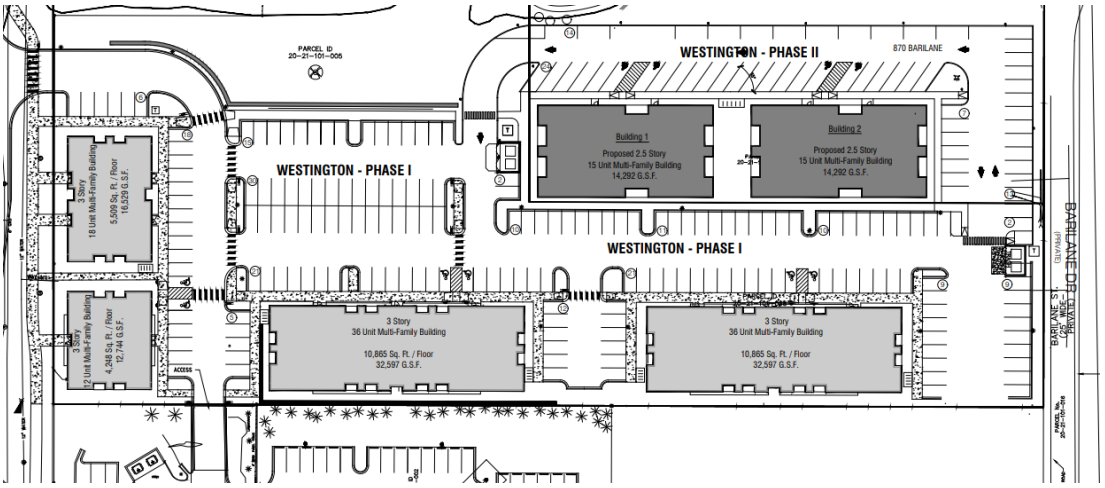
4. *The project fails to meet the transition requirements of the Zoning Ordinance as well as the density requirements.*

There was discussion on the motion on the floor.

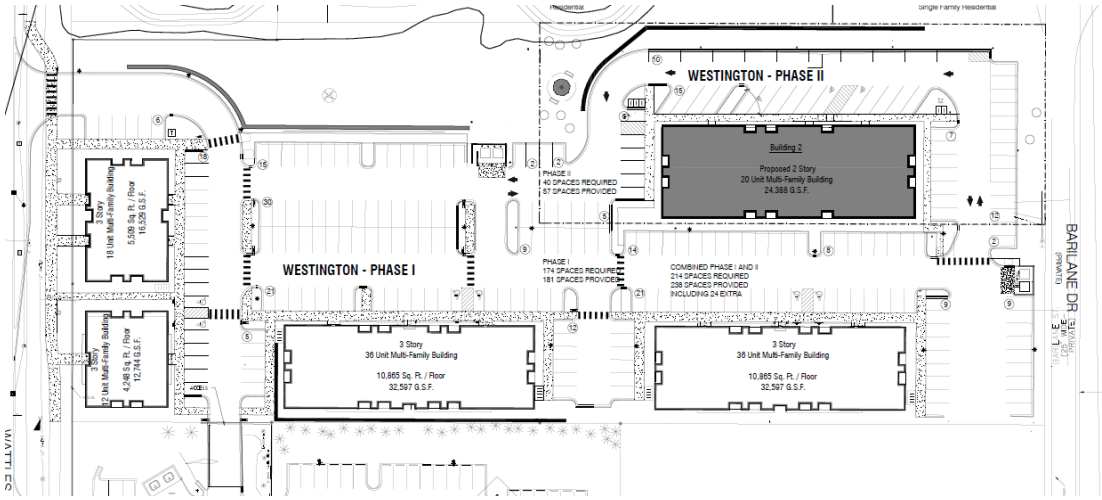
Chair Lambert said his main concerns are the destruction of the trees on the site and his belief there is not enough of a transition going from the higher height buildings that are closer to the street as proposed to where it comes up to residential areas farther to the east and to the south.

The motion passed 8-0.

CHANGES SINCE LAST PLANNING COMMISSION REVIEW



January 2022 Plan



March 2022 Plan

The applicant has proposed the following changes to the Site Plan since the last submittal:

- Combined two 14,000 sq/ft buildings into one (1) 24,000 sq/ft building
- Reduced the number of units from thirty (30) to twenty (20)

- By eliminating ten (10) units, they increased guest parking by thirteen (13) spaces, to provide a total of (eighteen) 18 guest spaces
- Preserved six (6) onsite protected trees
- Added onsite gazebo
- Increased overall open space by 9% for a total of 29%
- Decreased lot coverage by 5% for a total of 25%

NATURAL FEATURES

Topography: A topographic survey has been provided on sheet C-2.0. Elevations decrease in the northwest corner of site towards the floodplain.

Wetlands: There are no wetlands on site.

Floodplain: An existing 100-year floodplain is located at the northwest corner of the site, with two different designations as to where the edge of said floodplain lies. The applicant is proposing to continue the retaining wall that was done for Phase 1 to accommodate floodplain on this site.

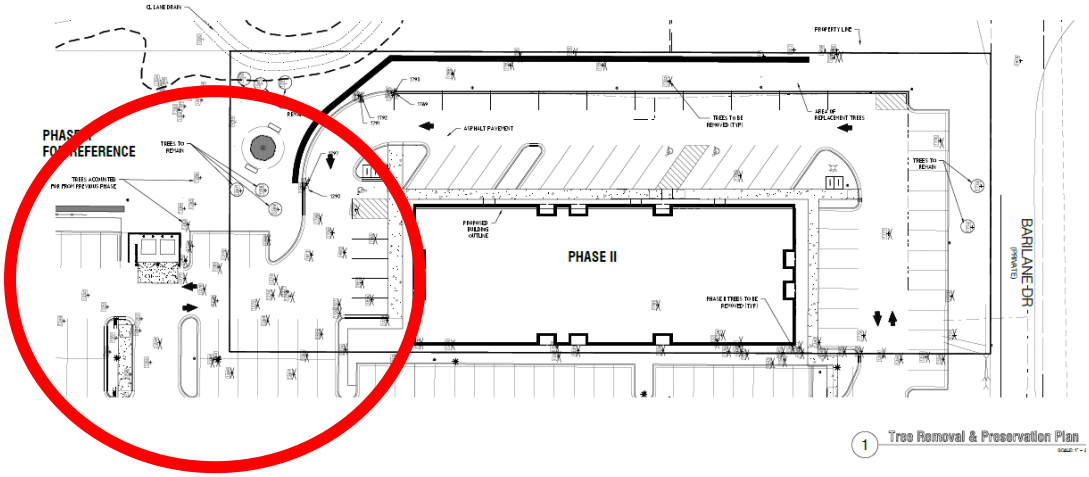
Floodplain confirmation will be determined as part of final engineering.

Woodlands: A tree inventory and replacement plan has been provided on Sheet L100, with replacement trees shown in the landscape plan on Sheet L101.

Replacement Details		
Protected Tree	**Inches Removed**	**Replacement Required**
Landmark	165 inches	165 inches
Woodland	597 inches	299 inches
Preservation/Mitigation	**Inches Preserved**	**Credit**
Landmark	45 inches	90 inches
Woodland	0 inches	0 inches
Protected Replacement Required	374 Inches	
Preservation Credit	0 Inches	
Total	**374-inch**	
Total Tree Mitigation	374 trees / 3 inches = 125 3-inch trees	

The applicant indicates that they are preserving 130 inches of trees, however, 79 of those inches are prohibited species which do not receive credit for preservation. As such the applicant has not provided the required replacement.

The applicant is preserving six (6) protected trees. We note that there is a clumping of protected trees (white pines, highlighted in red circle). Is the applicant able to shift the building or reconfigure the drive aisle to preserve additional trees?



Items to be addressed: *Can the applicant shift the building or reconfigure the drive aisle to preserve additional trees?*

SITE ARRANGEMENT

The applicant is proposing to construct one (1) 20-unit multi-family building. The building is 2.5 stories in height. The building is located on the western side of the site, with parking and circulation drives to the south and east.

The site is adjacent to a 7-Eleven, a medical office, and single-family residential zoned Neighborhood Node to the east; a single-family residential zoned Neighborhood Node to the southwest; a single-family residential zoned Neighborhood Node to the north; and the eastern portion of the site is located within the 100-year floodplain and provides a natural buffer to the R1-B property to the east.

Items to be addressed: *None.*

AREA, WIDTH, HEIGHT, SETBACKS

Table 5.03.B.3, Building Form C, Standards Applicable to All Districts of the Zoning Ordinance establishes the dimensional requirements for the NN, Neighborhood Node District. The requirements of Building form C and the proposed dimensions are shown in the following table.

	Required	Provided	Compliance

Side (East)	N/A, building may be placed up to property line	66 feet	Complies
Side (north)	N/A, building may be placed up to property line	87 feet	Complies
Rear (South)	30-foot minimum setback	93 feet	Complies
Building Height	Any building, or portion of a building, on a parcel abutting a one-family residentially zoned parcel shall not exceed 2.5-stories, 30 feet in height.	2.5 stories, 30.0 feet (to mid-point of ridge), 34 feet to roof peak.	Complies but see discussion below
Lot Coverage (Building)	30%	22.71% (Phase 2 only) 22.25% (Project Total)	Complies
Minimum Open Space	20%	33..68% (Phase 2 only) 29.17% (Project Total)	Complies
Parking Location	Cannot be located in front yard	Parking lots not in front yard	Complies

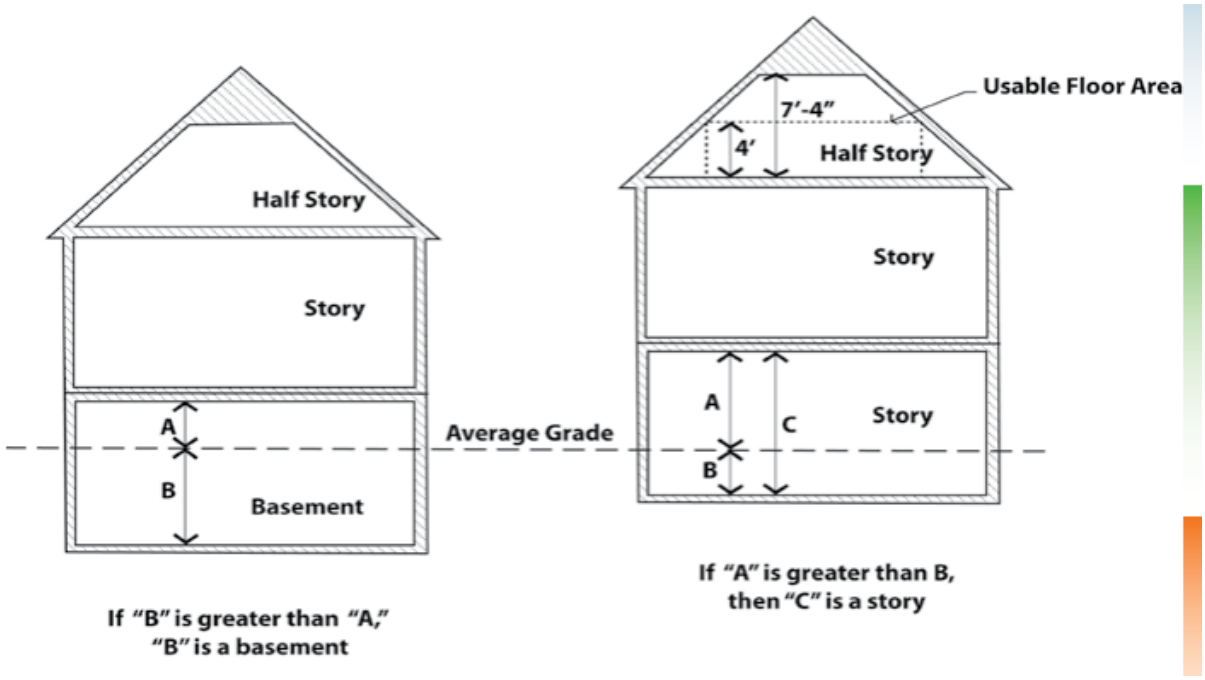
Building Height and Story Discussion:

Because this site is adjunct to one-family residentially zoned property, the applicant shall comply with Section 5.06.E.3.c, which limits height and stories to 2.5 stories and 30-feet. As set forth in the Zoning Ordinance, building height is defined as the following:

> *The term "building height" shall mean the vertical distance as measured from the established grade to the highest point of the roof for flat roofs, including walls or parapets that extend above the horizontal roof surface; to the deck line of mansard roofs; and to the average height between eaves and ridge for gable, hip, and gambrel roofs. When a non-residential building is located on sloping terrain, the height may be measured from the average ground level of the grade at the building wall. When a residential building is located on sloping terrain, the height shall be measured from the highest grade adjacent to the front of the structure to the highest point of the roof for flat roofs, including walls or parapets that extend above the horizontal roof surface; to the deck line of mansard roofs; and to the average height between eaves and ridge for gable, hip, and gambrel roofs. For residential buildings, the major or main roof over the living area shall be used to determine building height, with the following exception: when the total horizontal roof area of dormers and/or minor gables enclosing the living area exceeds twenty (20) percent of the total horizontal area of the roof to which such dormers or gables are attached, the predominant height of such dormers or gables shall be used as the basis for the determination of the building height.*

Story and half-story is defined as the following:

> *STORY: That part of a building, except a mezzanine, included between the surface of one (1) floor and the surface of the next floor, or if there is not a floor above, then the ceiling next above. A story thus defined shall not be counted as a story when more than fifty (50) percent by cubic content, is below the height level of the adjoining ground.*
>
> *STORY, HALF: An uppermost story lying under a sloping roof, the usable floor area of which, at a height of four feet above the floor, does not exceed two-thirds (2/3) of the floor area in the story directly below and the height above at least two hundred (200) square feet of floor space is seven feet four inches (7'4"). When the usable floor area of such a story, at a height of four (4) feet above the floor, does exceed two-thirds (2/3) of the floor area of the story directly below, it shall be counted as a full story.*



During the review process, we had asked the applicant to confirm that the building complied with the 2.5 story maximum. The applicant's architect provided additional plans and the required calculations. The City's Building Official reviewed the plans and the calculations and confirmed that the building meets the 2.5 story requirement as defined in the Zoning Ordinance. The applicant's architect plans and calculations, and the Building Official's response are provided in your packet.

Items to be addressed: *None.*

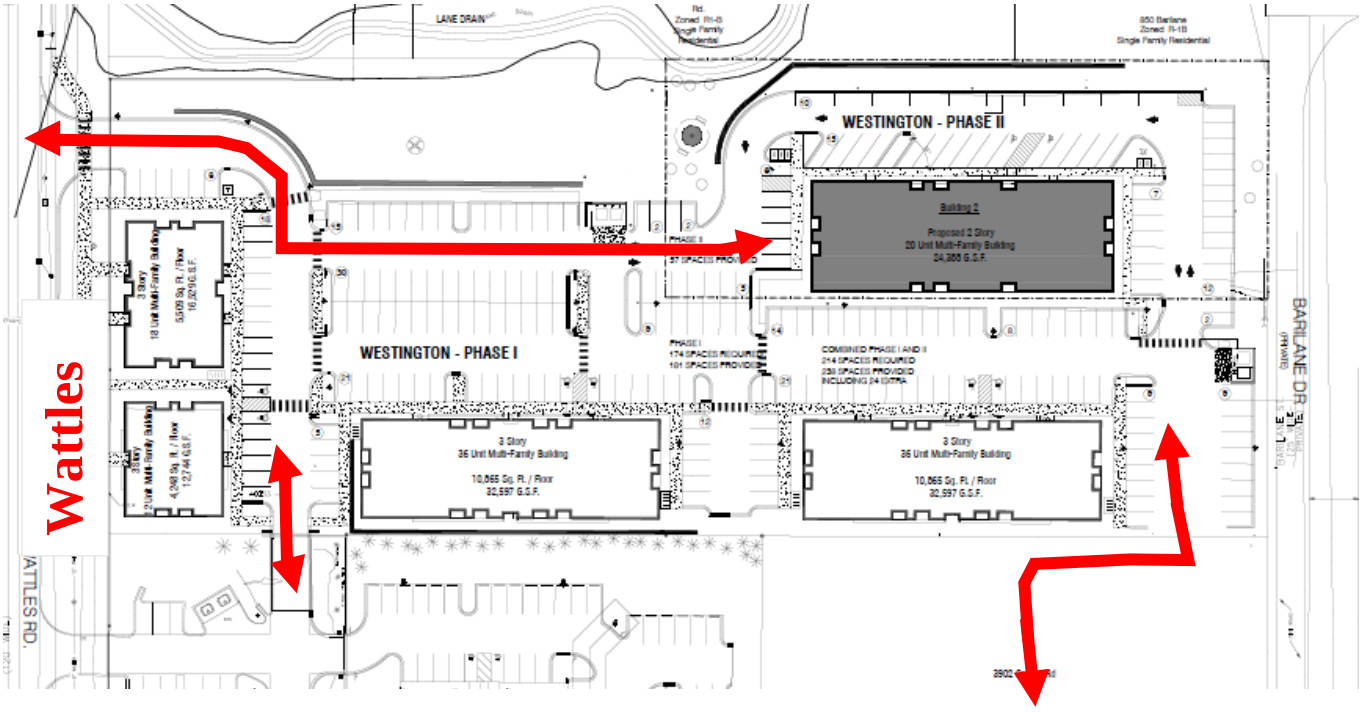
PARKING

Section 13.06.G of the Zoning Ordinance requires:

	Required	Provided
Residential (General): 2 spaces per unit	Phase 2: 20 units = 40 spaces Combined: 214 spaces	Phase 2: 57 spaces including 4 barrier free spaces per Sheet S100 Composite Site Plan Combined: 238 spaces
Barrier Free	4	4
Bicycle Parking	2	
Loading	0	0
Total	**40 spaces (phase 2)** **Combined: 214 spaces**	**238 spaces**

Items to be Addressed: *None*

SITE ACCESS AND CIRCULATION (Vehicular and Pedestrian)



Crooks

Interior drives through the Phase 1 component of the Westington project will provide access to the site. Access to Phase 1 is via Wattles Road, 7-11 cross-access, and through 3902 Crooks (proposed to be developed as Hills West, see separate review).

The site plan was reviewed by the Citys Engineer and Engineering Consultant OHM. IN there review they note the following site circulation and pedestrian circulation deficiencies:

1. Improve pedestrian connectivity between the proposed Phase II buildings and the rest of the site. OHM notes this may require some parking reconfiguration to achieve.
    a. Add sidewalk along the west side of the building proposed in Phase II to allow for easy access to those who park along the west side.
    b. Add pedestrian crosswalks along the north end of the Phase II building to allow for connectivity to the rest of the Phase I buildings and the proposed gazebo.
    c. Add a pedestrian crosswalk near the southwest corner of Building 2, providing connectivity to the existing southerly 3-story building and to the proposed development at 3902 Crooks Rd. For optimal placement, eliminate the parking spot and enlarge the island on the west side, allowing a perpendicular aligned crosswalk at the junction of drive aisles.
2. Widen sidewalks to provide seven (7) feet of sidewalk width adjacent to vehicular travel ways or abutting parking. The proposed sidewalk along the east and south sides of the proposed Phase II building, are approximately only 5 feet wide.
3. Show curb cuts and ramps at each proposed crosswalk. There are several locations, such as along the northeast corner of the proposed Phase II building, where sidewalks and ramps are not shown.
4. The proposed pedestrian crosswalk leading to the dumpster area along Barilane is awkwardly configured. Reorient the ramp and crosswalk such that the sidewalk ramps are aligned with one another.
5. Extend sidewalk to the proposed pavilion area.
6. Circuitous sidewalk layouts (such as at the northwest corner of the proposed Phase II building, with sidewalk following the back of curb) are difficult to navigate and should be revised to reduce the number of jogs or turns.

Items to be addressed: *Address Engineering noted comments*

TRAFFIC

As directed by the City the applicant has provided a Traffic Impact Study for both the Westington Phase II and the Hills West developments. Please note that the traffic study has not been revised as the applicant has reduced the overall number of units and thus reduced the traffic impact. The traffic review is based on 162 units. The revised total is 151 units

Summary:

The proposed development includes three (3) multi-family residential homes developments: Westington Phase I, Westington Phase II, and West Hills. The number of peak hour (AM and PM), and daily vehicle trips that would be generated by the proposed residential were forecast based on data published in the Institute of Transportation Engineers (ITE) Trip Generation Manual 11 th Edition, and the ITE Trip Generation Handbook, 3rd Edition. The site trip generation was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in Table E2.

Land Use	***Phase***	***Amount (units)***	***Average Daily Traffic (vpd)***	***AM Peak Hour (vph)***			***PM Peak Hour (vph)***		
				In	***Out***	***Total***	***In***	***Out***	***Total***
Multifamily Residential	*Westington Phase I*	*102*	*701*	*11*	*35*	*46*	*36*	*21*	*57*
	Westington Phase II	*30*	*206*	*4*	*10*	*14*	*11*	*6*	*17*
	West Hills	*30*	*206*	*3*	*10*	*13*	*10*	*6*	*16*
Total Trips		***162***	***1,114***	***18***	***55***	***73***	***57***	***33***	***90***

To/From	***Via***	***AM***	***PM***
North	*Crooks Road*	*31%*	*28%*
South	*Crooks Road*	*39%*	*41%*
East	*Wattles Road*	*14%*	*16%*
West	*Wattles Road*	*16%*	*15%*
Total		***100%***	***100%***

ANALYSIS SUMMARY

The conclusions of this TIS are as follows:

1. *Existing Conditions (2021): The result of the existing condition analysis indicates that all the study intersection approaches will operate at LOS D or better with the exceptions as follows:*
   - *Crooks Road & Wattles Road: The eastbound and westbound left and through movements are operating at LOS E during both AM and PM peak periods. Review of SimTraffic network simulations indicates long vehicle queues for these movements especially for eastbound through movement during the PM peak hour; however, these vehicle queues were observed to dissipate and were not present throughout the peak periods.*
   - *Crooks Road & 7-11 Drive: Although the westbound egress movements at 7-11 driveway currently operate at LOS D or better during the peak periods, long vehicle queue are observed on the site driveway during the PM peak hour. The northbound traffic at Wattles Road intersection occasionally extends past this driveway during peak periods and blocks the egress movements at the 7-11 Drive.*

This causes westbound egress vehicles to wait longer to find gaps within the through traffic along Crooks Road.

2. *Background Conditions (2023): The results of the background conditions analysis indicates that all study intersection approaches and movements will continue to operate in a manner similar to existing conditions with the following exceptions:*
   - *Crooks Road & Wattles Road: The southbound left-turn movement is expected to operate in LOS E during the PM peak hour at the intersection of Crooks Road & Wattles Road intersection due to the traffic growth in background (2023) conditions. However, the projected additional delay is only 1.6 seconds, which is not significant.*
3. *Future Conditions (2023): The results of the future conditions analysis indicates that with the addition of site generated traffic, all the study intersection approaches and delays continue to operate in a manner similar to background conditions with the exceptions as follows:*
   - *Crooks Road & Wattles Road: The overall intersection is expected to operate at LOS E during the PM peak hour. However, the overall delay at this intersection is expected to increase by only 0.4 seconds,which will be indiscernible from background condition intersection operations.*
   - *Crooks Road & Site Drive (West Hills): The westbound egress movements at West Hills driveway are expected to operate at LOS E during the PM peak periods with a 95th percentile queue length of 43 feet (2 vehicles), which is not significant. These vehicles will be contained within the project site and will not impact traffic operations at the adjacent streets. Moreover, the review of SimTraffic network simulation indicates the egress vehicles are able to find adequate gaps within through traffic along Crooks Road.*

RECOMMENDATIONS

The results of this study indicate that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to existing conditions with minor additional delays. Therefore, no mitigation measures are recommended to accommodate the site generated traffic volumes.

The applicant TIS was reviewed by OHM, the City's Traffic Consultant. OHM concludes:

I have reviewed the Traffic Impact Study for the Westington & West Hills development site, a proposed residential development located at the corner of Crooks and Wattles Roads. The applicant has proposed 162 dwelling units. The Traffic Impact Study was prepared by Fleis & Vandenbrink and is dated November 1, 2021.

OHM recommends approval of the TIS. While there are a few corrections and changes that could be made for this report, they are minor and would not impact the conclusions contained in the TIS.

Items to be addressed: *None*

LANDSCAPING

A landscaping plan has been provided on Sheet L101. The following table discusses the development's compliance with the landscape requirements set forth in Section 13.02.

	Required:	Provided:	Compliance:
East Property Line:			
Landscape buffering: Required buffering between two differentiating land uses. Alternative 1 or 2.	1 large evergreen every 10 feet or 1 narrow evergreen every 3 feet. Alternative screening method may be considered by the Planning Commission.	1 narrow evergreen every 3 feet.	Complies
Southeast property line: (adjacent to existing single-family home)			
Landscape buffering: Required buffering between two differentiating land uses. Alternative 1 or 2.	1 large evergreen every 10 feet or 1 narrow evergreen every 3 feet. Alternative screening method may be considered by the Planning Commission.	1 narrow evergreen every 3 feet along northern property line.	Complies
West Property Line:			
Landscape buffering: None required	None required	A variety of trees and bushes, numbering approx. 164 plants.	Complies
South Property Line			
Required buffering between two differentiating land uses. Alternative 1 or 2.	1 large evergreen tree every 10 feet	12 evergreen trees	Complies
Overall			
Site landscaping:	20%	24%	Complies

A minimum of twenty percent (20%) of the site area shall be comprised of landscape material. Up to twenty-five percent (25%) of the required landscape area may be brink, stone, pavers, or other public plaza elements, but shall not include any parking area or required sidewalks.			
Mitigation	374 trees / 3 inches = 125 3-inch trees	68 trees	Deficient

Transformer / Trash Enclosure:

The applicant has indicated a central trash enclosure. There will be one trash enclosure with two trash containers contained within a 6-foot-high masonry brick wall.

Items to be Addressed*: Applicant is deficient in tree mitigation. See tree mitigation discussion.*

PHOTOMETRICS

A photometric plan has been provided. A total of seven (7) building light fixtures are proposed, along with six (6) pole-mounted light fixtures.

Items to be Addressed: *None.*

FLOOR PLAN AND ELEVATIONS

Floor plans and elevations have been provided on sheets A100, A101, A102, and A200,. The elevations provided show architectural details, variations in material and pattern (brick, hardiboard siding, and limestone headers roof), as well as general color scheme.

Items to be Addressed: *None*

DESIGN STANDARDS AND SITE PLAN REVIEW STANDARDS

The Neighborhood Node design standards as well as Site Plan review standards provide the Planning Commission with direction when reviewing the proposed site plan and design features of this development.

Section 5.06.E. outlines Design Standards:

1. *Building Orientation and Entrance*
2. *Ground Story Activation*

3. *Transitional Features*
4. *Site Access, Parking, and Loading*

Please see Section 5.06.E for standard details.

Section 8.06 outlines Site Plan Review Design Standards.

1. *Development shall ensure compatibility to existing commercial districts and provide a transition between land uses.*
    a. *Building design shall enhance the character of the surrounding area in relation to building and parking placement, landscape and streetscape features, and architectural design.*
    b. *Street fronts shall provide a variety of architectural expression that is appropriate in its context and prevents monotony.*
    c. *Building design shall achieve a compatible transition between areas with different height, massing, scale, and architectural style.*

2. *Development shall incorporate the recognized best architectural building design practices.*
    a. *Foster a lasting impact on the community through the provision of high quality design, construction, and detailing.*
    b. *Provide high quality, durable materials, such as but not limited to stone, brick, glass, and metal. E.I.F.S. or material equivalent shall only be used as an accent material.*
    c. *Develop buildings with creativity that includes balanced compositions and forms.*
    d. *Design roofs that are appropriate to the architectural style of the building and create an appropriate visual exterior mass of the building given the context of the site.*
    e. *For commercial buildings, incorporate clearly defined, highly visible customer entrances using features such as canopies, porticos, arcades, arches, wing walls, ground plane elements, and/or landscape planters.*
    f. *Include community amenities that add value to the development such as patio/ seating areas, water features, art work or sculpture, clock towers, pedestrian plazas with park benches or other features located in areas accessible to the public.*

3. *Enhance the character, environment and safety for pedestrians and motorists.*
    a. *Provide elements that define the street and the pedestrian realm.*
    b. *Create a connection between the public right of way and ground floor activities.*
    c. *Create a safe environment by employing design features to reduce vehicular and pedestrian conflict, while not sacrificing design excellence.*
    d. *Enhance the pedestrian realm by framing the sidewalk area with trees, awnings, and other features.*
    e. *Improve safety for pedestrians through site design measures.*

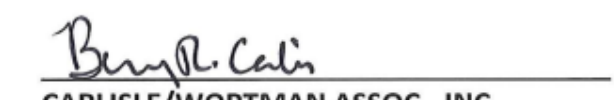
SUMMARY

As part of the deliberation, the Planning Commission and applicant shall discuss:

1. Can the applicant shift the building or reduce the size to preserve additional trees?
2. Compliance with Design Standards
3. Compliance with Site Plan Review Standards

Based on the Planning Commission discussion, the applicant shall also address engineering noted comments, and provide required tree mitigation.

Sincerely,



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

Westington Phase II

870 Barilane Dr.

Troy, MI 48084

PROJECT TEAM

OWNER
TOLLBROOK BROKERAGE, LLC
550 STEPHENSON HWY. #440
Troy, MI 48083
T: 248.906.5400
CONTACT: ARBAN STAFA

ARCHITECT
DESIGNHAUS ARCHITECTURE
3300 AUBURN RD. SUITE 300
AURBURN HILLS, MI 48326
T: 248.601.4422
F: 248.453.5854
PROJECT MANAGER: JOE LATOZAS
PROJECT ARCHITECT:
PETER STUHLREYER, A.I.A

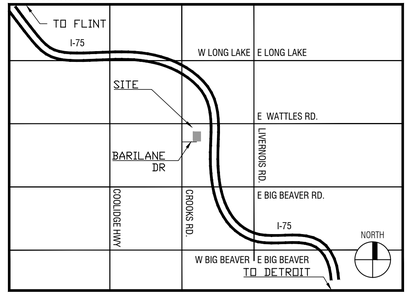
CIVIL ENGINEER
PEA, INC
2430 ROCHESTER CT. #100
TROY, MI 48083
T:248.689.9090
F:248.689.1044
CONTACT: GREG BONO

STATEMENT OF SELECTED DESIGN PROFESSIONAL

THESE CONSTRUCTION DOCUMENTS WERE PREPARED FOR COMPLIANCE WITH THE MICHIGAN CONSTRUCTION CODES IN EFFECT AT THE TIME OF PERMIT SUBMITTAL. ALL ENGINEERS, CONTRACTORS AND SUPPLIERS INVOLVED WITH THIS PROJECT SHALL COMPLY WITH THE SAME CODES ISSUED AND APPROVED CODE MODIFICATIONS AND/OR MUNICIPAL CONSTRUCTION BOARDS OF APPEALS RULINGS AND WHENEVER REQUIRED SHALL PROVIDE SHOP DRAWINGS AND SUBMITTALS CLEARLY DESCRIBING COMPLIANCE TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE FOR REVIEW AND APPROVAL.

REGISTERED DESIGN PROFESSIONAL IN CHARGE:
PETER STUHLREYER. A.I.A.
MICHIGAN IDENTIFICATION # 44668
DESIGNHAUS ARCHITECTURE

LOCATION MAP



INDEX OF DRAWINGS

SHEET ISSUED
REVISED
SHEET REISSUED

SPA Review #4: 22.01.17	SPA Review #3: 22.01.14	SPA Review #2: 21.10.28	SPA Review #1: 21.09.20	SHEET NO:	DRAWING NAME
				GENERAL	
☐	☐	☐	☐	G001	Title Sheet and Index
				CIVIL	
☐	☐	☐	☐	C-1.0	Topographic Survey
☐	☐	☐	☐	1 of 1	Survey
☐	☐	☐	☐	C.2	Preliminary Grading Plan
☐	☐	☐	☐	C.3	Preliminary Utility Plan
				LANDSCAPE	
☐	☐	☐	☐	S100	Composite Site Plan
☐	☐	☐	☐	S101	Site Plan
☐	☐	☐	☐	L100	Tree Preservation Plan
☐	☐	☐	☐	L101	Landscape Plan
☐	☐	☐	☐	1of 1	Lighting Plan
				ARCHITECTURAL	
☐	☐	☐	☐	A100	First Floor Plan
☐	☐	☐	☐	A101	Second Floor Plan
	☐			A102	Typical Roof Plan
☐	☐	☐	☐	A200	Elevations

DESIGNHAUS ARCHITECTURE EST 1998
3300 AUBURN RD.
AUBURN HILLS, MI 48326
T:248.601.4422 F:248.453.5854
WWW.DESIGNHAUS.COM
INFO@DESIGNHAUS.COM

Revision/Issue	Date
SPA Review #4	22.02.17
SPA Review #3	22.01.14
SPA Review #2	21.10.28
SPA Review #1	21.09.20

STATE OF MICHIGAN
PETER M. STUHLREYER
REGISTERED
No. 44668
LICENSED ARCHITECT

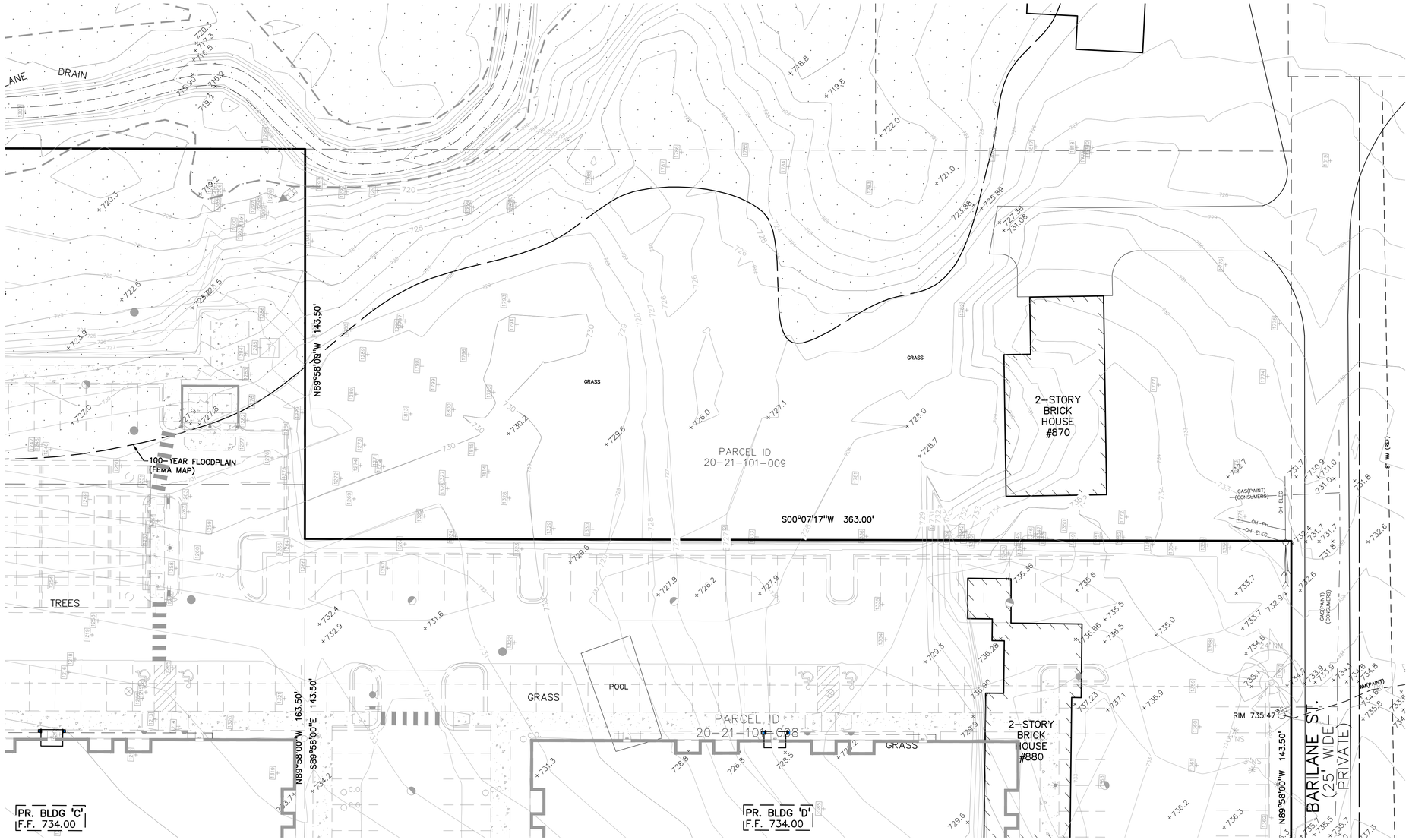
Westington Phase II
870 Barilane Dr.
Troy, MI 48084

Title Sheet and Index

021194

G001

G001 Title Sheet and Index.dwg
2/16/2022
Mike Pizzola



LEGEND

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

EXISTING

- 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 MAIN, VALVE & GAS LINE MARKER
- WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE
- SANITARY SEWER, CLEANOUT & MANHOLE
- STORM SEWER, CLEANOUT & MANHOLE
- COMBINED SEWER & MANHOLE
- SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
- POST INDICATOR VALVE
- WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF
- MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE
- UNIDENTIFIED STRUCTURE
- +696.00 SPOT ELEVATION
- 670 CONTOUR LINE
- FENCE
- GUARD RAIL
- STREET LIGHT
- SIGN
- CONC. CONCRETE
- ASPH. ASPHALT
- GRAVEL GRAVEL SHOULDER
- WETLAND

BENCHMARKS (GPS DERIVED – NAVD88 DATUM)

BM#300
SET BENCH TIE IN SOUTH FACE POWER POLE ±200 FEET SOUTH OF CENTERLINE OF W. WATTLES RD. ±15 FEET EAST OF BACK OF CURB OF CROOKS RD.
ELEVATION – 742.48

BM#302
ARROW ON HYDRANT SOUTH SIDE OF W. WATTLES RD. NEAR WEST PROPERTY LINE.
ELEVATION – 738.25

FLOODPLAIN NOTE:
BY GRAPHICAL PLOTTING, SITE IS WITHIN ZONE 'A', AREA DETERMINED TO BE WITHIN A SPECIAL FLOOD HAZARD AREA WITHOUT BASE FLOOD ELEVATION PER FLOOD INSURANCE RATE MAP NUMBER 26125C0533F, DATED SEPTEMBER 29, 2006.

WETLAND NOTE:
THERE ARE NO REGULATED WETLANDS ON SITE.

PEA GROUP
t: 844.813.2949
www.peagroup.com

STATE OF MICHIGAN
GREGORY BONO
ENGINEER
No. 54435
LICENSED PROFESSIONAL ENGINEER

NORTH

0 10 20 40
SCALE: 1" = 20'

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

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 VERIFYING THE LOCATIONS, ELEVATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

LOCATION MAP

CLIENT
TROY WESTINGTON LLC
1612 MUER RD
TROY, MI 48084

PROJECT TITLE
WESTINGTON PHASE II
3902 CROOKS ROAD
TROY, MI 48098

REVISIONS
- -

ORIGINAL ISSUE DATE:
OCTOBER 22, 2021

DRAWING TITLE
TOPOGRAPHIC SURVEY

PEA JOB NO.	2019-268
P.M.	GMB
DN.	DAS
DES.	GMB

DRAWING NUMBER:
C-1.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON – CMD\DWG\SITE PLANS (PHASE 2)\(C-1.0) TOPO-19268.dwg

FLOODPLAIN NOTE:
BY GRAPHICAL PLOTTING, SITE IS WITHIN ZONE 'A', AREA DETERMINED TO BE WITHIN A SPECIAL FLOOD HAZARD AREA WITHOUT BASE FLOOD ELEVATION PER FLOOD INSURANCE RATE MAP NUMBER 26125C0533F, DATED SEPTEMBER 29, 2006.

GRAPHIC SCALE
-30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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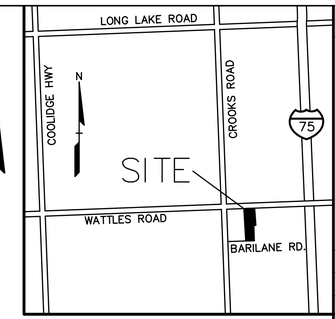

LOCATION MAP – NOT TO SCALE

LEGEND

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

EXISTING	PROPOSED
ELEC., PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE	
UNDERGROUND CABLE TV, CATV PEDESTAL	
TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE	
ELECTRIC U.G. CABLE, MANHOLE, METER & HANDHOLE	
GAS MAIN, VALVE & GAS LINE MARKER	
WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE	
SANITARY SEWER, CLEANOUT & MANHOLE	
STORM SEWER, CLEANOUT & MANHOLE	
COMBINED SEWER & MANHOLE	
SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN	
POST INDICATOR VALVE	
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MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE	
UNIDENTIFIED STRUCTURE	
SPOT ELEVATION	
CONTOUR LINE	
FENCE	
GUARD RAIL	
STREET LIGHT	
SIGN	
CONCRETE	
ASPHALT	

STD DUTY · HEAVY DUTY · R.O.W. ONLY
STD DUTY · HEAVY DUTY · DEEP STRENGTH

No.	BY	CHK	DESCRIPTION	DATE
1	TMK	JBT	REVISED LAYOUT - 35 LOTS	X-X-18

REVISIONS

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 LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY AND HOLD DESIGN PROFESSIONAL HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT EXCEPTING LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE DESIGN PROFESSIONAL.

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t: 248.689.9090
f: 248.689.1044
www.peainc.com

SCI HOMES INC.
1612 MUER DR.
TROY, MI 48084

CROOKS RD. MULTI-FAMILY
PART OF THE SE 1/4 OF SECTION 17, T. 2N., R. 11E.,
CITY OF TROY, OAKLAND COUNTY, MICHIGAN

DES.	DN.	SUR.	P.M.
GMB	GMB	KTR	GMB

S:\PROJECTS\2019\2019-268 WATTLES MULTI-FAMILY - OAR\DWG\25-BASE\19-268 BASMAP.dwg

ORIGINAL ISSUE DATE:
MAY 24, 2019

PEA JOB NO. 2018-238A

DRAWING NUMBER:

NOT FOR CONSTRUCTION

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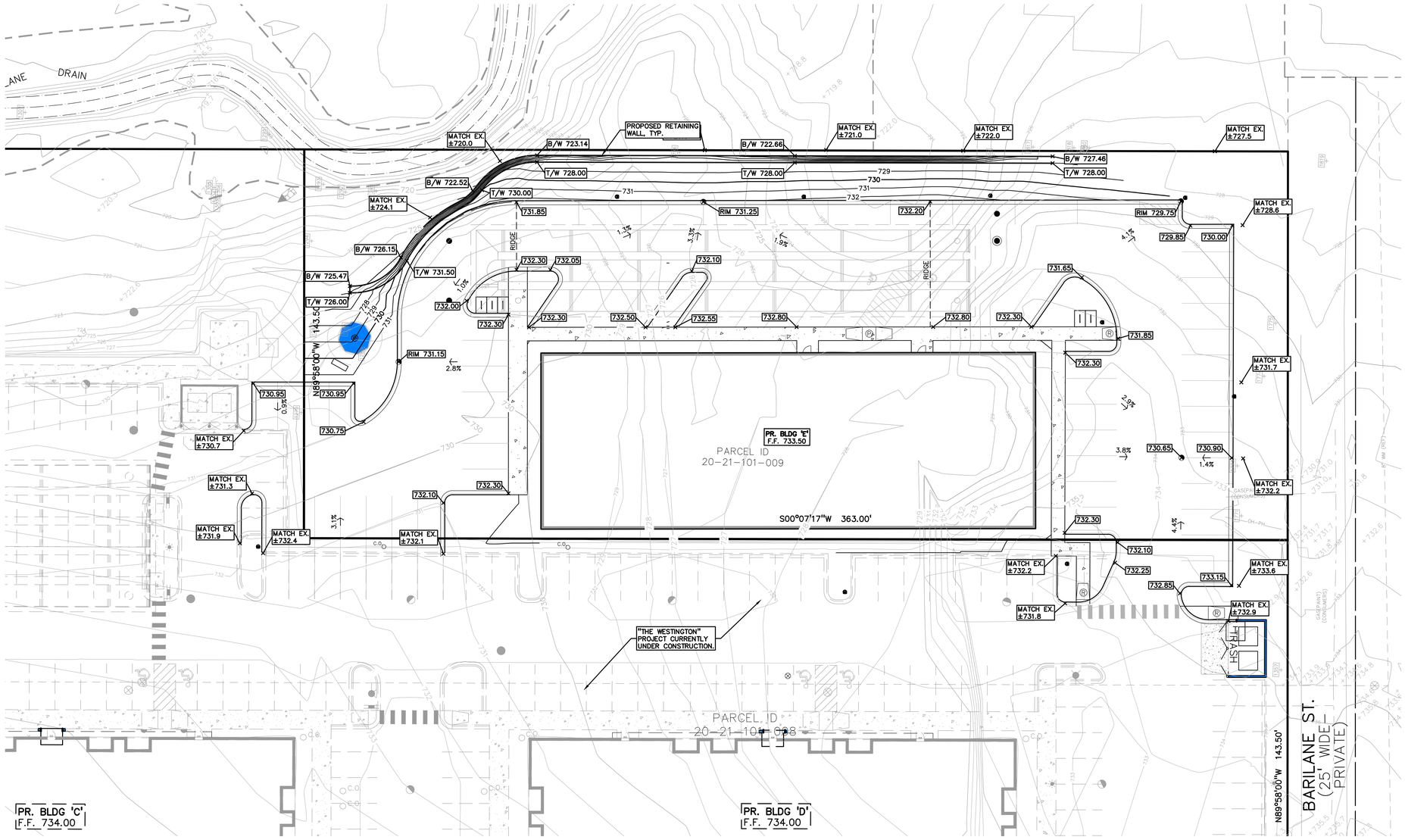

LEGEND

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EXISTING	PROPOSED
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MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE	
UNIDENTIFIED STRUCTURE	
SPOT ELEVATION	671.21
CONTOUR LINE	671
FENCE	
GUARD RAIL	
STREET LIGHT	
SIGN	
CONCRETE	STD DUTY, HEAVY DUTY, R.O.W. ONLY
ASPHALT	STD DUTY, HEAVY DUTY, DEEP STRENGTH
GRAVEL SHOULDER	
WETLAND	

SYMBOLS: GRADING

PROPOSED SPOT ELEVATION:
TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES. — 622.50

PROPOSED CONTOUR LINE — 922 —

ABBREVIATIONS:
T/C = TOP OF CURB
G = GUTTER GRADE
T/P = TOP OF PAVEMENT
T/S = TOP OF SIDEWALK
T/W = TOP OF WALL
B/W = BOTTOM OF WALL
F.G. = FINISH GRADE
RIM = RIM ELEVATION

RETAINING WALL NOTE:
TOP OF WALL (T/W) AND BOTTOM OF WALL (B/W) GRADES ARE THE FINISH GRADE AT THE TOP AND BOTTOM OF THE RETAINING WALL, NOT ACTUAL TOP AND BOTTOM OF THE WALL STRUCTURE.

BENCHMARKS (GPS DERIVED – NAVD88 DATUM)

BM#300
SET BENCH TIE IN SOUTH FACE POWER POLE ±200 FEET SOUTH OF CENTERLINE OF W. WATTLES RD. ±15 FEET EAST OF BACK OF CURB OF CROOKS RD.
ELEVATION – 742.48

BM#302
ARROW ON HYDRANT SOUTH SIDE OF W. WATTLES RD. NEAR WEST PROPERTY LINE.
ELEVATION – 738.25

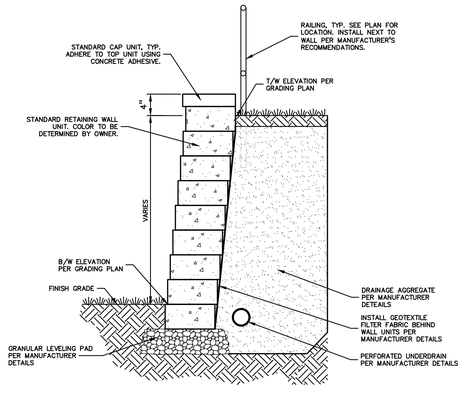
FLOODPLAIN NOTE:
BY GRAPHICAL PLOTTING, SITE IS WITHIN ZONE 'A', AREA DETERMINED TO BE WITHIN A SPECIAL FLOOD HAZARD AREA WITHOUT BASE FLOOD ELEVATION PER FLOOD INSURANCE RATE MAP NUMBER 26125C0533F, DATED SEPTEMBER 29, 2006.

WETLAND NOTE:
THERE ARE NO REGULATED WETLANDS ON SITE.

NOTE:

THIS DETAIL IS A GENERIC RETAINING WALL SECTION ILLUSTRATING THE MATERIALS TO BE USED IN THE WALL CONSTRUCTION. THE FINAL ENGINEERING OF THE WALL COMPONENTS, FOUNDATIONS, MECHANICALLY STABILIZED EARTH FILL AND GEOTECHNICAL FABRICS SHALL BE THE RESPONSIBILITY OF THE RETAINING WALL MATERIAL MANUFACTURER.

CONTRACTOR MUST SUBMIT SHOP DRAWINGS AND SITE SPECIFIC WALL CALCULATIONS OF PROPOSED WALL SEALED BY A PROFESSIONAL ENGINEER FOR APPROVAL.



TYPICAL RETAINING WALL SECTION
NOT TO SCALE

PEA GROUP
t: 844.813.2949
www.peagroup.com

STATE OF MICHIGAN
GREGORY BONO
ENGINEER
No. 54435
LICENSED PROFESSIONAL ENGINEER

NORTH

0 10 20 40
SCALE: 1" = 20'

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

CAUTION!!
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LOCATION MAP

CLIENT
TROY WESTINGTON LLC
1612 MUER RD
TROY, MI 48084

PROJECT TITLE
WESTINGTON PHASE II
3902 CROOKS ROAD
TROY, MI 48098

REVISIONS
-

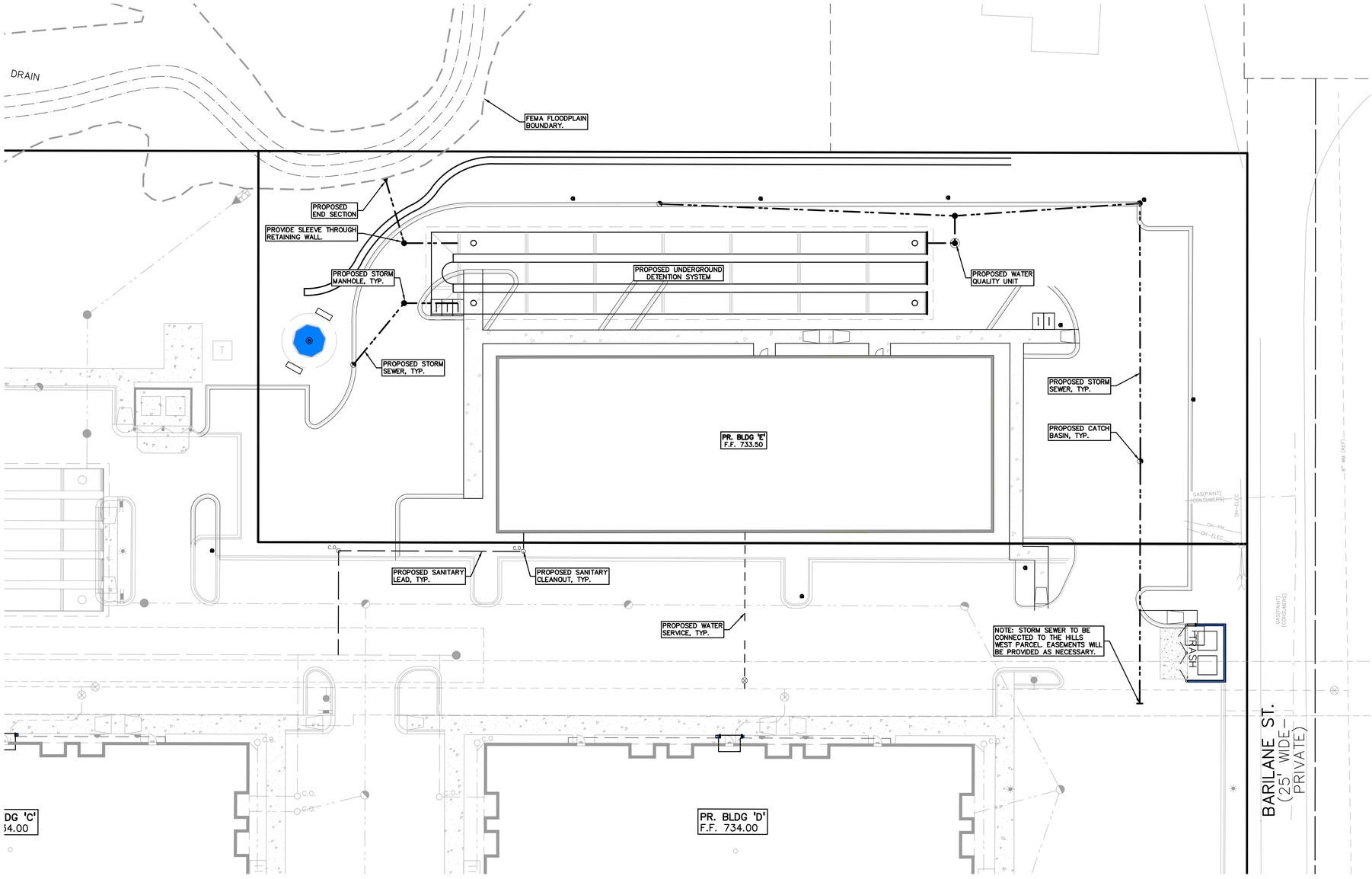
ORIGINAL ISSUE DATE:
OCTOBER 22, 2021

DRAWING TITLE
PRELIMINARY GRADING PLAN

PEA JOB NO.	2019-268
P.M.	GMB
DN.	DAS
DES.	GMB

DRAWING NUMBER:
C-2.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON - CAD\DWG\SITE PLANS (PHASE 2)\(C-2.0) GRADE-192658.dwg



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	PROPOSED	
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 MAIN, VALVE & GAS LINE MARKER
		WATERMAIN, HYD., GATE VALVE, TAPPING SLEEVE & VALVE
		SANITARY SEWER, CLEANOUT & MANHOLE
		STORM SEWER, CLEANOUT & MANHOLE
		COMBINED SEWER & MANHOLE
		SQUARE, ROUND & BEEHIVE CATCH BASIN, YARD DRAIN
		POST INDICATOR VALVE
		WATER VALVE BOX/HYDRANT VALVE BOX, SERVICE SHUTOFF
		MAILBOX, TRANSFORMER, IRRIGATION CONTROL VALVE
		UNIDENTIFIED STRUCTURE
		SPOT ELEVATION
670	671	CONTOUR LINE
		FENCE
		GUARD RAIL
		STREET LIGHT
		SIGN
CONC.		CONCRETE
ASPH.		ASPHALT
GRAVEL		GRAVEL SHOULDER
		WETLAND

STD DUTY | HEAVY DUTY | R.O.W. ONLY

STD DUTY | HEAVY DUTY | DEEP STRENGTH

Project:	The Westington - Phase 2
Location:	Troy
Date:	2/17/2022
Project No:	19-268

100 YEAR STORM DETENTION DESIGN (OAKLAND COUNTY DESIGN METHOD)

Site Drainage Data	
Contributing Area (A):	1.874 acre
Allowable Discharge (Qa)	0.37 cfs (0.2*area)
Coefficient of Runoff (Cr):	0.72
Storage Required (100-yr Storm)	
Qo = ((Qa)/(A)(Cr):	0.27 cfs/acre impervious
T = -25 + ((10312.5/Qo))^0.5:	170.43 minutes
Vs = (16500(T)/(T+25)) - 40Qo(T):	12.549 cf/acre impervious
Vt = (Vs)(A)(Cr):	**16,939 cft**
Underground Detention Storage Provided	
Pipe Diameter:	96 in
Pipe Volume per Linear Foot:	50.265 cft
Total Pipe Length:	552 ft
Total Pipe Volume:	**27,747 cft**

PEA GROUP
t: 844.813.2949
www.peagroup.com

STATE OF MICHIGAN
GREGORY BONO
ENGINEER
No. 54435
LICENSED PROFESSIONAL ENGINEER

NORTH

0 10 20 40
SCALE: 1" = 20'

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

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 VERIFYING THE LOCATIONS AND ELEVATIONS PRIOR TO THE START OF CONSTRUCTION.

LOCATION MAP

CLIENT
TROY WESTINGTON LLC
1612 MUER RD
TROY, MI 48084

PROJECT TITLE
WESTINGTON PHASE II
3902 CROOKS ROAD
TROY, MI 48098

REVISIONS
- -

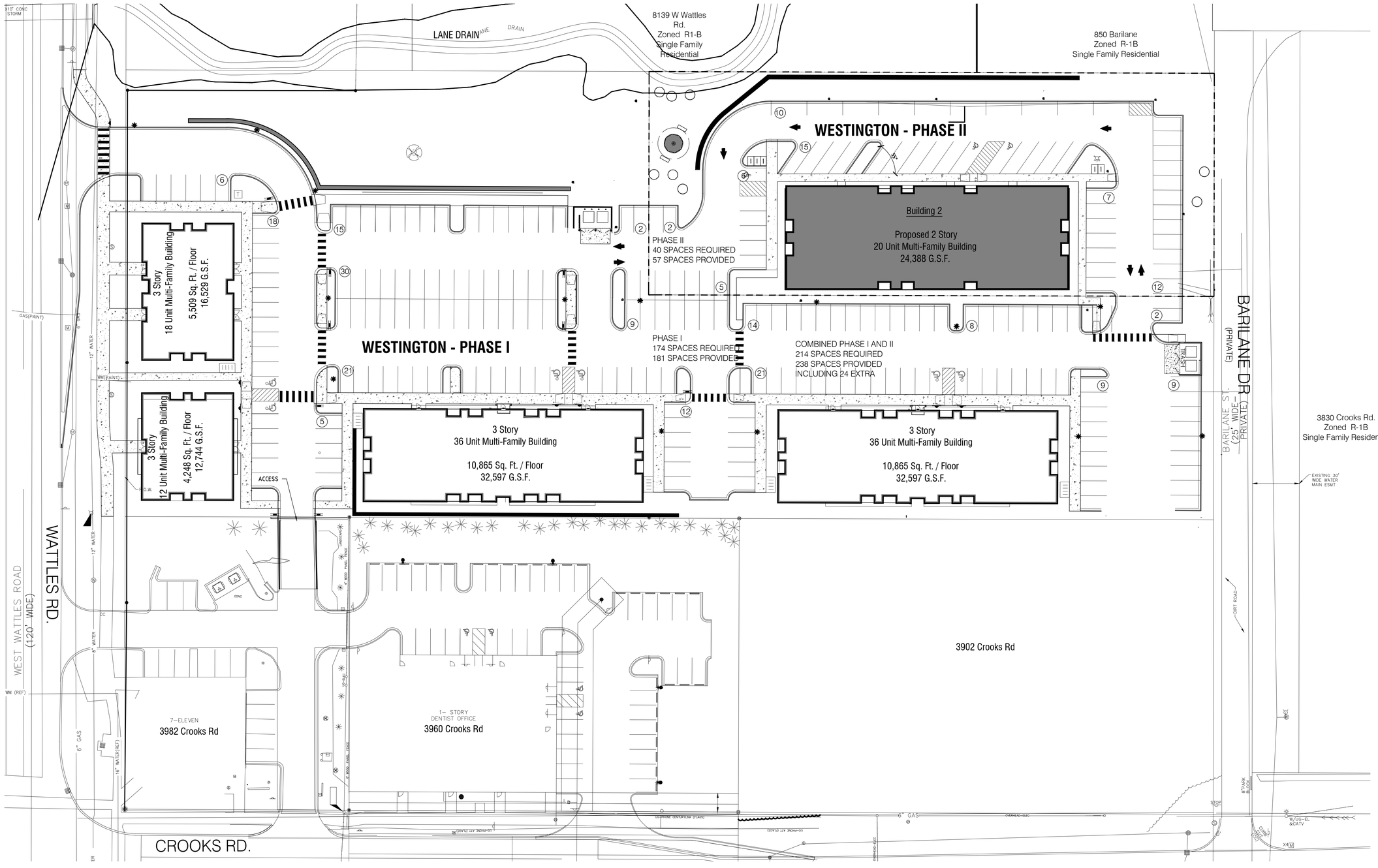
ORIGINAL ISSUE DATE:
OCTOBER 22, 2021

DRAWING TITLE
PRELIMINARY UTILITY PLAN

PEA JOB NO.	2019-268
P.M.	GMB
DN.	DAS
DES.	GMB

DRAWING NUMBER:
C-3.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON - OAK\DWG\SITE PLANS (PHASE 2)\(C-3.0) UTIL-19268.dwg



PARKING REQUIRED

Regulation	Required	Provided
Multi-Family	1 Spaces / Efficiency 2 Spaces / Unit	57 Total Spaces Provided Including: 40 Resident 17 Extra Spaces
(20) 2 Bed Units = 40 Spaces 40 Spaces Required		

	Westington	Westington Phase II	COMBINED
Area:	3.413 Acres (148,677 Sq. Ft.)	1.20 Acres (52,242 Sq. Ft.)	4.741 Acres (206,540 Sq. Ft.)
Units:	102 (30 Efficiency + 72 1-2 Bedroom)	20 2 Bedroom	102 (Eff / 1-2 Bed) + 20 (2 Bed) = 122
Parking Required / Provided:	174 Spaces / 181 Spaces	40 Spaces / 57 Spaces Provided	214 Spaces / 238 Spaces (24 Extra Spaces)
Building Coverage:	21.79%	22.71%	22.25% (Maximum 30%)
Open Space:	24.66%	33.68%	29.17% (Minimum 20%)

1 Composite Site Plan
SCALE: 1" = 30'

NORTH

DESIGNHAUS ARCHITECTURE EST 1998
3300 AUBURN RD.
AUBURN HILLS, MI 48326
T:248.601.4422 F:248.453.5854
WWW.DESIGNHAUS.COM
INFO@DESIGNHAUS.COM

Revision/Issue	Date
SPA Review #4	22.02.17
SPA Review #3	22.01.14
SPA Review #2	21.10.28
SPA Review #1	21.09.20

STATE OF MICHIGAN
MICHAEL E. PIZZOLA
LANDSCAPE ARCHITECT
No. 3901001656
REGISTERED LANDSCAPE ARCHITECT

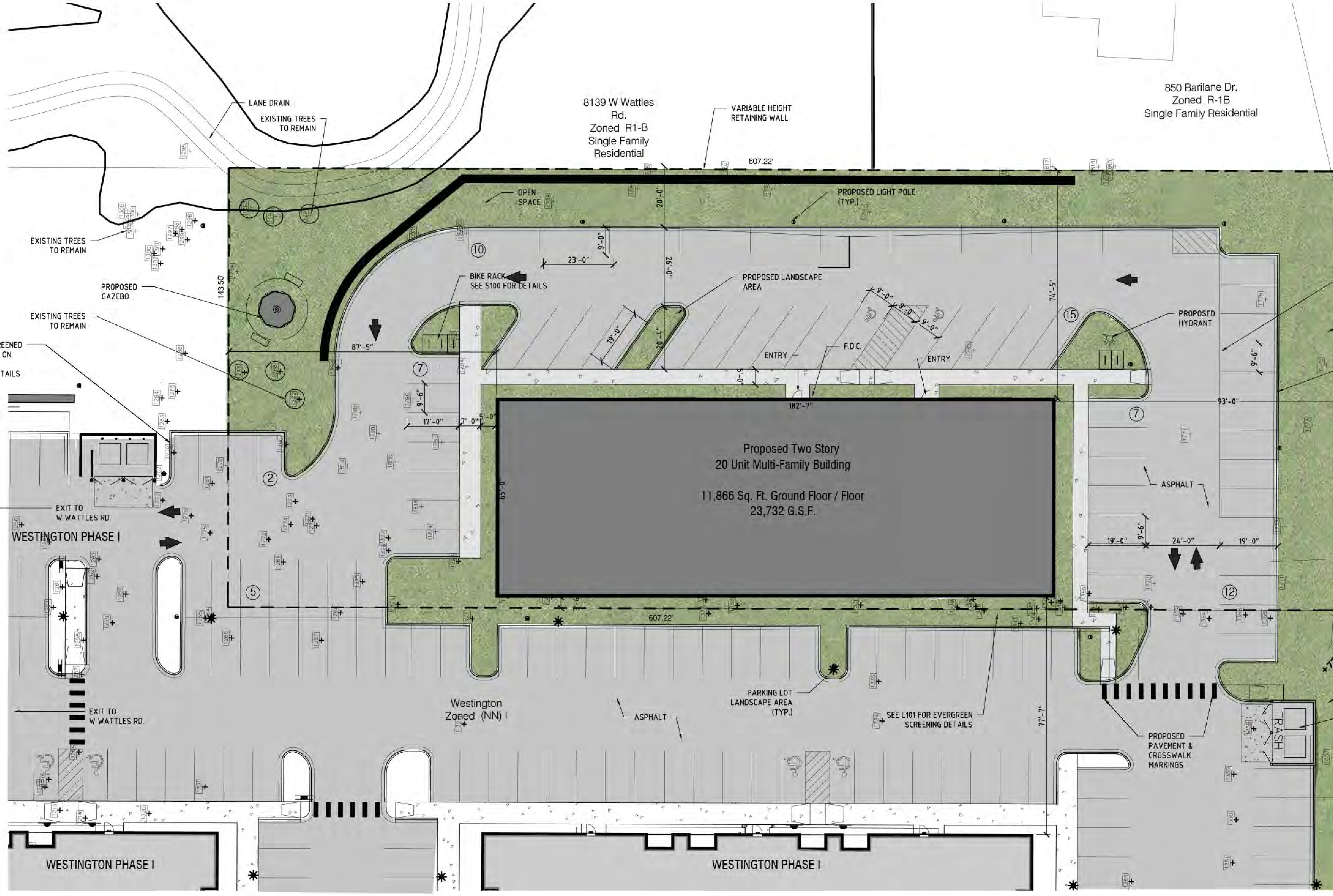
Westington Phase II
870 Barilane Dr.
Troy, MI 48084

Composite Site Plan

021194

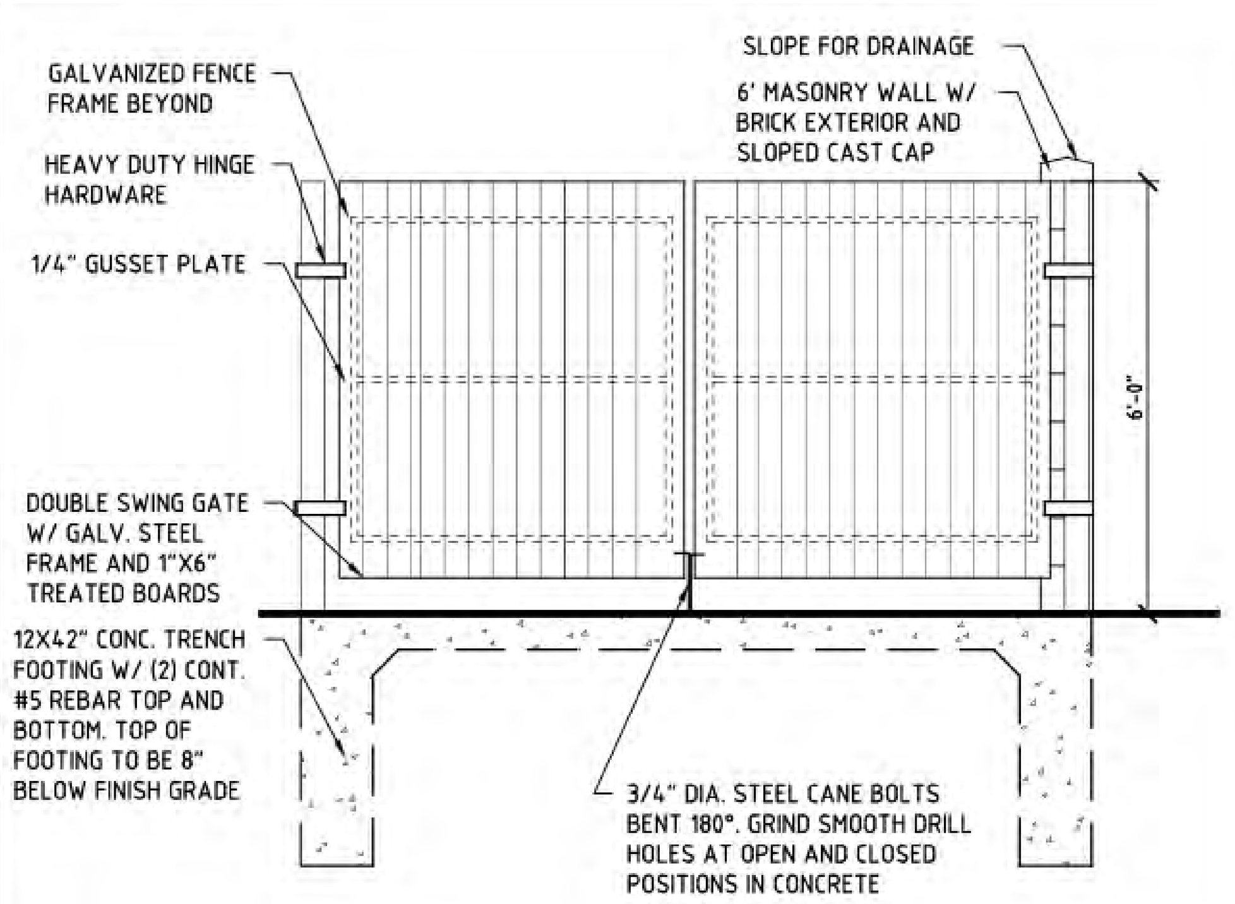
S100

S100 Composite Site Plan.dwg
2/18/2022
Mike Pizzola

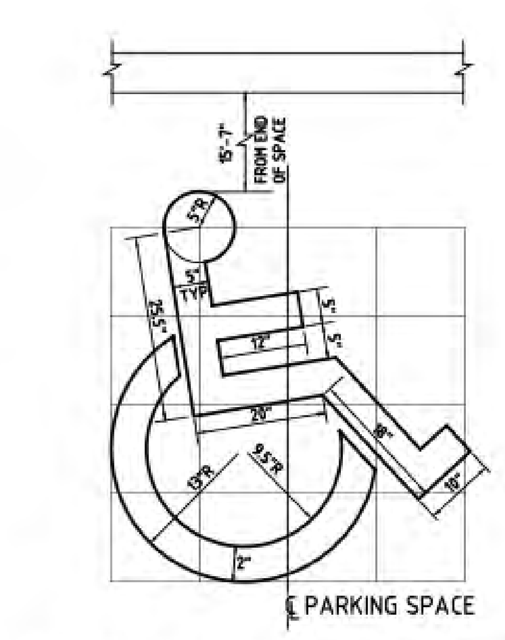


1 Site Plan
SCALE: 1" = 20'
NORTH

DUMPSTER ENCLOSURE DETAIL

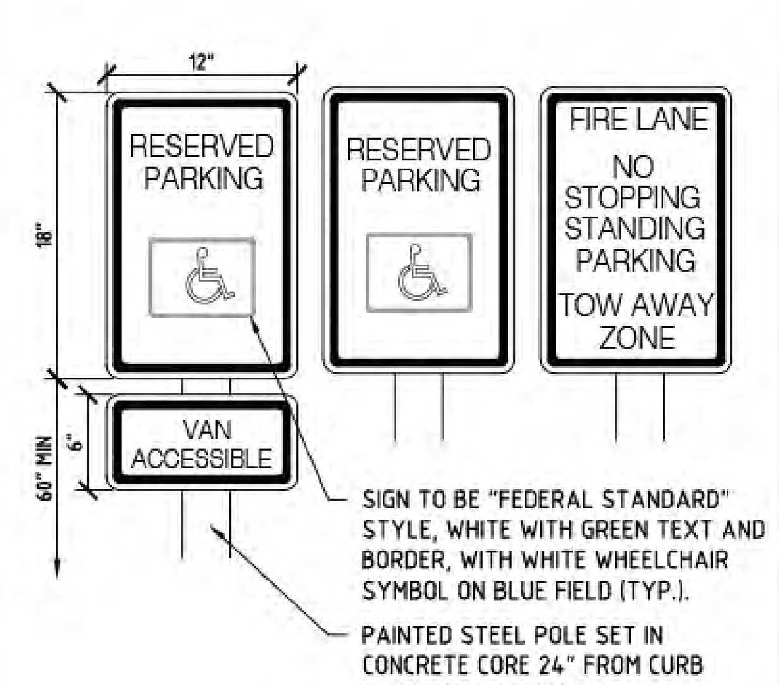


PARKING SPACE PAINT DETAIL

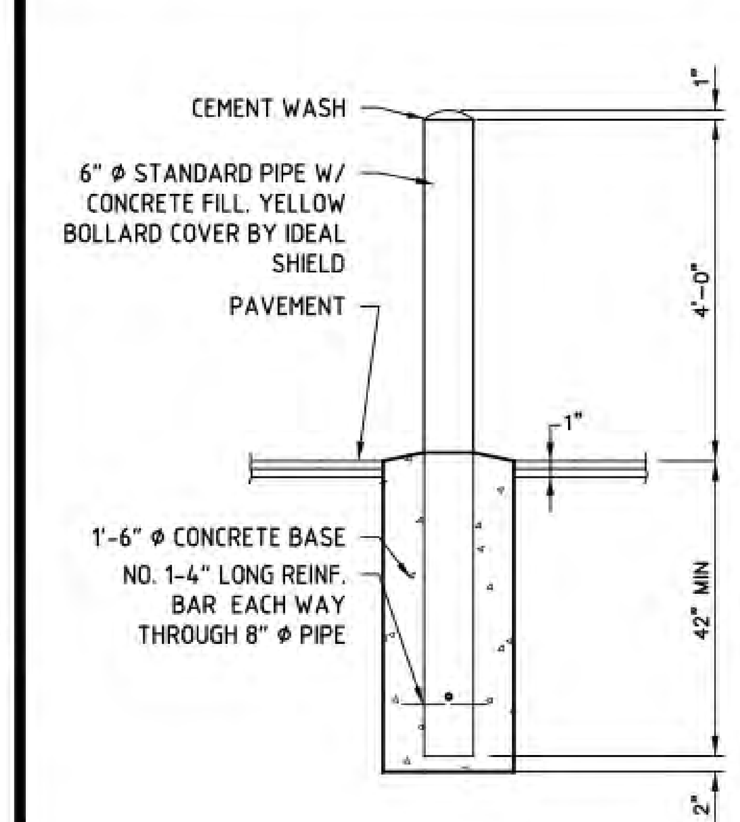


NOTE: SYMBOL SHALL BE PAINTED WITH BLUE TRAFFIC PAINT WITHIN OUTLINE SHOWN

HANDICAP SIGN DETAIL



BOLLARD DETAIL



PARKING SUMMARY

Regulation	Required	Provided
Multi-Family	1 Spaces / Efficiency 2 Spaces / Unit	20 x 2 = 40 Spaces Required 58 Spaces Provided
	(20) 2 Bed Units	

NOTES

1. Mechanical units to be wall mounted and internal (Magic Pack Units).
2. Lighting and photometric information provided on lighting plans.
3. All signs to meet Chapter 85 of City Code of Ordinances and be approved by Building Department.
4. Use MDOT R-28 series, sidewalk ramp and detectable warning details for sidewalk rams and detectable warning strips.
5. Maintain 10-foot horizontal separation between all underground utilities throughout.
6. Wattles Road is under City jurisdiction. Crooks - MDOT

ZONING SCHEDULE OF REGULATIONS

Regulation	Provided per (NN) I
Setbacks	West: 74'-5" Sides:N 82'-10" / S 97'-10" East: 3'-6"
Building Height	2.0 Stories - 30' to Mid-Rise
Coverage	Maximum Building Coverage - 30% 22.79% Provided Coverage Minimum Open Space - 20% 28.80% Provided Open Space

SITE DATA

Regulation	Information
Parcel I.D.	20-21-101-009
Address	870 Barilane Dr. Troy, MI 48098
Zoning	NN (Node I)
Parcel Area	(52,071 Sq.Ft.) 1.20 Acres

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Revision/Issue	Date
SPA Review #4	22.02.17
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SPA Review #2	21.10.28
SPA Review #1	21.09.20

PETER M. STUHLREYER ARCHITECT No. 44866 STATE OF MICHIGAN LICENSED ARCHITECT

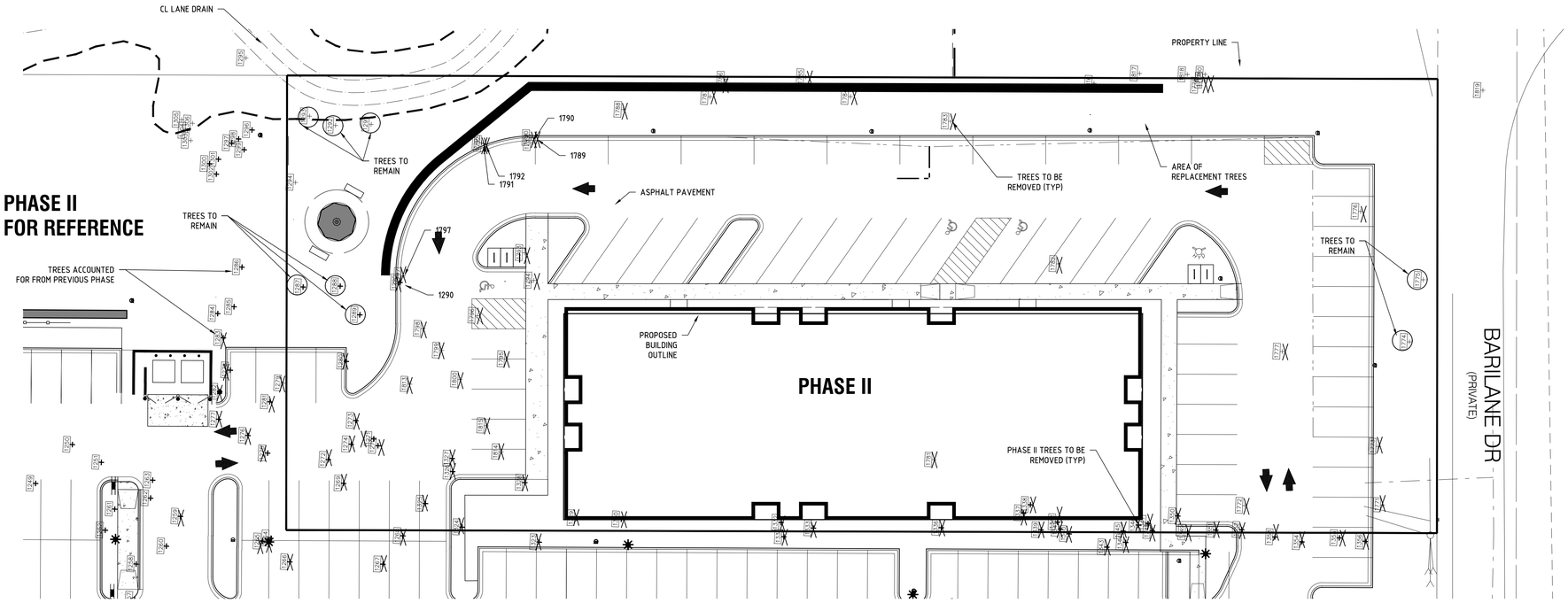
Westington Phase II
870 Barilane Dr.
Troy, MI 48084

Site Plan

021194

S101

S101 Site Plan.dwg
2/16/2022
Mike Pizzola

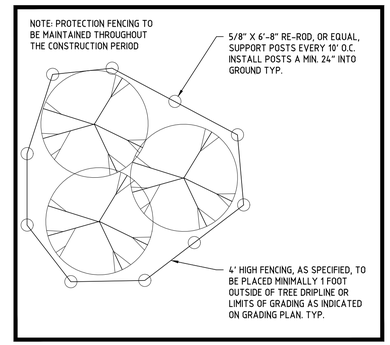


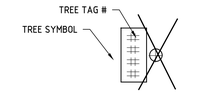
1 Tree Removal & Preservation Plan

SCALE: 1" = 20'

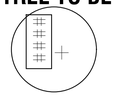
NORTH

TREE PROTECTION DETAIL





EXISTING TREE TO BE REMOVED



EXISTING TREE TO REMAIN

	A	B	C	D	E	F	G
1	TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
58	1257	WP	17	(Eastern) White Pine	Pinus strobus	Fair	
59	1258	GA	7	Green Ash	Fraxinus pennsylvanica	Very Poor	
60	1259	EE	7	Siberian Elm	Ulmus pumila	Poor	
61	1260	RC	12	Red Cedar	Juniperus virginiana	Poor	
62	1261	WP	10	(Eastern) White Pine	Pinus strobus	Fair	
63	1262	WP	9	(Eastern) White Pine	Pinus strobus	Poor	
64	1263	EE	8	Siberian Elm	Ulmus pumila	Poor	
65	1264	EE	6	Siberian Elm	Ulmus pumila	Fair	
66	1265	EE	13	Siberian Elm	Ulmus pumila	Fair	
67	1266	FC	10	Flowering Cherry	Prunus spp.	Fair	
68	1267	EE	26	Siberian Elm	Ulmus pumila	Fair	
69	1268	EE	35	Siberian Elm	Ulmus pumila	Fair	
70	1269	WP	14	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
71	1270	WP	11	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
72	1271	WP	12	(Eastern) White Pine	Pinus strobus	Poor	TBR / W
73	1272	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
74	1273	EE	14	Siberian Elm	Ulmus pumila	Fair	TBR / W
75	1274	WP	13	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
76	1275	EE	12	Siberian Elm	Ulmus pumila	Poor	
77	1276	CT	9	Cottonwood	Populus deltoides	Fair	
78	1277	EE	6	Siberian Elm	Ulmus pumila	Fair	
79	1278	WP	7	(Eastern) White Pine	Pinus strobus	Fair	
80	1279	CT	13	Cottonwood	Populus deltoides	Fair	TBR / E
81	1280	WP	14	(Eastern) White Pine	Pinus strobus	Poor	TBR / W
82	1281	EE	7	Siberian Elm	Ulmus pumila	Very Poor	
83	1282	CT	13	Cottonwood	Populus deltoides	Fair	
84	1283	EE	13	Siberian Elm	Ulmus pumila	Fair	
85	1284	CT	18	Cottonwood	Populus deltoides	Fair	
86	1285	CT	13	Cottonwood	Populus deltoides	Fair	
87	1286	EE	13	Siberian Elm	Ulmus pumila	Fair	
*** 88	1287	CT	13	Cottonwood	Populus deltoides	Fair	TO REMAIN
89	1288	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TO REMAIN
90	1289	WP	8	(Eastern) White Pine	Pinus strobus	Poor	TO REMAIN
91	1290	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
92	1291	E	16	American Elm	Ulmus americana	Fair	TO REMAIN
**** 93	1292	E	7	American Elm	Ulmus americana	Fair	TO REMAIN
94	1293	E	14	American Elm	Ulmus americana	Fair	TO REMAIN
95	1294	BW	12	Black Walnut	Juglans nigra	Fair	TO REMAIN
96	1295	SM	13	Silver Maple	Acer saccharinum	Fair	
97	1296	MW	10	White Mulberry	Morus alba	Fair	
98	1297	CT	14	Cottonwood	Populus deltoides	Fair	
99	1298	CT	18	Cottonwood	Populus deltoides	Fair	
100	1299	CT	13	Cottonwood	Populus deltoides	Fair	
101	1300	CT	12	Cottonwood	Populus deltoides	Fair	
102	1301	CT	13	Cottonwood	Populus deltoides	Fair	
103	1302	MW	10	White Mulberry	Morus alba	Fair	
104	1303	CT	13	Cottonwood	Populus deltoides	Fair	
105	1304	CT	12	Cottonwood	Populus deltoides	Poor	
106	1305	CT	28	Cottonwood	Populus deltoides	Fair	
107	1306	CT	26	Cottonwood	Populus deltoides	Fair	
108	1307	BX	8	Box elder	Acer negundo	Poor	
109	1308	AA	6	Tree-of-Heaven	Allanthus Altissima	Fair	
110	1309	SU	18	Sugar Maple	Acer saccharum	Good	x1
111	1310	SU	20	Sugar Maple	Acer saccharum	Fair	
112	1311	RC	8	Red Cedar	Juniperus virginiana	Fair	
113	1312	RC	7	Red Cedar	Juniperus virginiana	Fair	

102" - WOODLAND REPLACEMENT
0 - LANDMARK REPLACEMENT
82" - EXISTING TREE CREDIT (X2 REPLACEMENT VALUE)

	A	B	C	D	E	F	G
1	TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
115	1314	RC	8	Red Cedar	Juniperus virginiana	Fair	
116	1315	SU	23	Sugar Maple	Acer saccharum	Good	
117	1316	BWW	13	Black Willow	Salix nigra	Very Poor	
118	1317	BWW	54	Black Willow	Salix nigra	Fair	
119	1318	FC	15	Flowering Cherry	Prunus spp.	Poor	
120	1319	BW	6	Black Walnut	Juglans nigra	Fair	
121	1320	NM	8	Norway Maple	Acer platanoides	Fair	
122	1321	TH	6	Thornapple Hawthorne	Crataegus spp.	Poor	
123	1322	SU	16	Sugar Maple	Acer saccharum	Fair	
124	1323	BR	12	Bur oak	Quercus macrocarpa	Fair	
125	1324	EE	22	Siberian Elm	Ulmus pumila	Fair	
126	1325	WP	11	(Eastern) White Pine	Pinus strobus	Fair	
127	1326	WP	14	(Eastern) White Pine	Pinus strobus	Fair	
128	1327	WP	12	(Eastern) White Pine	Pinus strobus	Fair	
129	1328	WP	13	(Eastern) White Pine	Pinus strobus	Fair	
130	1329	EE	10	Siberian Elm	Ulmus pumila	Fair	
131	1330	MW	6	White Mulberry	Morus alba	Fair	TBR / W
132	1331	WC	7	White Cedar	Thuja occidentalis	Fair	x2 TBR / W
133	1332	MW	8	White Mulberry	Morus alba	Fair	TBR / W
134	1333	RC	8	Red Cedar	Juniperus virginiana	Fair	X3 TBR / W
135	1334	S	30	Sycamore	Platanus occidentalis	Good	TBR / L
136	1335	NS	19	Norway Spruce	Picea Abies	Good	TBR / L
137	1336	EE	6	Siberian Elm	Ulmus pumila	Poor	TBR / E
138	1337	WC	9	White Cedar	Thuja occidentalis	Fair	X3 TBR / W
139	1338	WC	7	White Cedar	Thuja occidentalis	Poor	TBR / W
140	1339	WC	9	White Cedar	Thuja occidentalis	Fair	TBR / W
141	1340	WC	6	White Cedar	Thuja occidentalis	Fair	x2 TBR / W
142	1341	WC	7	White Cedar	Thuja occidentalis	Fair	TBR / W
143	1342	WC	6	White Cedar	Thuja occidentalis	Fair	TBR / W
144	1343	RC	10	Red Cedar	Juniperus virginiana	Fair	TBR / W
145	1344	RC	9	Red Cedar	Juniperus virginiana	Fair	TBR / W
146	1345	RC	8	Red Cedar	Juniperus virginiana	Fair	TBR / W
147	1346	RC	6	Red Cedar	Juniperus virginiana	Fair	TBR / W
148	1347	RC	6	Red Cedar	Juniperus virginiana	Fair	TBR / W
149	1348	RC	8	Red Cedar	Juniperus virginiana	Fair	TBR / W
150	1349	SU	28	Sugar Maple	Acer saccharum	Fair	TBR / L
151	1350	RC	7	Red Cedar	Juniperus virginiana	Fair	TBR / W
152	1351	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
153	1352	JP	23	Jack Pine	Pinus banksiana	Poor	TBR / L
154	1353	JP	12	Jack Pine	Pinus banksiana	Poor	TBR / W
155	1354	JP	13	Jack Pine	Pinus banksiana	Poor	TBR / W
156	1355	WP	16	(Eastern) White Pine	Pinus strobus	Fair	TBR W
157	1356	WP	22	(Eastern) White Pine	Pinus strobus	Fair	TBR / L
158	1357	NM	27	Norway Maple	Acer platanoides	Good	
159	1358	WS	7	White Spruce	Picea glauca	Fair	
160	1359	WS	9	White Spruce	Picea glauca	Fair	
161	1360	WS	8	White Spruce	Picea glauca	Fair	
162	1361	WS	8	White Spruce	Picea glauca	Fair	
163	1362	NM	15	Norway Maple	Acer platanoides	Fair	
164	1363	NM	19	Norway Maple	Acer platanoides	Fair	
165	1364	WS	10	White Spruce	Picea glauca	Fair	
166	1365	WS	17	White Spruce	Picea glauca	Fair	
167	1366	WP	15	(Eastern) White Pine	Pinus strobus	Fair	
168	1367	MW	8	White Mulberry	Morus alba	Fair	
169	1368	EE	6	Siberian Elm	Ulmus pumila	Fair	

232" - WOODLAND REPLACEMENT
122" - LANDMARK REPLACEMENT
0 - EXISTING TREE CREDIT

	A	B	C	D	E	F	G
1	TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
** 60	1770	WS	8	White Spruce	Picea glauca	Good	TBR / W
61	1771	EE	24	Siberian Elm	Ulmus pumila	Good	TBR / E
62	1772	WS	10	White Spruce	Picea glauca	Fair	TBR / W
63	1773	EE	25	Siberian Elm	Ulmus pumila	Good	TBR / E
64	1774	EE	33	Siberian Elm	Ulmus pumila	Good	TO REMAIN
65	1775	WS	13	White Spruce	Picea glauca	Fair	TO REMAIN
66	1776	BS	21	Blue Spruce	Picea pungens	Fair	TBR / L
67	1777	BS	22	Blue Spruce	Picea pungens	Fair	TBR / L
68	1778	MW	8	White Mulberry	Morus alba	Fair	TBR / E
69	1779	MW	12	White Mulberry	Morus alba	Fair	TBR / E
70	1780	NM	12	Norway Maple	Acer platanoides	Good	TBR / W
71	1781	SM	44	Silver Maple	Acer saccharinum	Good	TBR / E
72	1782	WS	17	White Spruce	Picea glauca	Fair	TBR / W
73	1783	SC	11	Scotch Pine	Pinus sylvestris	Fair	TBR / W
74	1784	WP	18	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
75	1785	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
76	1786	WP	17	(Eastern) White Pine	Pinus strobus	Good	TBR / W
77	1787	WP	11	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
78	1788	WP	11	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
79	1789	PN	9	Pin Cherry	Prunus pennsylvanica	Fair	TBR / W
80	1790	PN	14	Pin Cherry	Prunus pennsylvanica	Fair	TBR / W
81	1791	PN	11	Pin Cherry	Prunus pennsylvanica	Fair	TBR / W
82	1792	PN	9	Pin Cherry	Prunus pennsylvanica	Fair	TBR / W
83	1793	EE	24	Siberian Elm	Ulmus pumila	Good	TBR / E
84	1794	WP	9	(Eastern) White Pine	Pinus strobus	Fair	TBR / W
85	1795	CT	23	Cottonwood	Populus deltoides	Fair	TBR / E
86	1796	EE	12	Siberian Elm	Ulmus pumila	Good	TBR / E
87	1797	WP	16	(Eastern) White Pine	Pinus strobus	Fair	TBR W
88	1798	WP	8	(Eastern) White Pine	Pinus strobus	Fair	TBR W
89	1799	WP	13	(Eastern) White Pine	Pinus strobus	Fair	TBR W
90	1800	WP	17	(Eastern) White Pine	Pinus strobus	Fair	TBR W
91	1813	WP	8	(Eastern) White Pine	Pinus strobus	Fair	TBR W
92	1814	WP	12	(Eastern) White Pine	Pinus strobus	Fair	TBR W
93	1815	WP	10	(Eastern) White Pine	Pinus strobus	Fair	TBR W

263" - WOODLAND REPLACEMENT
43" - LANDMARK REPLACEMENT
48" - EXISTING TREE PRESERVATION CREDIT (X2 REPLACEMENT VALUE)

TREES ON SITE

TO BE REMOVED / WOODLAND REPLACEMENT

TO BE REMOVED / EVASIVE - NO REPLACEMENT

TO BE REMOVED / LANDMARK REPLACEMENT

TO REMAIN

* EXISTING TREES TO BE PRESERVED

TREES NOT PART OF THIS PHASE

REPLACEMENT TREE SCHEDULE

PROTECTED TREES	**INCHES REMOVED**	**REPLACEMENT REQUIRED**
LANDMARK	165 INCHES	165 INCHES
WOODLAND	597 INCHES	299 INCHES
PRESERVATION / MITIGATION	**INCHES PRESERVED**	**CREDIT**
LANDMARK / WOODLAND	130"	260"
PROTECTED REPLACEMENT REQUIRED	464 INCHES	
PRESERVATION CREDIT	260 INCHES	
TOTAL	204 INCH REQUIREMENT REPLACEMENT	
	204" / 3" = (68) 3" REPLACEMENT TREES REQUIRED	

NOTE: SEE LANDSCAPE PLAN FOR ALLOCATION OF (68) 3" REPLACEMENT TREES

DESIGNHAUS ARCHITECTURE EST 1998
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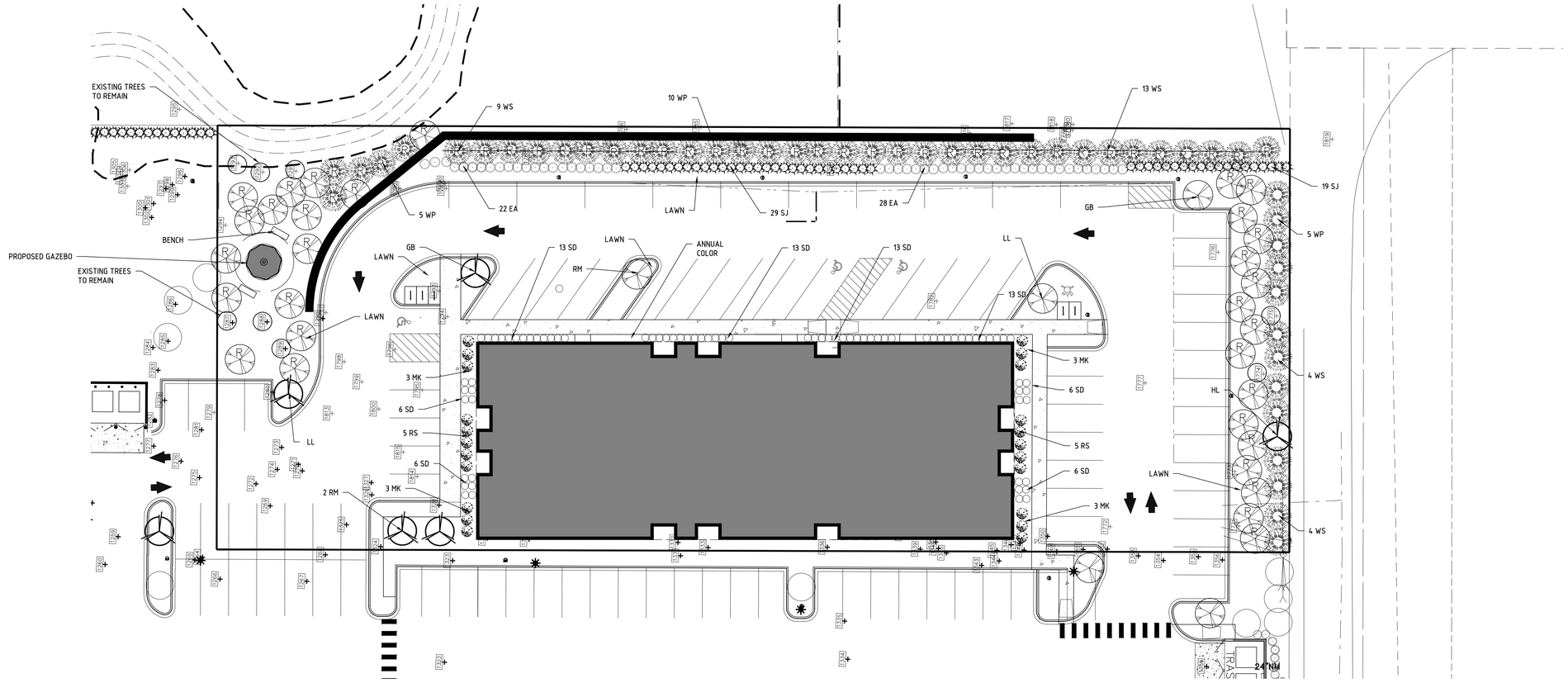
Revision/Issue	Date
SPA Review #4	22.02.17
SPA Review #3	22.01.14
SPA Review #2	21.10.28
SPA Review #1	21.09.20

STATE OF MICHIGAN
MICHAEL E. PIECZKA
LANDSCAPE ARCHITECT
No. 3901001656
REGISTERED LANDSCAPE ARCHITECT

Tree Preservation Plan
Westington Phase II
870 Barilane Dr.
Troy, MI 48084

021194

L100



1 Landscape Plan
SCALE: 1" = 30'

NORTH

Disposition	Landscaping Required	Landscaping Provided
General Site Landscaping:	20% Min.	+24.66% w Plant Material
Landscaping Adjacent to Roads:	N / A	N / A
Replacement Trees - R	68 Trees Required	68 Replacement Trees Provided
Greenbelt Requirements:	N / A	N / A
Screening Requirements:	Buffer Type 1 or 2 Between Conflicting Land Uses	Type 2 @ East / South Type 1 @ South Property Lines
Parking Lot Requirements:	1 Tree / 8 Spaces 58 / 8 = 7 Trees	7 Trees Provided

NOTE:
68 REPLACEMENT TREES REQUIRED

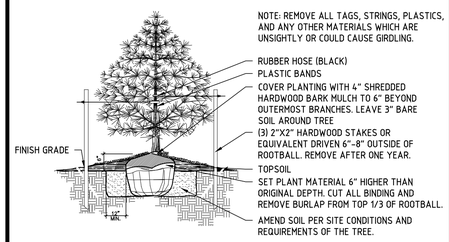
Ⓡ PHASE II REPLACEMENT TREE LOCATION

REPLACEMENT SCHEDULE:

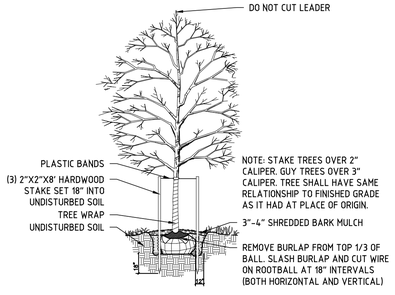
22 WHITE SPRUCE
10 WHITE PINE
5 GINKGO
5 LITTLE LEAF LINDEN
10 RED MAPLE
5 HONEYLOCUST
11 RED BUCKEYE

PLANTING DETAILS

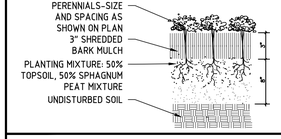
EVERGREEN TREES



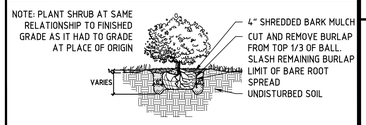
DECIDUOUS TREES



PERENNIALS



SHRUBS



PLANT SCHEDULE

QTY.	TAG	BOTANICAL NAME	COMMON NAME	SIZE/ROOT	NOTES
11	RB	AESCULUS pavia	RED BUCKEYE	3"B&B	
7	GB	GINKGO biloba	GINKGO	3" B&B	
6	LL	TILLA cordata	LITTLE LEAF LINDEN	3" B&B	
30	WS	PICEA glauca	WHITE SPRUCE	7-8' B&B	
12	RM	ACER rubrum	RED MAPLE	3" B&B	
50	EA	THUJA o EMERALD	EMERALD ARBORVITAE	7-8' B&B	
48	SJ	JUNIPERUS x S	SPARTAIN JUNIPER	7-8' B&B	
10	RS	SPIREA x COCCINEA	DWARF RED SPIREA	24" B&B	
12	MK	SYRINGA p MISS KIM	MISS KIM LILAC	24" B&B	
15	WP	PINUS strobus	WHITE PINE	7' B&B	
6	HL	GLEDITSIA t INERMIS	HONEYLOCUST	3" B&B	
63	SD	STELLA D'ORO	DAYLILY		

Total Trees: 87
Total Shrubs: 120
Total Grasses and Perennials:
Total New Plant Material Provided: 270 Plants

Irrigation Cost Estimate: $6,500.00
Total Landscape Cost Estimate: $30,745.00

PLANT SPACING:
FRONTAGE TREES - 30' O.C.
EVERGREEN TREES - 10' O.C.
NARROW EVERGREEN TREES - 5' O.C.
SHRUBS - 3' O.C.
PERENNIALS / GRASSES - 3' O.C.

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WWW.DESIGNHAUS.COM
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Revision/Issue	Date
SPA Review #4	22.02.17
SPA Review #3	22.01.14
SPA Review #2	21.10.28
SPA Review #1	21.09.20

STATE OF MICHIGAN
MICHAEL E PIZZOLA
LANDSCAPE ARCHITECT
No. 3901001656
REGISTERED LANDSCAPE ARCHITECT

Westington Phase II
870 Barilane Dr.
Troy, MI 48084

Landscape Plan

021194

L101

L101 Landscape Plan.dwg
2/18/2022
Mike Pizzola

Schedule

Symbol	Label	Quantity	Manufacturer	Catalog Number	Description	Lamp	Number Lamps	Filename	Lumens Per Lamp	Light Loss Factor	Wattage
	A	7	Lithonia Lighting	DSXW1 LED 10C 1000 40K T3S MVOLT	DSXW1 LED WITH (1) 10 LED LIGHT ENGINES, TYPE T3S OPTIC, 4000K, @ 1000mA.	LED	1	DSXW1_LED_10C_1000_40K_T3S_MVOLT.ies	3912	1	38.8
	B	6	Lithonia Lighting	DSXW1 LED 10C 1000 40K T3S MVOLT	DSXW1 LED WITH (1) 10 LED LIGHT ENGINES, TYPE T3S OPTIC, 4000K, @ 1000mA.	LED	1	DSXW1_LED_10C_1000_40K_T3S_MVOLT.ies	3912	1	38.8

Statistics

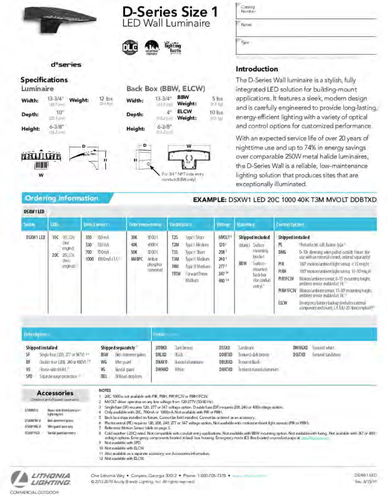
Description	Symbol	Avg	Max	Min	Max / Min	Avg / Min
Calc Zone #2	+	0.9 fc	5.6 fc	0.0 fc	N/A	N/A

GENERAL NOTE:
All site lighting to comply with City of Troy lighting standards (Section 13.05)

The engineer and/or architect must determine applicability of the layout to existing /future field conditions. This lighting layout represents illumination levels calculated from laboratory data taken under controlled conditions in accordance with illuminating engieering society approved methods. Actual performance of any manufacturer's luminaire may vary due to variation in electrical voltage, tolerance in lamps, and other variable field conditions. Mounting heights indicated are from grade and/or floor up.

These lighting calculations are not a substitute for independent engieering analysis of lighting system suitability and safety. The engineer and/or architect is responsible to review for Michigan Energy Code and lighting quality compliance.

Unless exempt, project must comply with lighting controls requirements defined in ASHRAE 90.132013.
For specific information contact GBA controls group at ASG@gasserbush.com or 734-266-6705



ORDERING NOTE:
For inquiries contact Gasser Bush at quotes@gasserbush.com or 734-266-6705

DRAWING NOTE:
This drawing was generated from an electronic image for estimation purpose only. Layout to be verified in field by others.

MOUNTING HEIGHT NOTE:
Mounting height is measured from grade to face of fixture. Pole height should be calculated as the mounting height less base height.

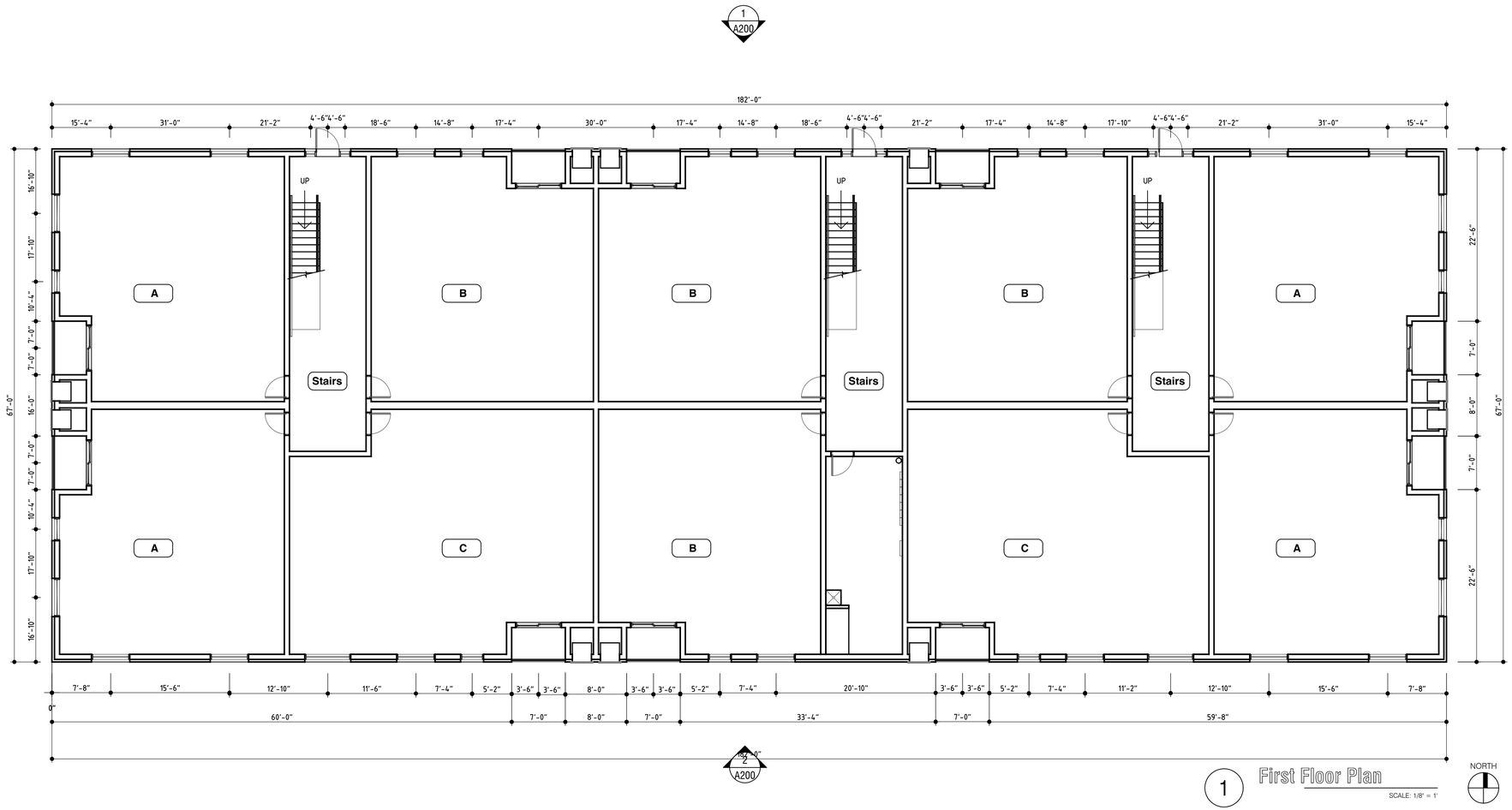
Current View

WESTINGTON PHASE II
945-915 WATTLES & 990 BARILANE DRIVE
TROY, MI 48084

Designer	
Date	2/16/2022
Scale	Not to Scale
Drawing No.	
Summary	

UNIT MATRIX

UNIT			1ST	2ND
A	2 BR	SQFT	4	4
B	2 BR	SQFT	4	3
C	2 BR	SQFT	2	2



1 First Floor Plan

SCALE: 1/8" = 1'

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SPA Review #1	21.09.20

PETER M. STUHLREYER — STATE OF MICHIGAN — ARCHITECT — No. 44008 — REGISTERED ARCHITECT

Westington Phase II

870 Barilane Dr.
Troy, MI 48084

First Floor Plan

021194

A100

A100 Floor Plan.dwg

2/18/2022

Mike Pizzola

UNIT MATRIX

UNIT			1ST	2ND
A	2 BR	SQFT	4	4
B	2 BR	SQFT	4	3
C	2 BR	SQFT	2	2

1 Second Floor
SCALE: 1/8" = 1'

NORTH

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Revision/issue	Date
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SPA Review #1	21.09.20

PETER M. STAHLREYER
ARCHITECT
44668
LICENSED ARCHITECT
STATE OF MICHIGAN

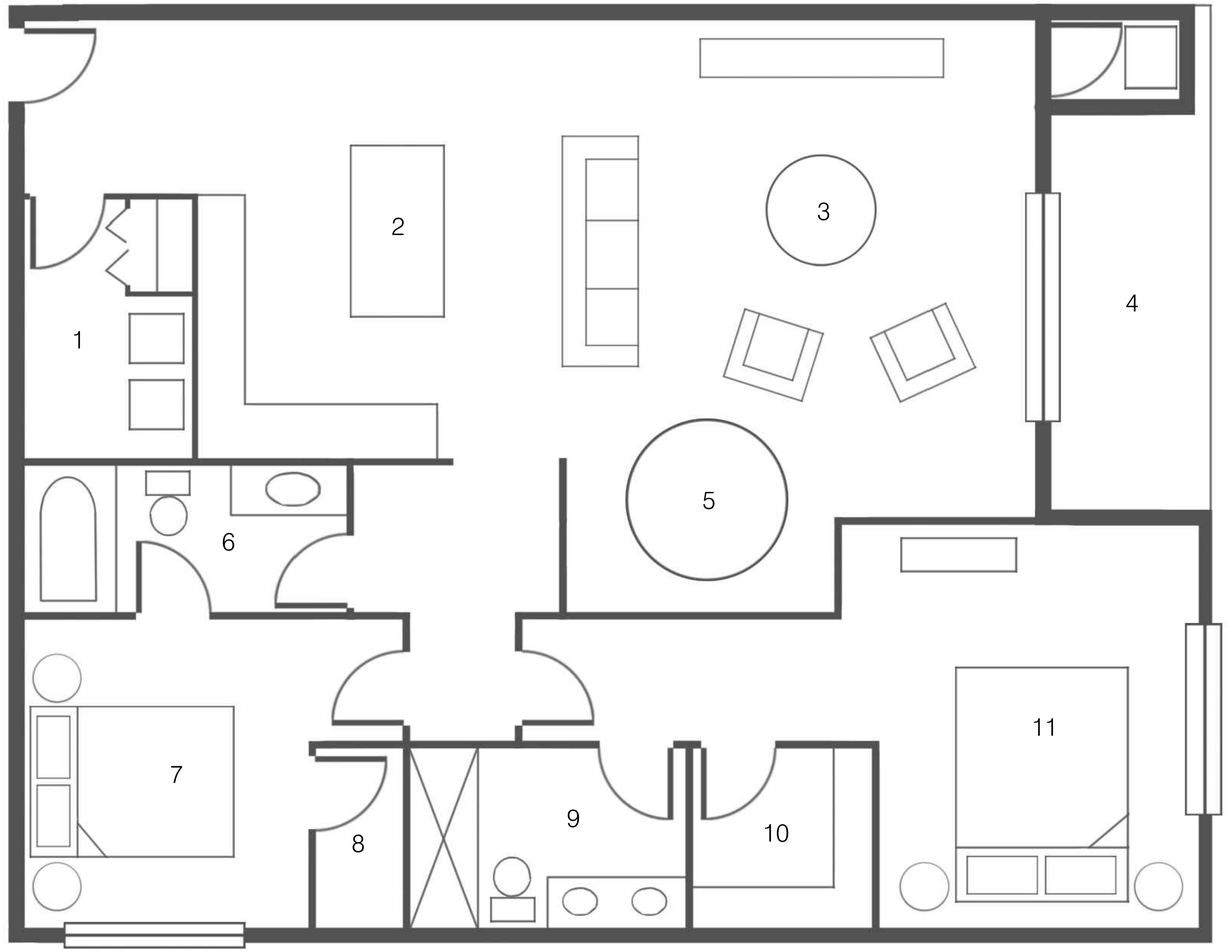
Westington Phase II

870 Bariliane Dr.
Troy, MI 48084

Second Floor Plan

021194

A101



1 Typical Unit Plan
SCALE: N.T.S

1. Laundry
2. Kitchen
3. Living Room
4. Balcony
5. Dining Room
6. Bathroom
7. Bedroom
8. Closet
9. Bathroom
10. Walk in Closet
11. Master Bedroom

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SPA Review #1	21.09.20

PETER M. STUHLREYER
ARCHITECT
44005

Westington Phase II

870 Barlane Dr.
Troy, MI 48084

Typical Unit Plan

021194

A103

MATERIAL LEGEND	
A	BRICK
B	ASPHALT SHINGLE ROOFING
C	VINYL WINDOW
D	LIMESTONE HEADER
E	METAL BALCONY
F	HARDIEPLANK SIDING
G	MECHANICAL VENT

4 East Elevation
SCALE: 1/8" = 1'

2 West Elevation
SCALE: 1/8" = 1'

3 North Elevation
SCALE: 1/8" = 1'

1 South Elevation
SCALE: 1/8" = 1'

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SPA Review #1	21.09.20

PETER M. STUHLREYER ARCHITECT 41005

Westington Phase II
870 Barlane Dr.
Troy, MI 48084

Elevations

021194

A200

WESTINGTON & WEST HILLS DEVELOPMENT TRAFFIC IMPACT STUDY

TROY, MICHIGAN

NOVEMBER 11, 2021

PREPARED BY:

FLEIS&VANDENBRINK
DESIGN. BUILD. OPERATE.

27725 STANSBURY BLVD., SUITE 195
FARMINGTON HILLS, MI 48334

F&V 851940

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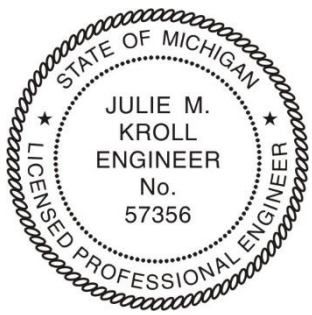

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Michigan.

Agency Review	Date	Comments

TABLE OF CONTENTS

LIST OF TABLES

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List of Appendices

References

American Association of State Highway and Transportation Officials (AASHTO). (2018). *A Policy on Geometric Design of Highways and Streets.* Washington DC.

Federal Highway Administration, Michigan Department of Transporation, Michigan State Police. (2011). *Michigan Manual on Uniform Traffic Control Devices.*

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Papacostas, & Prevedouros. (2001). *Transportation Engineering and Planning.*

Stover, V. G., & Koepke, F. J. (2006). *Transportation and Land Development* (Vol. 2nd Edition). Washington DC: Institute of Transportation Engineers (ITE).

EXECUTIVE SUMMARY

This report presents the results of a Traffic Impact Study (TIS) for three (3) multi-family residential developments proposed in the City of Troy, Michigan. The project site is located generally in the southeast quadrant of the Crooks Road and Wattles Road intersection, as shown in **Figure E1**. The proposed developments include Westington Phase I, Westington Phase II, and West Hills. Access to the project sites is provided via both Wattles Road and Crooks Road. No access to Barilane Drive is proposed with this project.

FIGURE E1: SITE LOCATION

BACKGROUND DATA

F&V subconsultant Traffic Data Collection, Inc. (TDC) performed weekday AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) turning movement counts at the following study intersections on Wednesday, September 29, 2021.

- Wattles Road & Crooks Road
- Crooks Road & Barilane Drive
- Crooks Road & 7-11 Drive/Site Drive (shared access)

Due to the impact of COVID-19 traffic volume is not representative of “typical” operations. Therefore, an adjusted baseline traffic volume was established based on the methodologies described below following the input from City of Troy (OHM).

- Pre-COVID (2018) historical traffic volume data on Crooks Road, and Wattles Road were collected from the RCOC SCATS database due to construction impacts in 2019.
- Historical traffic volume at the adjacent streets were reviewed which shows a negative annual growth rate in recent years. Therefore, a conservative background growth rate of **0.5%** per year was applied to the 2018 data collected to determine the expected 2021 traffic volumes.

- A COVID adjustment factor was calculated by comparing the expected 2021 traffic volumes to the collected 2021 traffic volumes.
- The calculated COVID adjustment factors are summarized in **Table E1** which were applied to the collected traffic volume to establish a baseline traffic volume at the intersection of Crooks Road & Wattles Road, as shown below.

Table E1: COVID Traffic Volume Adjustment Factors

Roadway Approach	AM Peak Hour	PM Peak Hour
Crooks Road (NB)	+44%	+13%
Crooks Road (SB)	+20%	+22%
Wattles Road (EB)	+42%	+2%
Wattles Road (WB)	+37%	+22%

TRIP GENERATION

The proposed development includes three (3) multi-family residential homes developments: Westington Phase I, Westington Phase II, and West Hills. The number of peak hour (AM and PM), and daily vehicle trips that would be generated by the proposed residential were forecast based on data published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual 11th Edition,* and the ITE *Trip Generation Handbook, 3rd Edition*. The site trip generation was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in **Table E2**.

Table E2: Trip Generation Summary

Land Use	ITE Code	Phase	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
						In	Out	Total	In	Out	Total
Multi-Family Home (Low-Rise)	220	Westington Phase I	102	D.U.	701	11	35	46	36	21	57
		Westington Phase II	30	D.U.	206	4	10	14	11	6	17
		West Hills	30	D.U.	207	3	10	13	10	6	16
Total Trips			**162**	**D.U.**	**1,114**	**18**	**55**	**73**	**57**	**33**	**90**

SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roads based on existing peak hour traffic patterns on the adjacent roadway network and the methodologies published by ITE. To determine the distribution of site generated traffic it was assumed that adjacent street trips in the AM are generally home-to-work and PM trips are generally work-to-home. Therefore, the distribution utilizes the existing traffic volumes and patterns to provide an estimated distribution for the site-generated traffic. The site trip distribution was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in **Table E3**.

Table E3: Trip Distribution

To/From	Via	AM	PM
North	Crooks Road	31%	28%
South	Crooks Road	39%	41%
East	Wattles Road	14%	16%
West	Wattles Road	16%	15%
Total		**100%**	**100%**

ANALYSIS SUMMARY

The results of the analysis are summarized below.

The conclusions of this TIS are as follows:

1. **Existing Conditions (2021):** The result of the existing condition analysis indicates that all the study intersection approaches will operate at LOS D or better with the exceptions as follows:
   - *Crooks Road & Wattles Road:* The eastbound and westbound left and through movements are operating at LOS E during both AM and PM peak periods. Review of SimTraffic network simulations indicates long vehicle queues for these movements especially for eastbound through movement during the PM peak hour; however, these vehicle queues were observed to dissipate and were not present throughout the peak periods.
   - *Crooks Road & 7-11 Drive**:*** Although the westbound egress movements at 7-11 driveway currently operate at LOS D or better during the peak periods, long vehicle queue are observed on the site driveway during the PM peak hour. The northbound traffic at Wattles Road intersection occasionally extends past this driveway during peak periods and blocks the egress movements at the 7-11 Drive. This causes westbound egress vehicles to wait longer to find gaps within the through traffic along Crooks Road.
2. **Background Conditions (2023):** The results of the background conditions analysis indicates that all study intersection approaches and movements will continue to operate in a manner similar to existing conditions with the following exceptions:
   - *Crooks Road & Wattles Road:* The southbound left-turn movement is expected to operate in LOS E during the PM peak hour at the intersection of Crooks Road & Wattles Road intersection due to the traffic growth in background (2023) conditions. However, the projected additional delay is only 1.6 seconds, which is not significant.
3. **Future Conditions (2023):** The results of the future conditions analysis indicates that with the addition of site generated traffic, all the study intersection approaches and delays continue to operate in a manner similar to background conditions with the exceptions as follows:
   - *Crooks Road & Wattles Road:* The overall intersection is expected to operate at LOS E during the PM peak hour. However, the overall delay at this intersection is expected to increase by only 0.4 seconds, which will be indiscernible from background condition intersection operations.
   - ***Crooks Road &** Site Drive (West Hills)**:*** The westbound egress movements at West Hills driveway are expected to operate at LOS E during the PM peak periods with a 95th percentile queue length of 43 feet (2 vehicles), which is not significant. These vehicles will be contained within the project site and will not impact traffic operations at the adjacent streets. Moreover, the review of SimTraffic network simulation indicates the egress vehicles are able to find adequate gaps within through traffic along Crooks Road.

RECOMMENDATIONS

- The results of this study indicate that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to existing conditions with minor additional delays. Therefore, no mitigation measures are recommended to accommodate the site-generated traffic volumes.

1 INTRODUCTION

This report presents the results of a Traffic Impact Study (TIS) for three (3) multi-family residential developments proposed in the City of Troy, Michigan. The project site is located generally in the southeast quadrant of the Crooks Road and Wattles Road intersection, as shown in **Figure 1**. The proposed developments include Westington Phase I, Westington Phase II, and West Hills. Access to the project sites is provided via both Wattles Road and Crooks Road. No access to Barilane Drive is proposed with this project. Crooks Road is under the jurisdiction of the Road Commission for Oakland County (RCOC), Wattles Road is under the jurisdiction of the City of Troy, and Barilane Drive is a Private Road.

The purpose of this study is to identify the traffic related impacts, if any, of the proposed development project on the adjacent road network. F&V proposes to complete the scope of services for this project consistent with accepted traffic engineering practice and pursuant to the requirements City of Troy (OHM) and the RCOC. Specific tasks undertaken for this study include the following:

1. **Study Area**

   a. Provide a description of the study area including: intersection and roadway geometries, speed limits, functional classifications and traffic volume data (where available). In addition, a study area site map showing the site location and the study intersections will also be provided.

2. **Proposed Lane Use**

   a. Obtain and review the proposed site plan which includes the proposed land uses, densities, and desired site access locations. A description of the current and proposed land use will be accompanied with a complete project site plan (with buildings identified as to proposed use). A schedule for construction of the development and proposed development stages (if any) will also be provided.

3. **Existing Conditions**

   a. Provide an analysis of the traffic-related impacts of the proposed development at the following study intersections:

      - Wattles Road & Crooks Road
      - Crooks Road & Barilane Drive
      - Crooks Road & 7-11 Drive/Site Drive (shared access)
      - Crooks Road & Site Drive (proposed)
      - Wattles Road & Site Drive (proposed)

   b. Due to the impact of COVID-19, current traffic volume data is not representative of “typical” operations. Therefore, the data collection necessary for this study is proposed as follows:

      - Collect existing turning movement counts at the study intersections during the AM (7:00AM - 9:00AM) & PM (4:00PM – 6:00PM) peak periods at the study intersections.
      - Obtain and review historical turning movement count data and 24-hour traffic volumes where available from the RCOC and MDOT.
      - Obtain and review available historical (pre-COVID) traffic count data at the study intersections and adjacent roadways previously performed by MDOT, RCOC, and others.
      - Apply a growth rate to the historic traffic volumes to calculate the expected existing traffic volumes, without COVID impact.
      - Compare the existing turning movement count data to expected existing traffic volumes collected in the area to determine a COVID adjustment factor for the existing turning movements counts.
      - Apply COVID factor(s) where applicable to the existing turning movement counts to calculate the existing baseline traffic volumes for use in the study.

FIGURE 1

SITE LOCATION MAP

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

SITE — SITE LOCATION

NORTH
SCALE: NOT TO SCALE

c. Calculate the **Existing** vehicle delays, LOS, and vehicle queues at the study intersections during the AM and PM peak hours. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.

4. Background Conditions

a. Calculate the future background traffic volumes based on an appropriate traffic growth determined from local or statewide data to the project build-out year and/or any applicable background developments in the vicinity of this project as identified by the City of Troy.

b. Calculate the **Background (*without the proposed development*)** vehicle delays, LOS, and vehicle queues at the study intersections during the AM and PM peak periods. Intersection analysis shall include LOS determination for all approaches and movements. The LOS will be based on the procedures outlined in the HCM 6th Edition, the latest edition of Transportation Research Board's Highway Capacity Manual.

c. Any state, local, or private transportation improvement projects in the project study area that will be underway in the build-out year as identified by the City of Troy or RCOC will be included as background conditions.

5. Trip Generation

a. Forecast the number of Weekday AM and PM peak hour trips and daily trips that would be generated by the proposed development based on data published by the Institute of Transportation Engineers (ITE) in *Trip Generation*, *11th Edition* and the ITE *Trip Generation Handbook*, *3rd Edition*.

b. Provide the trip generation to the City and OHM for review and approval prior to use in the analysis.

c. A table will be provided in the report outlining the categories and quantities of land uses, with the corresponding trip generation rates or equations, and the resulting number of trips. The trip generation will be summarized to show the projected traffic impact for each phase of the project: Westington Phase I, Westington Phase II, and West Hills.

6. Trip Distribution and Traffic Assignment

a. Assign the trips that would be generated by the proposed development to the adjacent road network based on the existing traffic patterns and methodologies outlined in the ITE *Transportation and Land Development, 2nd Edition*.

b. The distribution percentages with the corresponding volumes will be provided in a graphical format to include in the report and the basis will be explained.

c. Provide the trip distribution to the City and OHM for review and approval prior to use in the analysis.

d. Combine the site-generated traffic assignments with the background traffic forecasts to establish the Future weekday AM, and PM peak hour traffic volumes.

7. Future Conditions

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

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

The scope of this study was developed based on Fleis & VandenBrink's (F&V) knowledge of the study area, understanding of the development program, accepted traffic engineering practices and information published by the Institute of Transportation Engineers (ITE). The study analyses were completed using Synchro/SimTraffic (Version 11). Sources of data for this study include F&V subconsultant Traffic Data Collection, Inc. (TDC), information provided by Michigan Department of Transportation (MDOT), the Southeast Michigan Council of Governments (SEMCOG) and ITE. All background information is provided in **Appendix A**.

2 BACKGROUND

2.1 EXISTING ROAD NETWORK

Vehicle transportation for the study area is provided by Crooks Road and Wattles Road. The lane uses and traffic control at the study intersections are shown on **Figure 2** and the study roadways are further described below. For the purposes of this study, all minor streets and driveways are assumed to have an operating speed of 25 miles per hour (mph).

Crooks Road runs north/south adjacent to the west side of the project site. The roadway is classified as a *Other Principal Arterial* and is under the jurisdiction of the RCOC. The roadway has a posted speed limit of 45 mph and an Average Annual Daily Traffic (AADT) of 25,400 vehicles per day (SEMCOG 2016). The roadway geometry has a typical five-lane cross section, with two lanes in each direction with a left-center turn lane.

Wattles Road runs in the east/west directions adjacent to the north side of the project site. The roadway is classified as a *Minor Arterial* and is under the jurisdiction of the City of Troy. Wattles Road has a posted speed limit of 40 mph, and an AADT of 13,400 vehicles per day (SEMCOG 2016). The roadway has a typical three-lane cross section, with one lane in each direction with a center left-turn lane.

2.2 EXISTING TRAFFIC VOLUMES

F&V subconsultant Traffic Data Collection, Inc. (TDC) performed weekday AM (7:00 AM to 9:00 AM) and PM (4:00 PM to 6:00 PM) turning movement counts at the following study intersections on Wednesday, September 29, 2021.

- Wattles Road & Crooks Road
- Crooks Road & Barilane Drive
- Crooks Road & 7-11 Drive/Site Drive (shared access)

Due to the impact of COVID-19 traffic volume is not representative of “typical” operations. Therefore, an adjusted baseline traffic volume was established based on the methodologies described below following the input from City of Troy (OHM).

- Pre-COVID (2018) historical traffic volume data on Crooks Road, and Wattles Road were collected from the RCOC SCATS database due to construction impacts in 2019.
- Historical traffic volume at the adjacent streets were reviewed which shows a negative annual growth rate in recent years. Therefore, a conservative background growth rate of **0.5%** per year was applied to the 2018 data collected to determine the expected 2021 traffic volumes.
- A COVID adjustment factor was calculated by comparing the expected 2021 traffic volumes to the collected 2021 traffic volumes.
- The calculated COVID adjustment factors are summarized in **Table 1** which were applied to the collected traffic volume to establish a baseline traffic volume at the intersection of Crooks Road & Wattles Road, as shown below.

Table 1: COVID Traffic Volume Adjustment Factors

Roadway Approach	AM Peak Hour	PM Peak Hour
Crooks Road (NB)	+44%	+13%
Crooks Road (SB)	+20%	+22%
Wattles Road (EB)	+42%	+2%
Wattles Road (WB)	+37%	+22%

Existing through traffic volumes at the proposed site driveway was determined through balancing traffic volumes through the study network. The existing AM and PM peak hour traffic volumes are shown on the attached **Figure 3**. The existing (2021) baseline traffic volume was reviewed and approved by the City of Troy (OHM) prior to use in the analysis.

3 EXISTING CONDITIONS

3.1 EXISTING OPERATIONS

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

Descriptions of LOS "A" through "F", as defined in the HCM, are provided in **Appendix B** for signalized and unsignalized intersections. Typically, LOS D is considered acceptable, with LOS A representing minimal delay, and LOS F indicating failing conditions. The results of the analysis of existing conditions are presented in **Appendix B** and are summarized in **Table 2**. Microsimulation was also conducted at the study intersections using SimTraffic to further evaluate the network performance.

Table 2: Existing Intersection Operations

Intersection		Control	Approach	Existing Conditions			
				AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Crooks Road & Wattles Road	Signalized	EBL	57.0	E	71.9	E
			EBT	75.9	E	77.7	E
			EBR	51.0	D	43.8	D
			WBL	75.4	E	77.3	E
			WBT	61.5	E	65.8	E
			WBR	42.2	D	44.6	D
			NBL	49.6	D	46.5	D
			NBT	39.7	D	58.2	E
			NBR	31.2	C	35.4	D
			SBL	45.6	D	53.8	D
			SBL	41.2	D	37.9	D
			SBT	29.3	C	27.2	C
			Overall	**49.4**	**D**	**54.0**	**D**
2	Crooks Road & 7-11 Drive	Stop (Minor)	WB	13.7	B	26.9	D
			NB	Free		Free	
			SBL	16.1	C	25.2	D
3	Crooks Road & Barilane Drive	Stop (Minor)	WB	19.5	C	32.7	D
			NB	Free		Free	
			SBL	10.6	B	14.8	B

The result of the existing condition analysis indicates that all the study intersection approaches will operate at LOS D or better with the exceptions as follow:

Crooks Road & Wattles Road

- The eastbound and westbound left and through movements are operating at LOS E during both AM and PM peak periods. Review of SimTraffic network simulations indicates long vehicle queues for these movements especially for eastbound through movement during the PM peak hour; however, these vehicle queues were observed to dissipate and were not present throughout the peak periods.
- The longer delays at east-west approaches at this intersection are due to high vehicle volumes for north-south approaches in conjunction with the long cycle length (130 seconds).

Crooks Road & 7-11 Drive

- Although the westbound egress movements at *7-11* driveway currently operate at LOS D or better during the peak periods, long vehicle queue are observed on the site driveway during the PM peak hour. The northbound traffic at Wattles Road intersection occasionally extends past this driveway during peak periods and blocks the egress movements at the *7-11 Drive*. This causes westbound egress vehicles to wait longer to find gaps within the through traffic along Crooks Road.

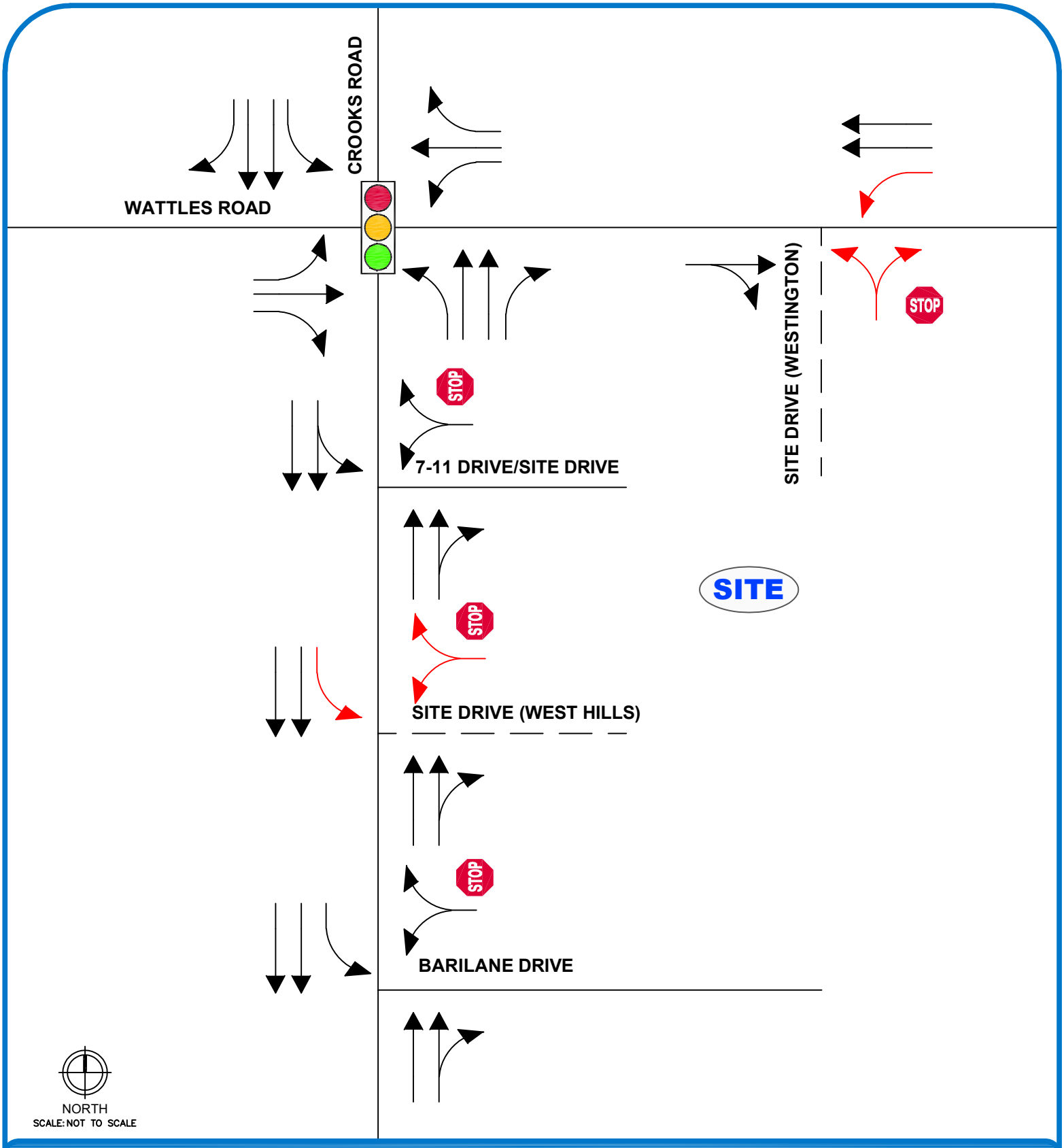


FIGURE 2
LANE USE AND TRAFFIC CONTROL

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

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

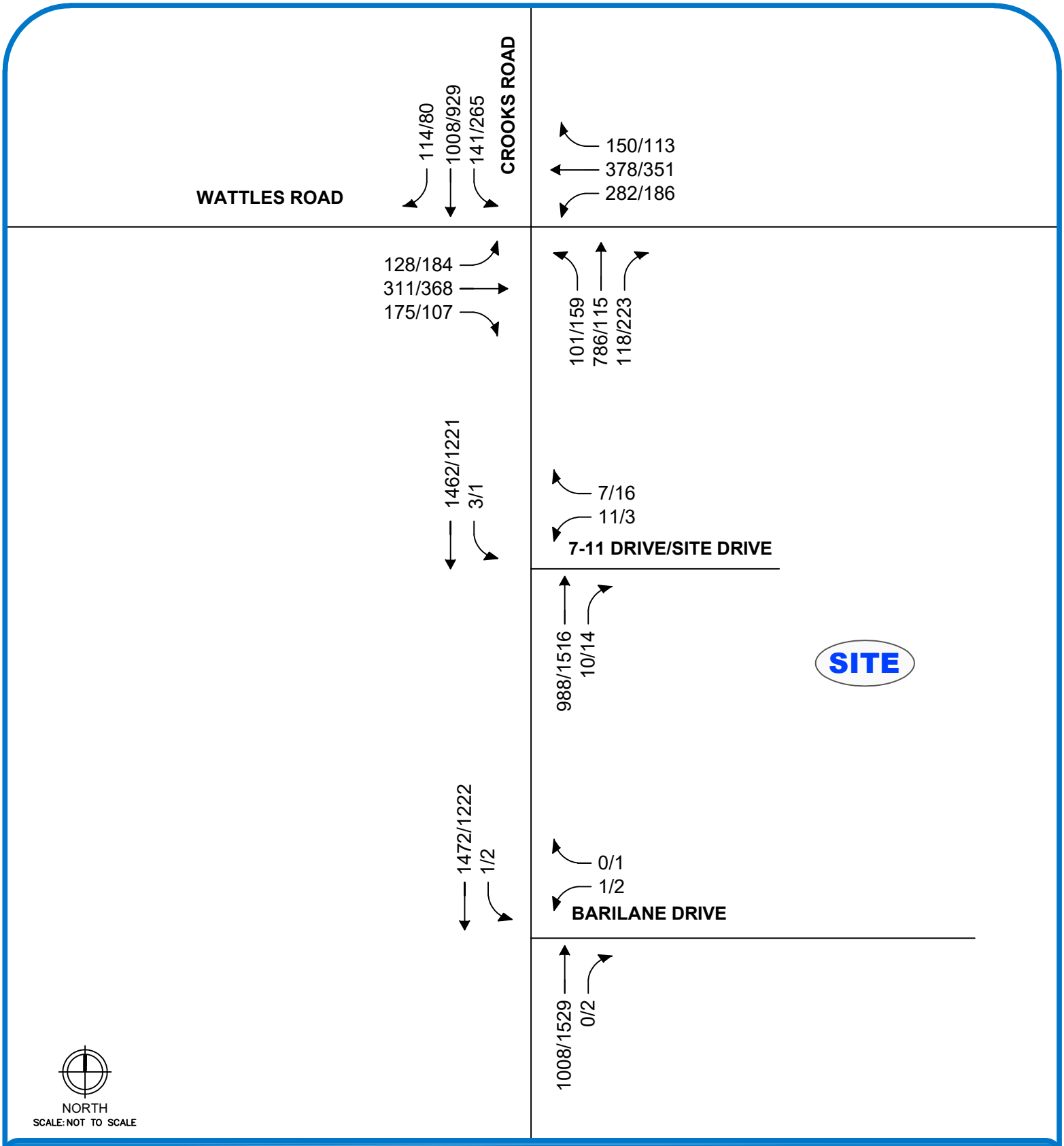


FIGURE 3
EXISTING TRAFFIC VOLUMES

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)

4 BACKGROUND CONDITIONS

In order to determine the applicable traffic growth rate for the existing 2021 conditions to the buildout year 2023, historical population and economic profile data was obtained for the City of Troy from Southeast Michigan Council of Governments (SEMCOG). Population and employment projections from 2020 to 2045 were reviewed which shows an average annual growth of -0.16% and 0.18%, respectively. Therefore, a conservative background growth rate of **0.5%** per year was applied to the existing 2021 traffic volumes to forecast the background (2023) traffic volume ***without the proposed development,*** as shown on **Figure 4**.

4.1 BACKGROUND OPERATIONS

The background peak hour vehicle delays and LOS ***without the proposed development*** were calculated based on the existing lane use and traffic control shown on **Figure 2**, the background traffic volumes shown on **Figure 4**, and the methodologies presented in the HCM6. The results of the analysis of background conditions are presented in **Appendix C** and are summarized in **Table 3**.

Table 3: Background Intersection Operations

Intersection		Control	Approach	Existing Conditions				Background Conditions				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Crooks Road & Wattles Road	Signalized	EBL	57.0	E	71.9	E	56.8	E	72.9	E	-0.2	-	1.0	-
			EBT	75.9	E	77.7	E	76.3	E	78.3	E	0.4	-	0.6	-
			EBR	51.0	D	43.8	D	51.1	D	43.7	D	0.1	-	-0.1	-
			WBL	75.4	E	77.3	E	75.8	E	77.6	E	0.4	-	0.3	-
			WBT	61.5	E	65.8	E	61.6	E	66.1	E	0.1	-	0.3	-
			WBR	42.2	D	44.6	D	42.0	D	44.3	D	-0.2	-	-0.3	-
			NBL	49.6	D	46.5	D	50.2	D	47.1	D	0.6	-	0.6	-
			NBT	39.7	D	58.2	E	39.9	D	59.8	E	0.2	-	1.6	-
			NBR	31.2	C	35.4	D	31.3	C	35.4	D	0.1	-	0.0	-
			SBL	45.6	D	53.8	D	46.3	D	55.4	E	0.7	-	1.6	D→E
			SBL	41.2	D	37.9	D	41.5	D	38.2	D	0.3	-	0.3	-
			SBT	29.3	C	27.2	C	29.3	C	27.2	C	0.0	-	0.0	-
			Overall	**49.4**	**D**	**54.0**	**D**	**49.7**	**D**	**54.8**	**D**	**0.3**	**-**	**0.8**	**-**
2	Crooks Road & 7-11 Drive	Stop (Minor)	WB	13.7	B	26.9	D	13.7	B	27.4	D	0.0	-	0.5	-
			NB	Free		Free		Free		Free		Free		Free	
			SBL	16.1	C	25.2	D	16.2	C	25.6	D	0.0	-	0.0	-
3	Crooks Road & Barilane Drive	Stop (Minor	WB	19.5	C	32.7	D	19.4	C	33.1	D	-0.1	-	0.4	-
			NB	Free		Free		Free		Free		Free		Free	
			SBL	10.6	B	14.8	B	10.6	B	15.0	B	0.0	-	0.2	-

The results of the background conditions analysis indicates that all study intersection approaches and movements will continue to operate in a manner similar to existing conditions with the following exceptions:

Crooks Road & Wattles Road

- The southbound left-turn movement is expected to operate in LOS E during the PM peak hour at the intersection of Crooks Road & Wattles Road intersection due to the traffic growth in background (2023) conditions. However, the projected additional delay is only 1.6 seconds, which is not significant.

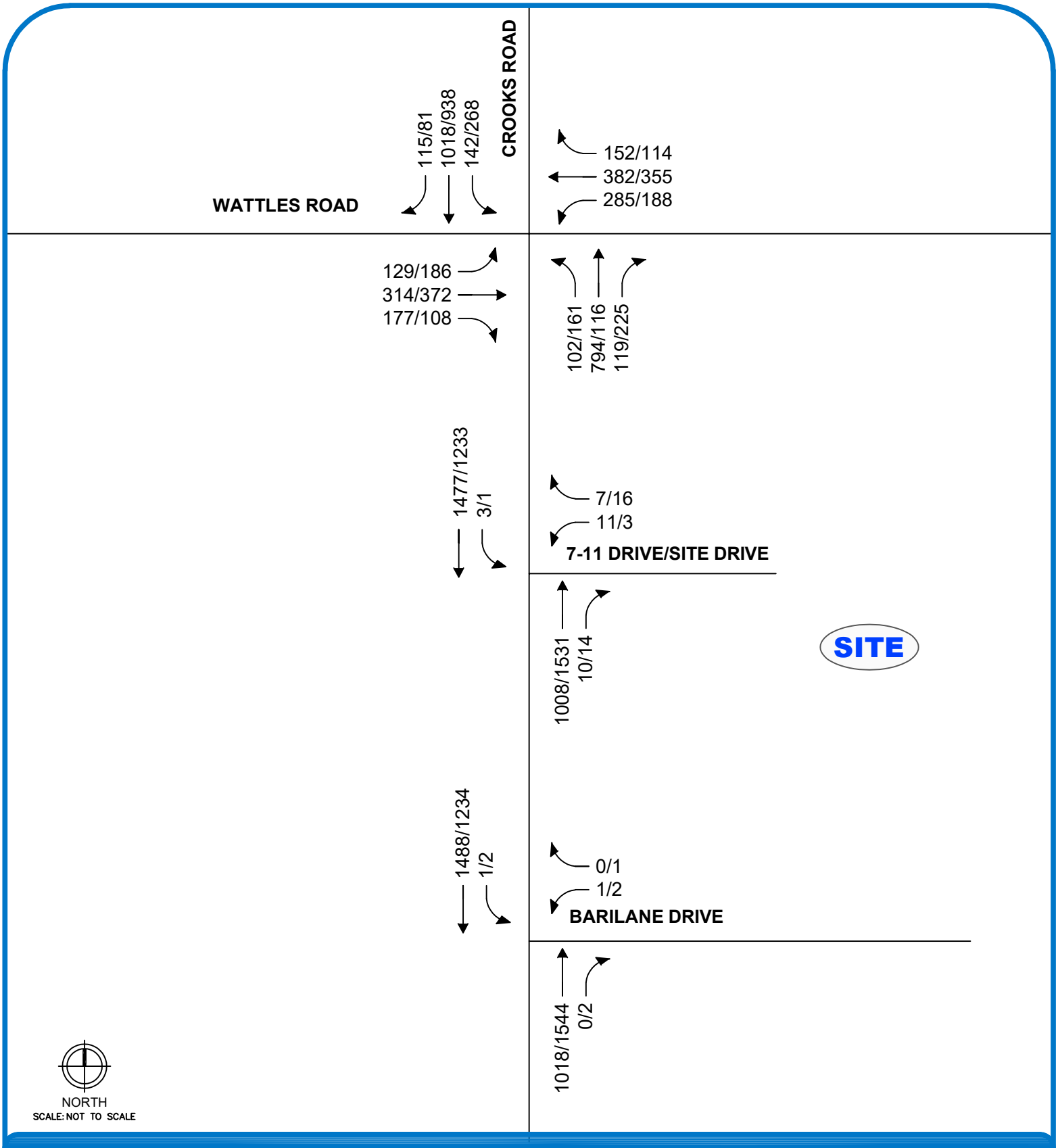


FIGURE 4
BACKGROUND TRAFFIC VOLUMES

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)

5 SITE TRIP GENERATION

The proposed development includes three (3) multi-family residential developments: Westington Phase I, Westington Phase II, and West Hills. Access to the project sites is provided via two (2) site driveways on Crooks Road, including the shared access with the adjacent *7-11* store, and one (1) access drive on Wattles Road. The number of peak hour (AM and PM), and daily vehicle trips that would be generated by the proposed residential were forecast based on data published in the Institute of Transportation Engineers (ITE) *Trip Generation Manual 11th Edition,* and the ITE *Trip Generation Handbook, 3rd Edition*. The trip generation was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in **Table 4**.

Table 4: Trip Generation Summary

Land Use	ITE Code	Phase	Amount	Units	Average Daily Traffic (vpd)	AM Peak Hour (vph)			PM Peak Hour (vph)		
						In	Out	Total	In	Out	Total
Multi-Family Home (Low-Rise)	220	Westington Phase I	102	D.U.	701	11	35	46	36	21	57
		Westington Phase II	30	D.U.	206	4	10	14	11	6	17
		West Hills	30	D.U.	207	3	10	13	10	6	16
Total Trips			**162**	**D.U.**	**1,114**	**18**	**55**	**73**	**57**	**33**	**90**

6 SITE TRIP DISTRIBUTION

The vehicular trips that would be generated by the proposed development were assigned to the study roads based on existing peak hour traffic patterns on the adjacent roadway network and the methodologies published by ITE. To determine the distribution of site generated traffic it was assumed that adjacent street trips in the AM are generally home-to-work and PM trips are generally work-to-home. Therefore, the distribution utilizes the existing traffic volumes and patterns to provide an estimated distribution for the site-generated traffic. The trip distribution was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in **Table 5**.

Table 5: Site Trip Distribution

To/From	Via	AM	PM
North	Crooks Road	31%	28%
South	Crooks Road	39%	41%
East	Wattles Road	14%	16%
West	Wattles Road	16%	15%
Total		**100%**	**100%**

The vehicular traffic volumes shown in **Table 4** were distributed to the roadway network according to the distribution shown in **Table 5**. The site generated trips are shown on **Figure 5** and were added to the background traffic volumes shown on **Figure 4** to calculate the future peak hour traffic volumes shown on **Figure 6**.

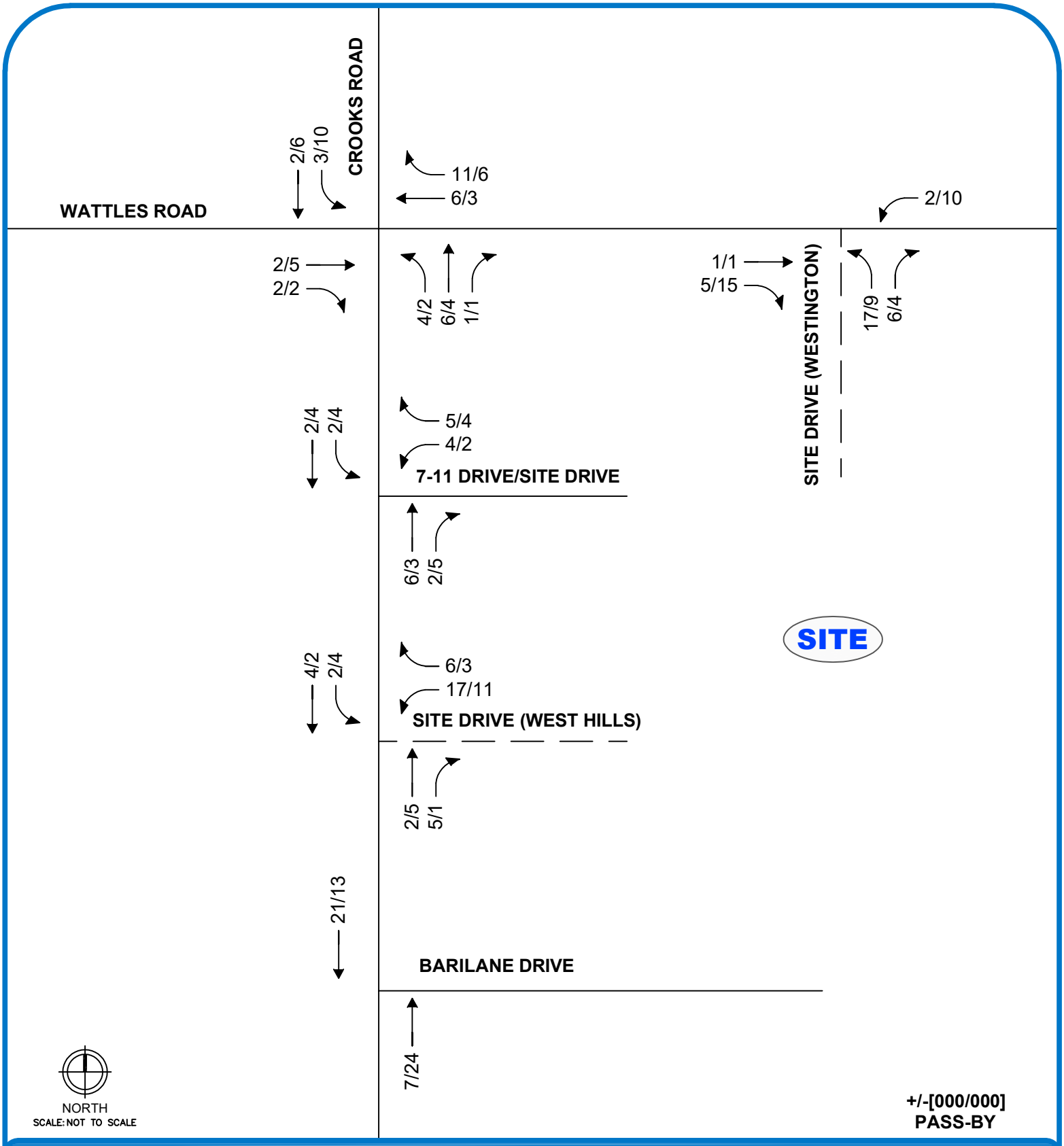


FIGURE 5
SITE-GENERATED TRAFFIC VOLUMES

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)

7 FUTURE CONDITIONS

7.1 FUTURE OPERATIONS

Future peak hour vehicle delays and LOS ***with the proposed development*** were calculated based on the future lane use shown on **Figure 2**, the proposed site access plan, the future traffic volumes shown on **Figure 6**, and the methodologies presented in the HCM6. The results of the future conditions analysis are presented in **Appendix D** and are summarized in **Table 6.**

Table 6: Future Intersection Operations

Intersection		Control	Approach	Background Conditions				Future Conditions				Difference			
				AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
				Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
1	Crooks Road & Wattles Road	Signalized	EBL	56.8	E	72.9	E	57.5	E	72.1	E	0.7	-	-0.8	-
			EBT	76.3	E	78.3	E	76.6	E	79.1	E	0.3	-	0.8	-
			EBR	51.1	D	43.7	D	51.2	D	43.5	D	0.1	-	-0.2	-
			WBL	75.8	E	77.6	E	75.8	E	77.7	E	0.0	-	0.1	-
			WBT	61.6	E	66.1	E	61.8	E	66.2	E	0.2	-	0.1	-
			WBR	42.0	D	44.3	D	42.0	D	44.4	D	0.0	-	0.1	-
			NBL	50.2	D	47.1	D	51.0	D	47.6	D	0.8	-	0.5	-
			NBT	39.9	D	59.8	E	41.3	D	60.4	E	1.4	-	0.6	-
			NBR	31.3	C	35.4	D	32.1	C	35.5	D	0.8	-	0.1	-
			SBL	46.3	D	55.4	E	46.5	D	58.3	E	0.2	-	2.9	-
			SBL	41.5	D	38.2	D	41.6	D	38.3	D	0.1	-	0.1	-
			SBT	29.3	C	27.2	C	29.3	C	27.2	C	0.0	-	0.0	-
			Overall	**49.7**	**D**	**54.8**	**D**	**50.1**	**D**	**55.2**	**E**	**0.4**	**-**	**0.4**	**D→E**
2	Crooks Road & 7-11 Drive/Site Drive	Stop (Minor)	WB	13.7	B	27.4	D	14.6	B	30.7	D	14.6	-	3.3	-
			NB	Free		Free		Free		Free		Free		Free	
			SBL	16.2	C	25.6	D	16.4	C	26.4	D	16.4	-	26.4	-
3	Crooks Road & Barilane Drive	Stop (Minor	WB	19.4	C	33.1	D	19.7	C	34.0	D	0.3	-	0.9	-
			NB	Free		Free		Free		Free		Free		Free	
			SBL	10.6	B	15.0	B	10.7	B	15.2	C	0.1	-	0.2	B→C
4	Crooks Road & Site Drive (West Hills)	Stop (Minor)	WB	N/A				19.1	C	38.1	E	N/A			
			NB					Free		Free					
			SBL					10.7	B	14.6	B				
5	Wattles Road & Site Drive (Westington)	Stop (Minor	WB	N/A				Free		Free		N/A			
			NB					8.9	A	11.5	B				
			SBL					12.0	B	16.5	C				

The results of the future conditions analysis indicates that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to background conditions with the exceptions as follows:

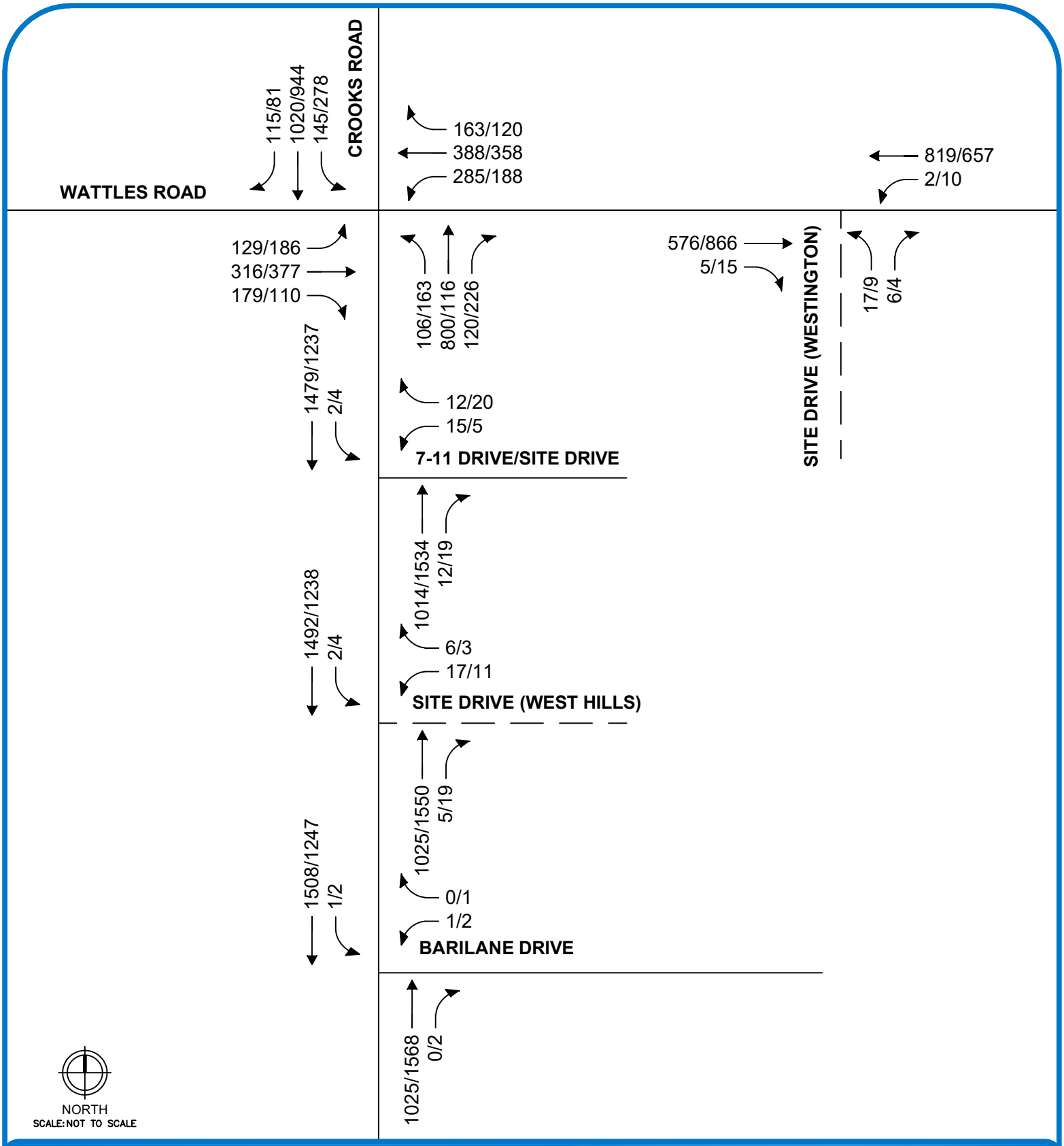


FIGURE 6
FUTURE TRAFFIC VOLUMES

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)

Crooks Road & Wattles Road

- The overall intersection is expected to operate at LOS E during the PM peak hour. However, the overall delay at this intersection is expected to increase by only 0.4 seconds, which will be indiscernible from background condition intersection operations.

Crooks Road & Site Drive (West Hills)

- The westbound egress movements at *West Hills* driveway are expected to operate at LOS E during the PM peak periods with a 95th percentile queue length of 43 feet (2 vehicles), which is not significant. These vehicles will be contained within the project site and will not impact traffic operations at the adjacent streets. Moreover, the review of SimTraffic network simulation indicates the egress vehicles are able to find adequate gaps within through traffic along Crooks Road.

8 CONCLUSIONS

The conclusions of this TIS are as follows:

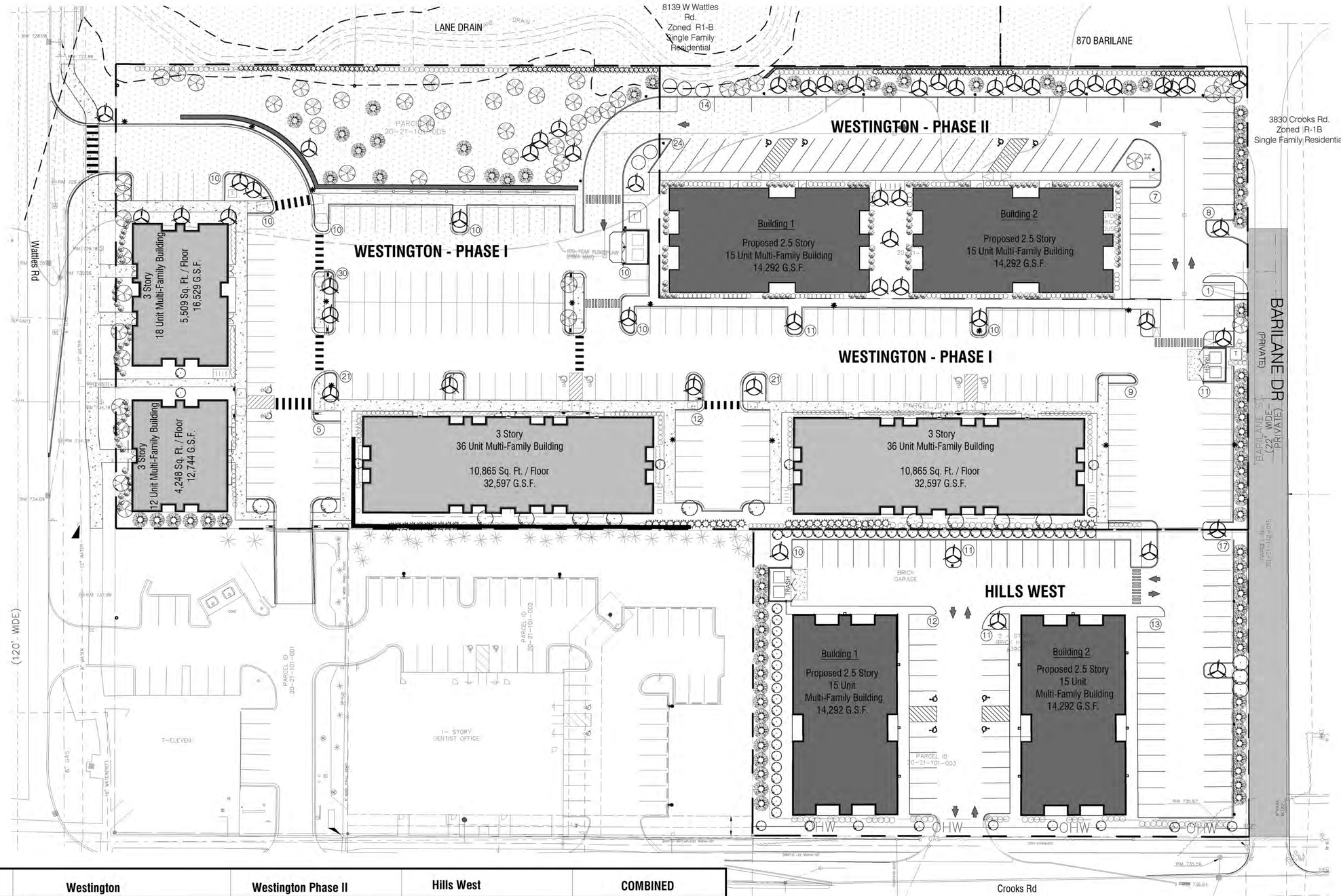
1. **Existing Conditions (2021):** The result of the existing condition analysis indicates that all the study intersection approaches will operate at LOS D or better with the exceptions as follow:
   - *Crooks Road & Wattles Road:* The eastbound and westbound left and through movements are operating at LOS E during both AM and PM peak periods. Review of SimTraffic network simulations indicates long vehicle queues for these movements especially for eastbound through movement during the PM peak hour; however, these vehicle queues were observed to dissipate and were not present throughout the peak periods.
   - *Crooks Road & 7-11 Drive:* Although the westbound egress movements at 7-11 driveway currently operate at LOS D or better during the peak periods, long vehicle queue are observed on the site driveway during the PM peak hour. The northbound traffic at Wattles Road intersection occasionally extends past this driveway during peak periods and blocks the egress movements at the 7-11 Drive. This causes westbound egress vehicles to wait longer to find gaps within the through traffic along Crooks Road.
2. **Background Conditions (2023):** The results of the background conditions analysis indicates that all study intersection approaches and movements will continue to operate in a manner similar to existing conditions with the following exceptions:
   - *Crooks Road & Wattles Road:* The southbound left-turn movement is expected to operate in LOS E during the PM peak hour at the intersection of Crooks Road & Wattles Road intersection due to the traffic growth in background (2023) conditions. However, the projected additional delay is only 1.6 seconds, which is not significant.
3. **Future Conditions (2023):** The results of the future conditions analysis indicates that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to existing/background conditions with the exceptions as follows:
   - *Crooks Road & Wattles Road:* The overall intersection is expected to operate at LOS E during the PM peak hour. However, the overall delay at this intersection is expected to increase by only 0.4 seconds, which will be indiscernible from background condition intersection operations.
   - *Crooks Road & Site Drive (West Hills):* The westbound egress movements at West Hills driveway are expected to operate at LOS E during the PM peak periods with a 95th percentile queue length of 43 feet (2 vehicles), which is not significant. These vehicles will be contained within the project site and will not impact traffic operations at the adjacent streets. Moreover, the review of SimTraffic network simulation indicates the egress vehicles are able to find adequate gaps within through traffic along Crooks Road.

9 RECOMMENDATIONS

The results of this study indicate that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to existing conditions with minor additional delays. Therefore, no mitigation measures are recommended to accommodate the site-generated traffic volumes.

Appendix A

BACKGROUND INFORMATION



	Westington	Westington Phase II	Hills West	COMBINED
Area:	3.413 Acres (148,677 Sq. Ft.)	1.20 Acres (52,242 Sq. Ft.)	1.33 Acres (57,863 Sq. Ft.)	4.741 Acres (206,540 Sq. Ft.)
Units:	102 (30 Efficiency + 72 1-2 Bedroom)	(30) 1-2 Bedroom	(30) 1-2 Bedroom	294
Parking Required:	174 Spaces	60 Spaces	60 Spaces Required	294 Spaces
Parking Provided:	181 Spaces	53 Spaces	74 Spaces Provided	304 Spaces
Building Coverage:	21.79%	32.66%	27.23% (Maximum 30%)	27.23% (Maximum 30%)
Open Space:	24.66%	17.32%	20.99% (Minimum 20%)	20.99% (Minimum 20%)

Note: Overage if 10 Spaces for all Phases

1 Composite Site Plan
SCALE: 1" = 30'

NORTH

DESIGNHAUS ARCHITECTURE EST 1998
3300 AUBURN RD. SUITE 300
AUBURN HILLS, MI 48326
T:248.601.4422 F:248.453.5854
WWW.DESIGNHAUS.COM
INFO@DESIGNHAUS.COM

No.	Revision/Issue	Date
	----	----
	SPA Resubmittal	21.10.14
	SPA Review Set	21.10.06
	SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Composite Site Plan

S100 | 021241

S100 Composite Site Plan.dwg
10/14/2021
Mike Pizzola

Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 32G SW

File Name : TMC_1 Wattles & Crooks_9-29-21
Site Code : TMC_1
Start Date : 9/29/2021
Page No : 1

4 Hour video traffic study was conducted during typical weekday (Wednesday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was in session & during COVID 19.

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

	Crooks Road Southbound					Wattles Road Westbound					Crooks Road Northbound					Wattles Road Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	33	122	15	0	170	42	85	31	0	158	13	85	28	0	126	31	71	12	0	114	568
07:15 AM	30	157	39	0	226	34	69	32	0	135	16	95	25	0	136	33	86	22	0	141	638
07:30 AM	23	201	35	0	259	27	62	44	0	133	12	122	19	0	153	27	50	20	1	98	643
07:45 AM	28	246	31	0	305	26	62	55	0	143	21	124	14	0	159	28	56	21	0	105	712
Total	114	726	120	0	960	129	278	162	0	569	62	426	86	0	574	119	263	75	1	458	2561
08:00 AM	21	195	23	0	239	33	55	47	0	135	20	117	12	0	149	21	46	31	0	98	621
08:15 AM	25	208	34	0	267	25	83	61	0	169	12	161	27	0	200	33	46	21	0	100	736
08:30 AM	26	214	33	0	273	20	59	44	0	123	23	141	20	0	184	41	60	19	0	120	700
08:45 AM	23	225	28	0	276	31	78	53	0	162	27	125	11	0	163	28	66	19	0	113	714
Total	95	842	118	0	1055	109	275	205	0	589	82	544	70	0	696	123	218	90	0	431	2771
*** BREAK ***																					
04:00 PM	27	152	47	0	226	18	53	20	0	91	35	220	23	0	278	18	89	45	0	152	747
04:15 PM	18	194	33	0	245	21	53	26	0	100	44	201	30	0	275	16	92	32	0	140	760
04:30 PM	16	168	29	0	213	17	81	32	0	130	52	262	24	0	338	26	90	32	0	148	829
04:45 PM	20	175	51	0	246	21	68	34	0	123	43	249	36	0	328	25	109	32	0	166	863
Total	81	689	160	0	930	77	255	112	0	444	174	932	113	0	1219	85	380	141	0	606	3199
05:00 PM	15	184	53	0	252	26	68	40	0	134	58	264	33	0	355	27	86	54	0	167	908
05:15 PM	11	220	59	1	291	17	80	41	1	139	51	270	37	0	358	25	98	55	0	178	966
05:30 PM	20	183	54	0	257	29	72	38	0	139	45	231	34	2	312	30	75	43	0	148	856
05:45 PM	16	142	44	1	203	21	70	37	0	128	45	195	23	2	265	14	88	35	0	137	733
Total	62	729	210	2	1003	93	290	156	1	540	199	960	127	4	1290	96	347	187	0	630	3463
Grand Total	352	2986	608	2	3948	408	1098	635	1	2142	517	2862	396	4	3779	423	1208	493	1	2125	11994
Apprch %	8.9	75.6	15.4	0.1		19	51.3	29.6	0		13.7	75.7	10.5	0.1		19.9	56.8	23.2	0		
Total %	2.9	24.9	5.1	0	32.9	3.4	9.2	5.3	0	17.9	4.3	23.9	3.3	0	31.5	3.5	10.1	4.1	0	17.7	
Pass Cars	349	2949	596	0	3894	404	1078	628	0	2110	511	2803	388	0	3702	409	1184	487	0	2080	11786
% Pass Cars	99.1	98.8	98	0	98.6	99	98.2	98.9	0	98.5	98.8	97.9	98	0	98	96.7	98	98.8	0	97.9	98.3
Single Units	3	34	12	0	49	4	20	7	0	31	6	44	8	0	58	14	24	6	0	44	182
% Single Units	0.9	1.1	2	0	1.2	1	1.8	1.1	0	1.4	1.2	1.5	2	0	1.5	3.3	2	1.2	0	2.1	1.5
Heavy Trucks	0	3	0	0	3	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	18
% Heavy Trucks	0	0.1	0	0	0.1	0	0	0	0	0	0	0.5	0	0	0.4	0	0	0	0	0	0.2
Peds	0	0	0	2	2	0	0	0	1	1	0	0	0	4	4	0	0	0	1	1	8
% Peds	0	0	0	100	0.1	0	0	0	100	0	0	0	0	100	0.1	0	0	0	100	0	0.1

TDC Traffic Comments: Signalized controlled intersection, ped. signals for all quadrants. Video VCU camera was located within SW intersection quadrant. Note: Peds. are excluded from peak hour reports. Traffic study was performed for Troy Westington Phase II Traffic Impact Study for Fleis & Vandenbrink.

Traffic Data Collection, LLC

www:tdccounts.com

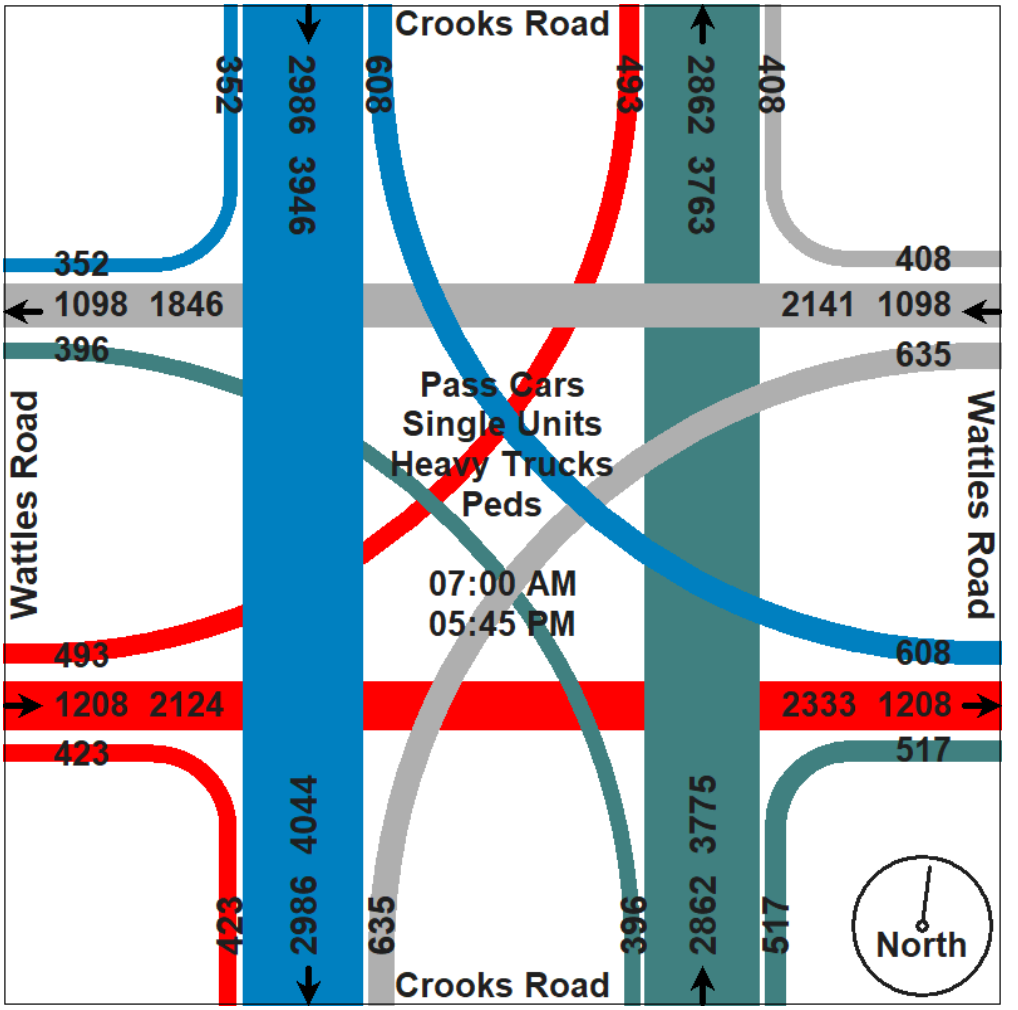
Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 32G SW

File Name : TMC_1 Wattles & Crooks_9-29-21
Site Code : TMC_1
Start Date : 9/29/2021
Page No : 2



Traffic Data Collection, LLC

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Phone: 586.786-5407

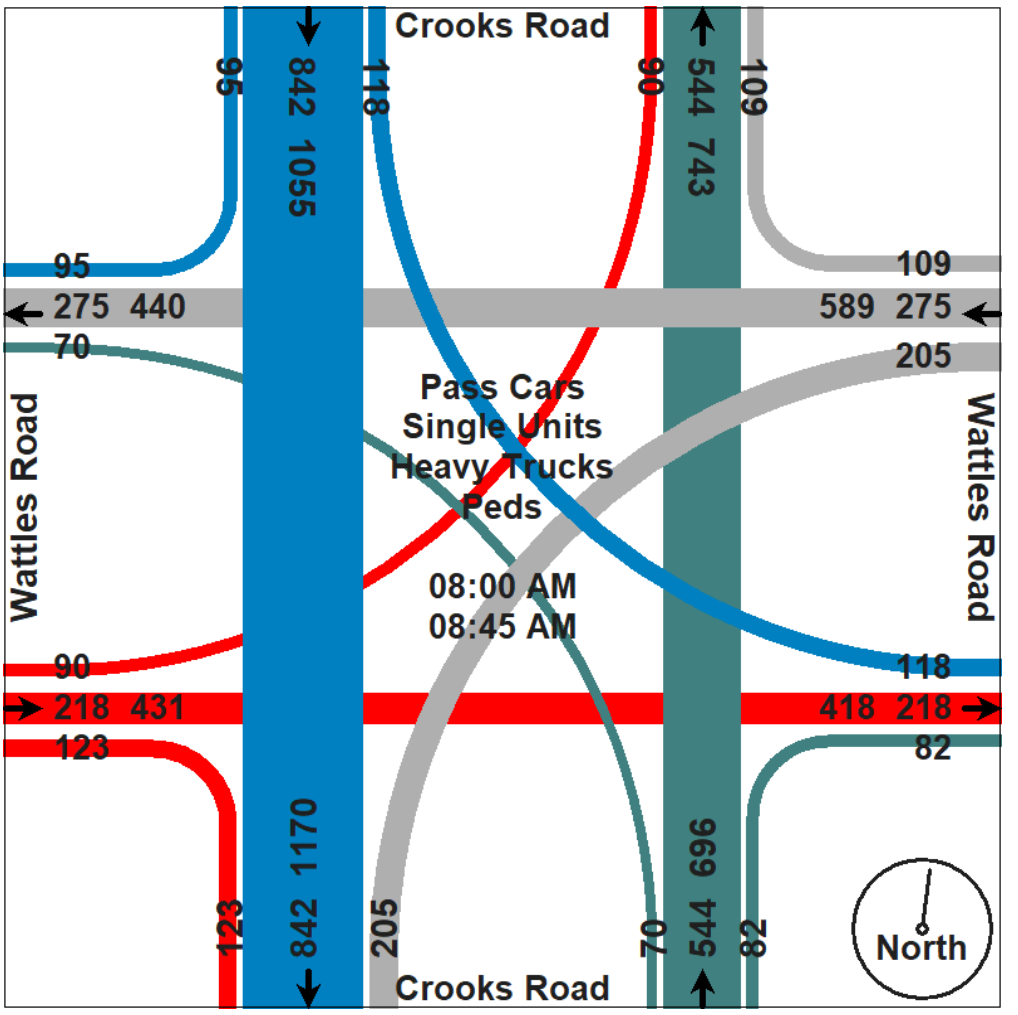
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 32G SW

File Name : TMC_1 Wattles & Crooks_9-29-21
Site Code : TMC_1
Start Date : 9/29/2021
Page No : 3

	Crooks Road Southbound				Wattles Road Westbound				Crooks Road Northbound				Wattles Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	21	195	23	239	**33**	55	47	135	20	117	12	149	21	46	**31**	98	621
08:15 AM	25	208	**34**	267	25	**83**	**61**	**169**	12	**161**	**27**	**200**	33	46	21	100	**736**
08:30 AM	**26**	214	33	273	20	59	44	123	23	141	20	184	**41**	60	19	**120**	700
08:45 AM	23	**225**	28	**276**	31	78	53	162	**27**	125	11	163	28	**66**	19	113	714
Total Volume	95	842	118	1055	109	275	205	589	82	544	70	696	123	218	90	431	2771
% App. Total	9	79.8	11.2		18.5	46.7	34.8		11.8	78.2	10.1		28.5	50.6	20.9		
PHF	.913	.936	.868	.956	.826	.828	.840	.871	.759	.845	.648	.870	.750	.826	.726	.898	.941
Pass Cars	95	831	117	1043	109	265	202	576	81	517	66	664	117	212	89	418	2701
% Pass Cars	100	98.7	99.2	98.9	100	96.4	98.5	97.8	98.8	95.0	94.3	95.4	95.1	97.2	98.9	97.0	97.5
Single Units	0	11	1	12	0	10	3	13	1	20	4	25	6	6	1	13	63
% Single Units	0	1.3	0.8	1.1	0	3.6	1.5	2.2	1.2	3.7	5.7	3.6	4.9	2.8	1.1	3.0	2.3
Heavy Trucks	0	0	0	0	0	0	0	0	0	7	0	7	0	0	0	0	7
% Heavy Trucks	0	0	0	0	0	0	0	0	0	1.3	0	1.0	0	0	0	0	0.3
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

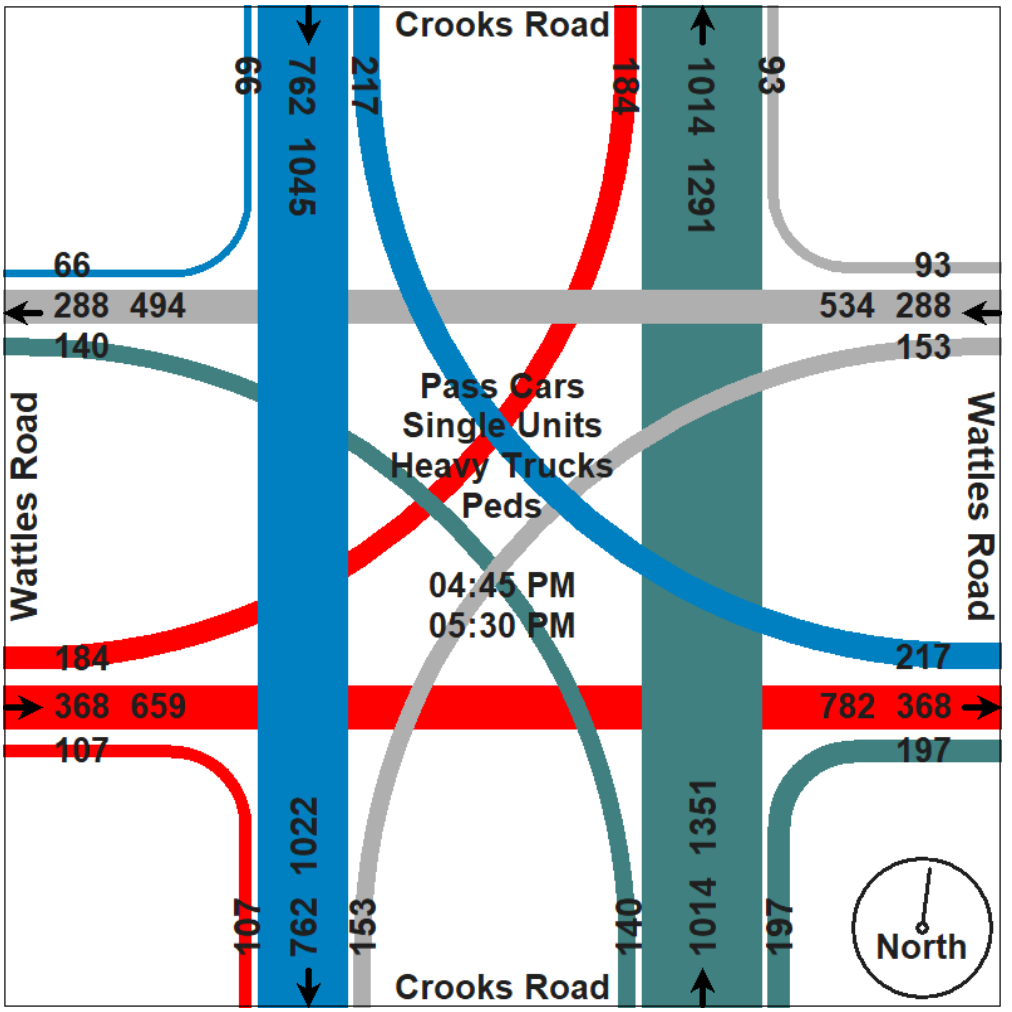
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 32G SW

File Name : TMC_1 Wattles & Crooks_9-29-21
Site Code : TMC_1
Start Date : 9/29/2021
Page No : 4

	Crooks Road Southbound				Wattles Road Westbound				Crooks Road Northbound				Wattles Road Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	**20**	175	51	246	21	68	34	123	43	249	36	328	25	**109**	32	166	863
05:00 PM	15	184	53	252	26	68	40	134	**58**	264	33	355	27	86	54	167	908
05:15 PM	11	**220**	**59**	**290**	17	**80**	**41**	138	51	**270**	**37**	**358**	25	98	**55**	**178**	**964**
05:30 PM	20	183	54	257	**29**	72	38	**139**	45	231	34	310	**30**	75	43	148	854
Total Volume	66	762	217	1045	93	288	153	534	197	1014	140	1351	107	368	184	659	3589
% App. Total	6.3	72.9	20.8		17.4	53.9	28.7		14.6	75.1	10.4		16.2	55.8	27.9		
PHF	.825	.866	.919	.901	.802	.900	.933	.960	.849	.939	.946	.943	.892	.844	.836	.926	.931
Pass Cars	66	757	215	1038	93	284	151	528	196	1006	138	1340	105	364	184	653	3559
% Pass Cars	100	99.3	99.1	99.3	100	98.6	98.7	98.9	99.5	99.2	98.6	99.2	98.1	98.9	100	99.1	99.2
Single Units	0	5	2	7	0	4	2	6	1	7	2	10	2	4	0	6	29
% Single Units	0	0.7	0.9	0.7	0	1.4	1.3	1.1	0.5	0.7	1.4	0.7	1.9	1.1	0	0.9	0.8
Heavy Trucks	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.0
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 32G SW

File Name : TMC_1 Wattles & Crooks_9-29-21
Site Code : TMC_1
Start Date : 9/29/2021

Aerial Photo

Traffic Data Collection, LLC

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Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 3CU SE

File Name : TMC_2 Wattles & Seven Eleven_9-29-21
Site Code : TMC_2
Start Date : 9/29/2021
Page No : 1

4 Hour video traffic study was conducted during typical weekday (Wednesday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was in session & during COVID 19.

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

	Crooks Road Southbound					Seven Eleven Dw. Westbound					Crooks Road Northbound					Residential Dw. Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	5	174	0	0	179	2	0	0	0	2	3	120	0	0	123	0	0	3	0	3	307
07:15 AM	3	223	0	0	226	8	0	1	0	9	1	122	0	0	123	0	0	1	0	1	359
07:30 AM	7	266	0	0	273	7	0	4	0	11	5	147	0	0	152	0	0	0	1	1	437
07:45 AM	1	329	0	0	330	2	0	6	0	8	3	155	0	0	158	0	0	0	0	0	496
Total	16	992	0	0	1008	19	0	11	0	30	12	544	0	0	556	0	0	4	1	5	1599
08:00 AM	0	261	0	0	261	0	0	0	0	0	2	150	0	0	152	0	0	2	0	2	415
08:15 AM	0	292	0	0	292	2	3	2	0	7	2	193	1	0	196	1	0	3	0	4	499
08:30 AM	0	303	0	0	303	3	2	3	0	8	3	173	1	0	177	0	0	2	0	2	490
08:45 AM	0	293	3	0	296	3	1	2	0	6	3	151	1	0	155	0	0	3	0	3	460
Total	0	1149	3	0	1152	8	6	7	0	21	10	667	3	0	680	1	0	10	0	11	1864
*** BREAK ***																					
04:00 PM	0	190	1	0	191	2	0	4	0	6	6	286	6	0	298	0	0	1	0	1	496
04:15 PM	0	236	0	0	236	1	0	2	0	3	4	267	0	0	271	2	0	3	0	5	515
04:30 PM	0	213	0	0	213	3	1	0	0	4	4	309	0	0	313	2	0	2	0	4	534
04:45 PM	0	222	0	0	222	5	1	2	0	8	5	322	2	0	329	1	0	1	0	2	561
Total	0	861	1	0	862	11	2	8	0	21	19	1184	8	0	1211	5	0	7	0	12	2106
05:00 PM	11	261	0	0	272	6	0	0	0	6	5	369	0	0	374	2	0	3	0	5	657
05:15 PM	6	289	0	0	295	5	0	1	0	6	2	339	0	0	341	0	0	2	3	5	647
05:30 PM	5	244	0	0	249	0	0	0	0	0	2	307	0	0	309	1	0	0	0	1	559
05:45 PM	3	188	1	0	192	2	3	0	0	5	2	250	0	0	252	1	0	2	2	5	454
Total	25	982	1	0	1008	13	3	1	0	17	11	1265	0	0	1276	4	0	7	5	16	2317
Grand Total	41	3984	5	0	4030	51	11	27	0	89	52	3660	11	0	3723	10	0	28	6	44	7886
Apprch %	1	98.9	0.1	0		57.3	12.4	30.3	0		1.4	98.3	0.3	0		22.7	0	63.6	13.6		
Total %	0.5	50.5	0.1	0	51.1	0.6	0.1	0.3	0	1.1	0.7	46.4	0.1	0	47.2	0.1	0	0.4	0.1	0.6	
Pass Cars	41	3927	5	0	3973	50	11	27	0	88	52	3586	10	0	3648	9	0	27	0	36	7745
% Pass Cars	100	98.6	100	0	98.6	98	100	100	0	98.9	100	98	90.9	0	98	90	0	96.4	0	81.8	98.2
Single Units	0	51	0	0	51	1	0	0	0	1	0	54	1	0	55	1	0	1	0	2	109
% Single Units	0	1.3	0	0	1.3	2	0	0	0	1.1	0	1.5	9.1	0	1.5	10	0	3.6	0	4.5	1.4
Heavy Trucks	0	6	0	0	6	0	0	0	0	0	0	20	0	0	20	0	0	0	0	0	26
% Heavy Trucks	0	0.2	0	0	0.1	0	0	0	0	0	0	0.5	0	0	0.5	0	0	0	0	0	0.3
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	13.6	0.1

TDC Traffic Comments: Non-signalized controlled intersection. Video VCU camera was located within SE intersection quadrant. Note: Peds. are excluded from peak hour reports. Traffic study was performed for Troy Westington Phase II Traffic Impact Study for Fleis & Vandenbrink.

Traffic Data Collection, LLC

www:tdccounts.com

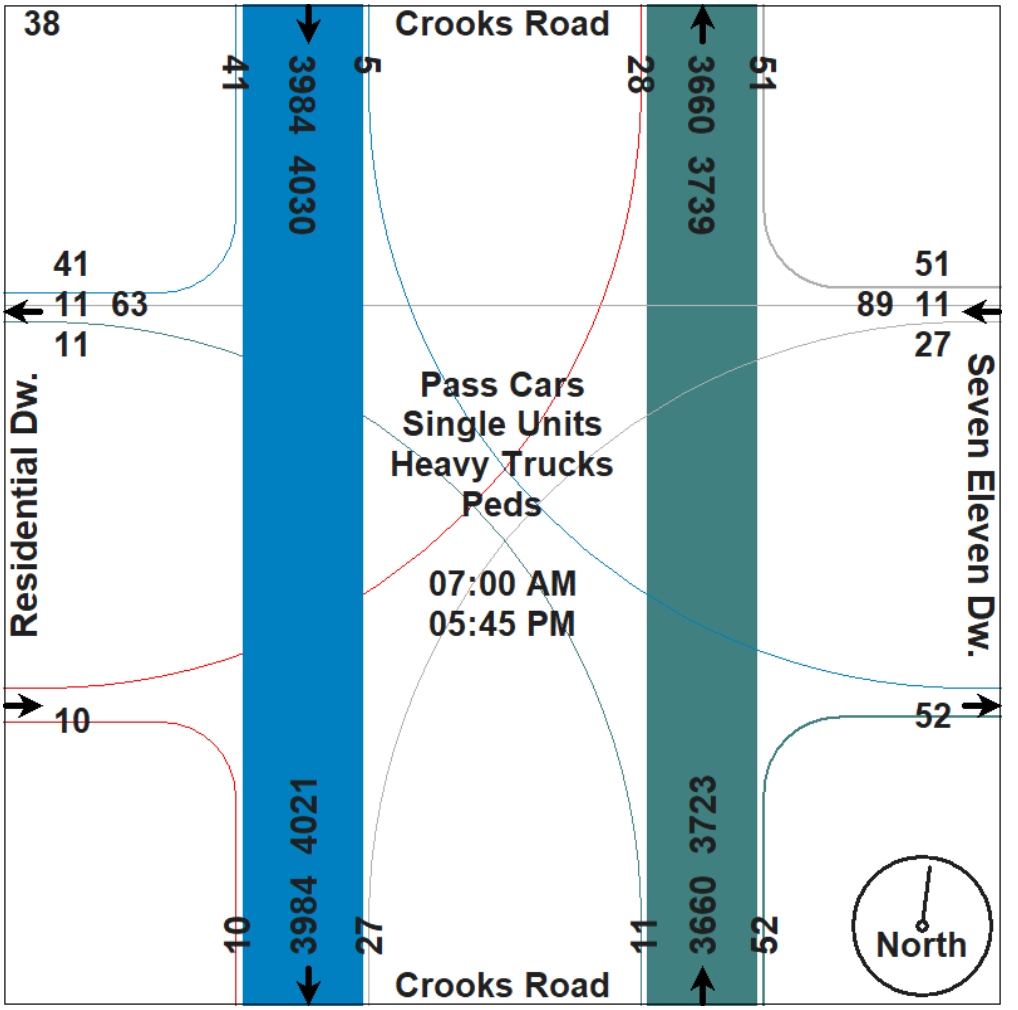
Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 3CU SE

File Name : TMC_2 Wattles & Seven Eleven_9-29-21
Site Code : TMC_2
Start Date : 9/29/2021
Page No : 2



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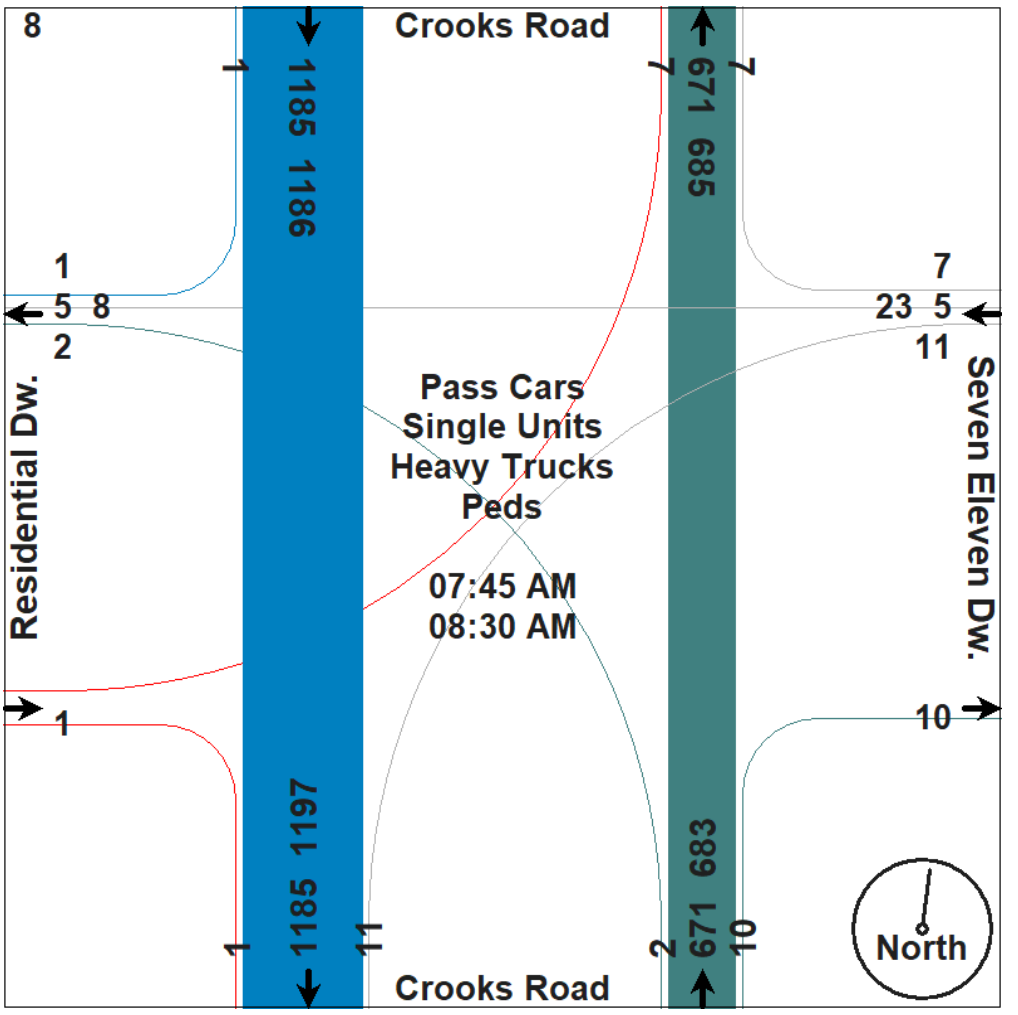
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 3CU SE

File Name : TMC_2 Wattles & Seven Eleven_9-29-21
Site Code : TMC_2
Start Date : 9/29/2021
Page No : 3

	Crooks Road Southbound				Seven Eleven Dw. Westbound				Crooks Road Northbound				Residential Dw. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:45 AM																	
07:45 AM	**1**	**329**	0	**330**	2	0	**6**	**8**	**3**	155	0	158	0	0	0	0	496
08:00 AM	0	261	0	261	0	0	0	0	2	150	0	152	0	0	2	2	415
08:15 AM	0	292	0	292	2	**3**	2	7	2	**193**	**1**	**196**	**1**	0	**3**	**4**	**499**
08:30 AM	0	303	0	303	**3**	2	3	8	3	173	1	177	0	0	2	2	490
Total Volume	1	1185	0	1186	7	5	11	23	10	671	2	683	1	0	7	8	1900
% App. Total	0.1	99.9	0		30.4	21.7	47.8		1.5	98.2	0.3		12.5	0	87.5		
PHF	.250	.900	.000	.898	.583	.417	.458	.719	.833	.869	.500	.871	.250	.000	.583	.500	.952
Pass Cars	1	1165	0	1166	7	5	11	23	10	640	2	652	1	0	7	8	1849
% Pass Cars	100	98.3	0	98.3	100	100	100	100	100	95.4	100	95.5	100	0	100	100	97.3
Single Units	0	18	0	18	0	0	0	0	0	24	0	24	0	0	0	0	42
% Single Units	0	1.5	0	1.5	0	0	0	0	0	3.6	0	3.5	0	0	0	0	2.2
Heavy Trucks	0	2	0	2	0	0	0	0	0	7	0	7	0	0	0	0	9
% Heavy Trucks	0	0.2	0	0.2	0	0	0	0	0	1.0	0	1.0	0	0	0	0	0.5
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

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Phone: 586.786-5407

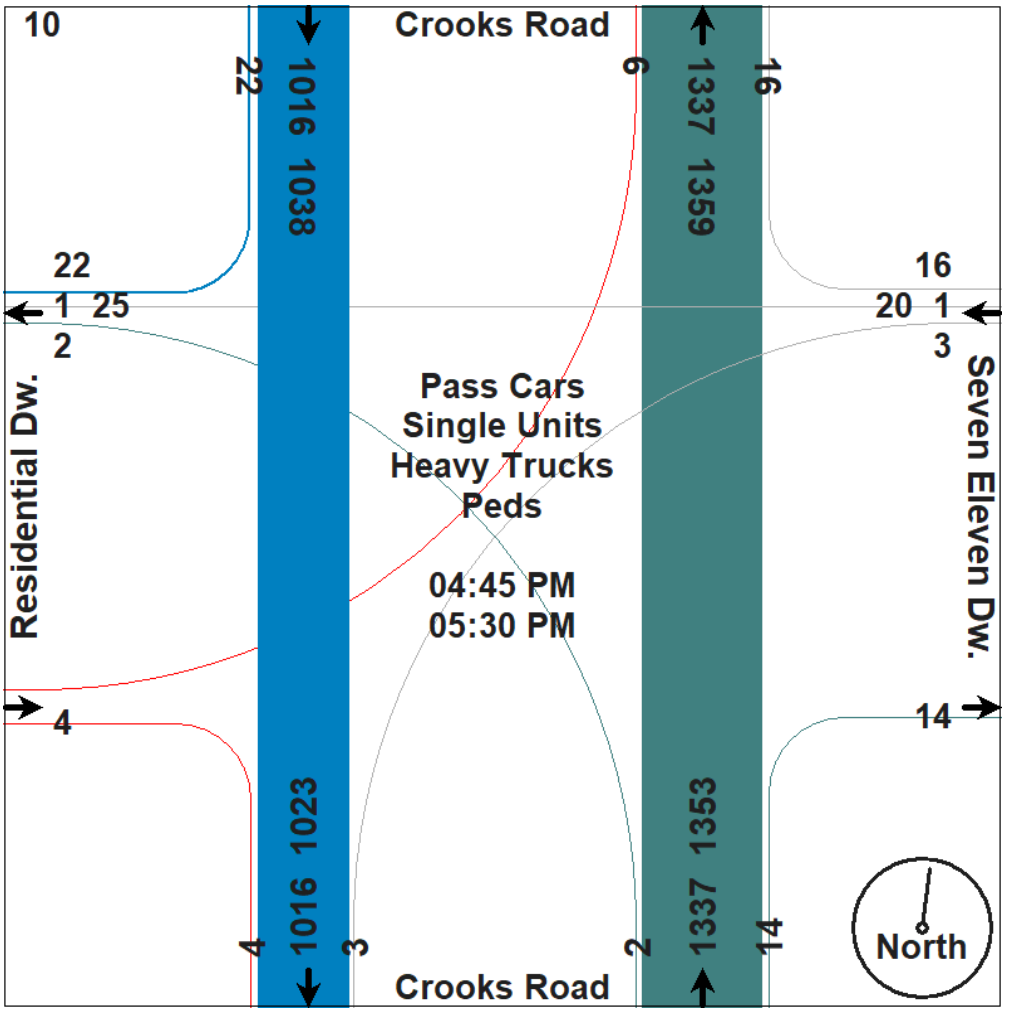
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 3CU SE

File Name : TMC_2 Wattles & Seven Eleven_9-29-21
Site Code : TMC_2
Start Date : 9/29/2021
Page No : 4

	Crooks Road Southbound				Seven Eleven Dw. Westbound				Crooks Road Northbound				Residential Dw. Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	222	0	222	5	**1**	**2**	**8**	**5**	322	**2**	329	1	0	1	2	561
05:00 PM	**11**	261	0	272	**6**	0	0	6	5	**369**	0	**374**	**2**	0	**3**	**5**	**657**
05:15 PM	6	**289**	0	**295**	5	0	1	6	2	339	0	341	0	0	2	2	644
05:30 PM	5	244	0	249	0	0	0	0	2	307	0	309	1	0	0	1	559
Total Volume	22	1016	0	1038	16	1	3	20	14	1337	2	1353	4	0	6	10	2421
% App. Total	2.1	97.9	0		80	5	15		1	98.8	0.1		40	0	60		
PHF	.500	.879	.000	.880	.667	.250	.375	.625	.700	.906	.250	.904	.500	.000	.500	.500	.921
Pass Cars	22	1005	0	1027	16	1	3	20	14	1327	2	1343	4	0	6	10	2400
% Pass Cars	100	98.9	0	98.9	100	100	100	100	100	99.3	100	99.3	100	0	100	100	99.1
Single Units	0	11	0	11	0	0	0	0	0	9	0	9	0	0	0	0	20
% Single Units	0	1.1	0	1.1	0	0	0	0	0	0.7	0	0.7	0	0	0	0	0.8
Heavy Trucks	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
% Heavy Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.0
Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

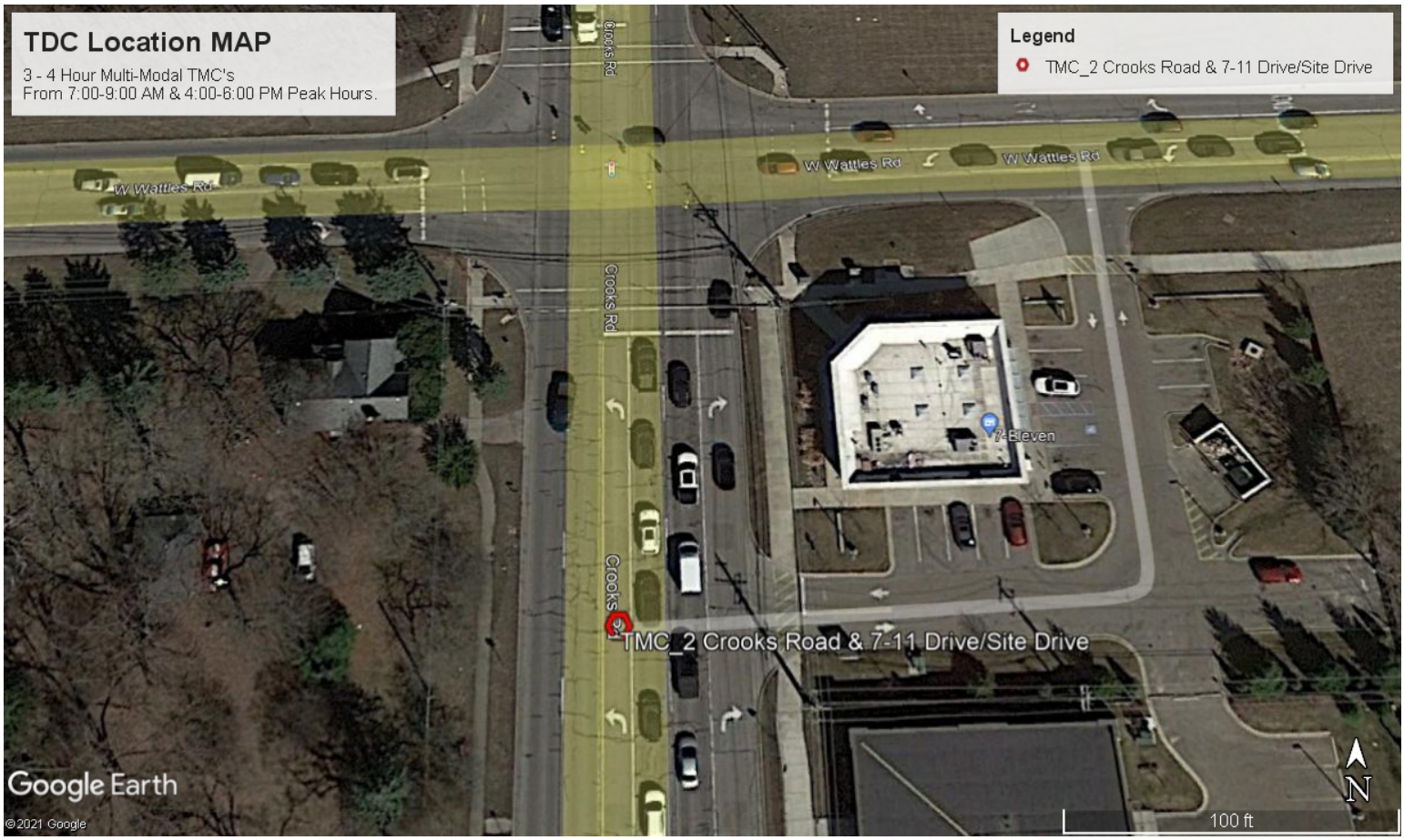
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 3CU SE

File Name : TMC_2 Wattles & Seven Eleven_9-29-21
Site Code : TMC_2
Start Date : 9/29/2021
Page No : 5

Aerial Photo



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Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 1US SE

File Name : TMC_3 Wattles & Barilane_9-29-21
Site Code : TMC_3
Start Date : 9/29/2021
Page No : 1

4 Hour video traffic study was conducted during typical weekday (Wednesday) from 7:00 AM - 9:00 AM morning & 4:00 PM - 6:00 PM afternoon peak hours, while school was in session & during COVID 19.

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

	Crooks Road Southbound				Barilane Drive (Private) Westbound				Crooks Road Northbound				
Start Time	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Right	Thru	Peds	App. Total	Int. Total
07:00 AM	190	0	0	190	0	1	0	1	0	121	0	121	312
07:15 AM	237	0	0	237	0	0	0	0	0	124	0	124	361
07:30 AM	266	1	0	267	1	0	0	1	0	145	0	145	413
07:45 AM	339	1	0	340	0	0	0	0	0	149	0	149	489
Total	1032	2	0	1034	1	1	0	2	0	539	0	539	1575
08:00 AM	267	0	0	267	0	0	0	0	0	176	0	176	443
08:15 AM	306	0	0	306	0	1	3	4	0	183	0	183	493
08:30 AM	316	0	0	316	0	0	0	0	0	181	0	181	497
08:45 AM	296	2	0	298	0	1	0	1	0	156	0	156	455
Total	1185	2	0	1187	0	2	3	5	0	696	0	696	1888
*** BREAK ***													
04:00 PM	194	0	0	194	0	1	0	1	0	311	0	311	506
04:15 PM	240	1	0	241	0	0	0	0	0	269	0	269	510
04:30 PM	221	1	0	222	1	1	0	2	2	340	0	342	566
04:45 PM	227	1	0	228	0	0	0	0	0	314	0	314	542
Total	882	3	0	885	1	2	0	3	2	1234	0	1236	2124
05:00 PM	265	0	0	265	0	0	0	0	0	386	0	386	651
05:15 PM	288	0	0	288	0	1	0	1	0	327	0	327	616
05:30 PM	244	0	0	244	1	0	0	1	1	317	0	318	563
05:45 PM	188	0	0	188	0	0	0	0	1	251	0	252	440
Total	985	0	0	985	1	1	0	2	2	1281	0	1283	2270
Grand Total	4084	7	0	4091	3	6	3	12	4	3750	0	3754	7857
Apprch %	99.8	0.2	0		25	50	25		0.1	99.9	0		
Total %	52	0.1	0	52.1	0	0.1	0	0.2	0.1	47.7	0	47.8	
Pass Cars	4027	7	0	4034	3	6	0	9	4	3672	0	3676	7719
% Pass Cars	98.6	100	0	98.6	100	100	0	75	100	97.9	0	97.9	98.2
Single Units	49	0	0	49	0	0	0	0	0	52	0	52	101
% Single Units	1.2	0	0	1.2	0	0	0	0	0	1.4	0	1.4	1.3
Heavy Trucks	8	0	0	8	0	0	0	0	0	26	0	26	34
% Heavy Trucks	0.2	0	0	0.2	0	0	0	0	0	0.7	0	0.7	0.4
Peds	0	0	0	0	0	0	3	3	0	0	0	0	3
% Peds	0	0	0	0	0	0	100	25	0	0	0	0	0

TDC Traffic Comments: Non-signalized controlled intersection. Video VCU camera was located within SE intersection quadrant. Note: Peds. are excluded from peak hour reports. Traffic study was performed for Troy Westington Phase II Traffic Impact Study for Fleis & Vandenbrink.

Traffic Data Collection, LLC

www:tdccounts.com

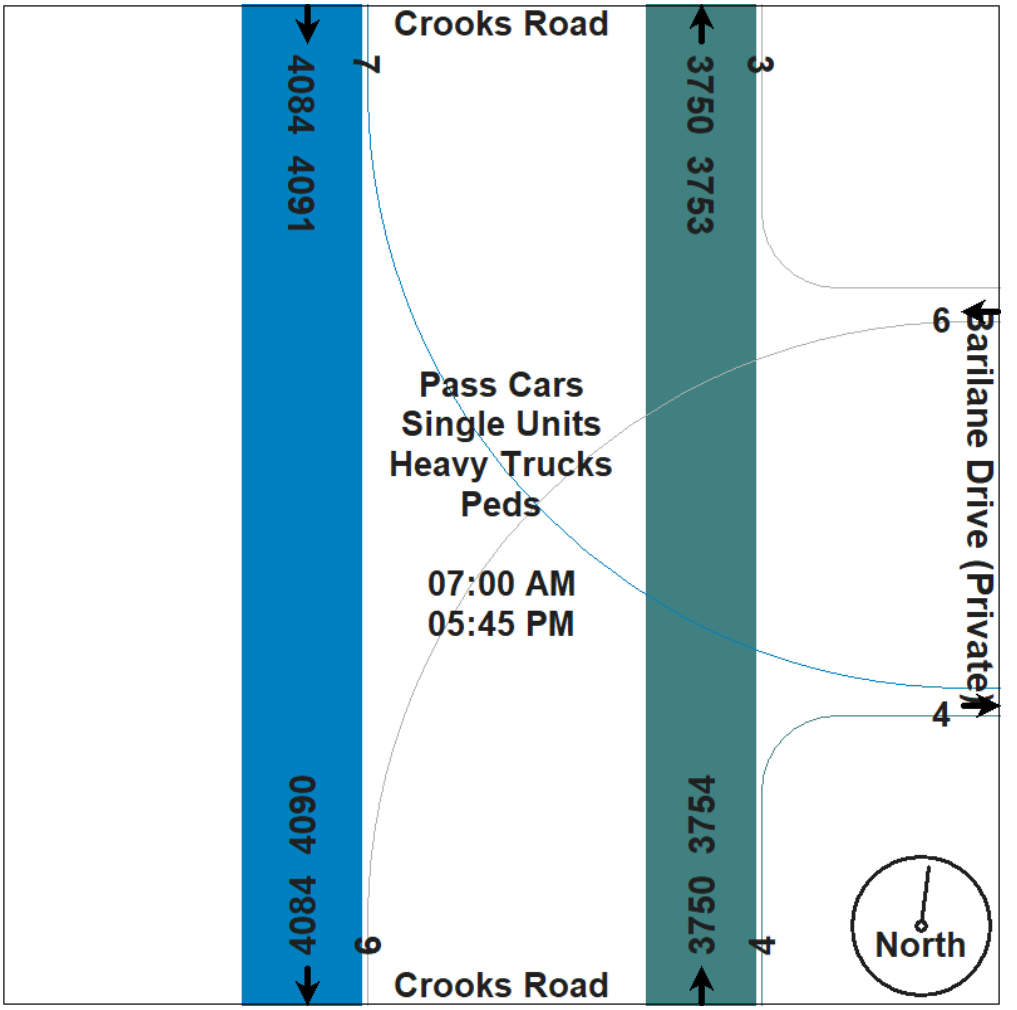
Phone: 586.786-5407

Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 1US SE

File Name : TMC_3 Wattles & Barilane_9-29-21
Site Code : TMC_3
Start Date : 9/29/2021
Page No : 2



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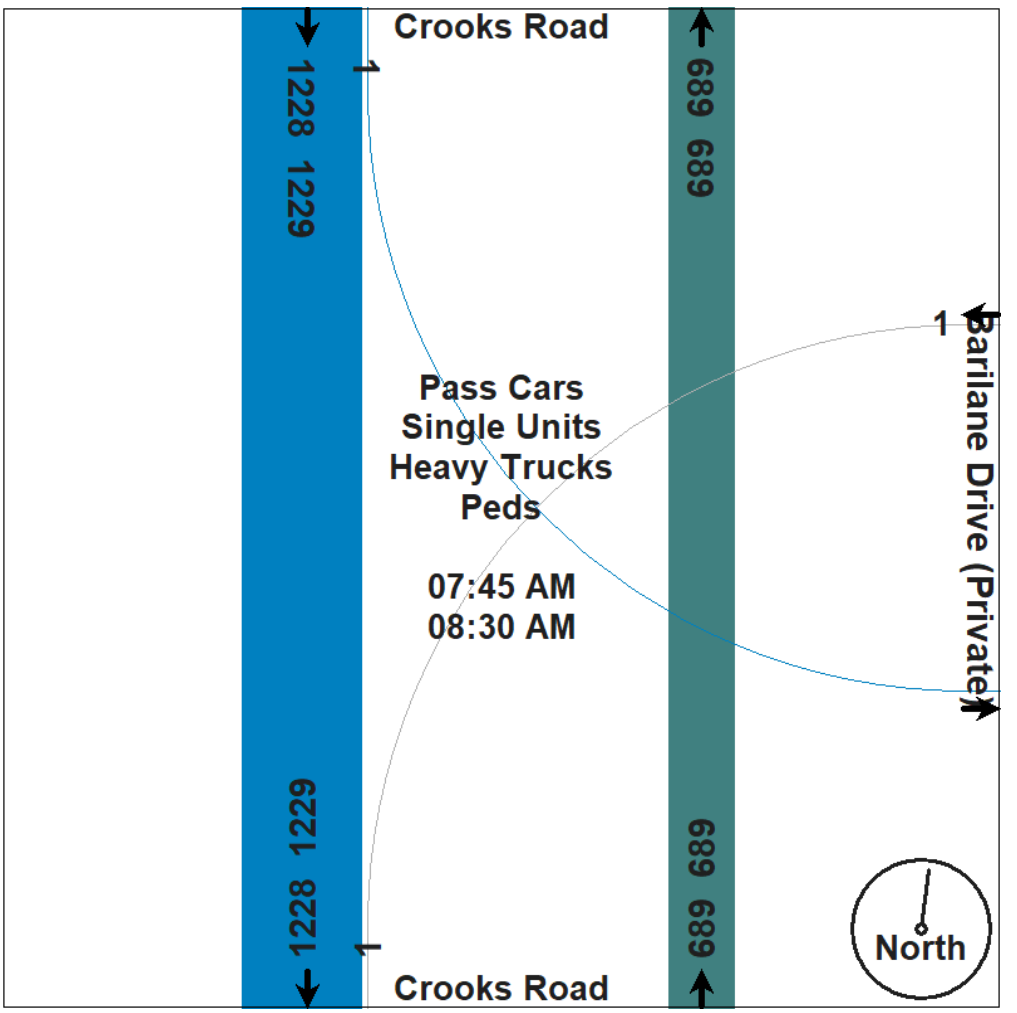
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 1US SE

File Name : TMC_3 Wattles & Barilane_9-29-21
Site Code : TMC_3
Start Date : 9/29/2021
Page No : 3

	Crooks Road Southbound			Barilane Drive (Private) Westbound			Crooks Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 07:45 AM										
07:45 AM	**339**	**1**	**340**	0	0	0	0	149	149	489
08:00 AM	267	0	267	0	0	0	0	176	176	443
08:15 AM	306	0	306	0	**1**	**1**	0	**183**	**183**	490
08:30 AM	316	0	316	0	0	0	0	181	181	**497**
Total Volume	1228	1	1229	0	1	1	0	689	689	1919
% App. Total	99.9	0.1		0	100		0	100		
PHF	.906	.250	.904	.000	.250	.250	.000	.941	.941	.965
Pass Cars	1207	1	1208	0	1	1	0	660	660	1869
% Pass Cars	98.3	100	98.3	0	100	100	0	95.8	95.8	97.4
Single Units	18	0	18	0	0	0	0	20	20	38
% Single Units	1.5	0	1.5	0	0	0	0	2.9	2.9	2.0
Heavy Trucks	3	0	3	0	0	0	0	9	9	12
% Heavy Trucks	0.2	0	0.2	0	0	0	0	1.3	1.3	0.6
Peds	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0



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Phone: 586.786-5407

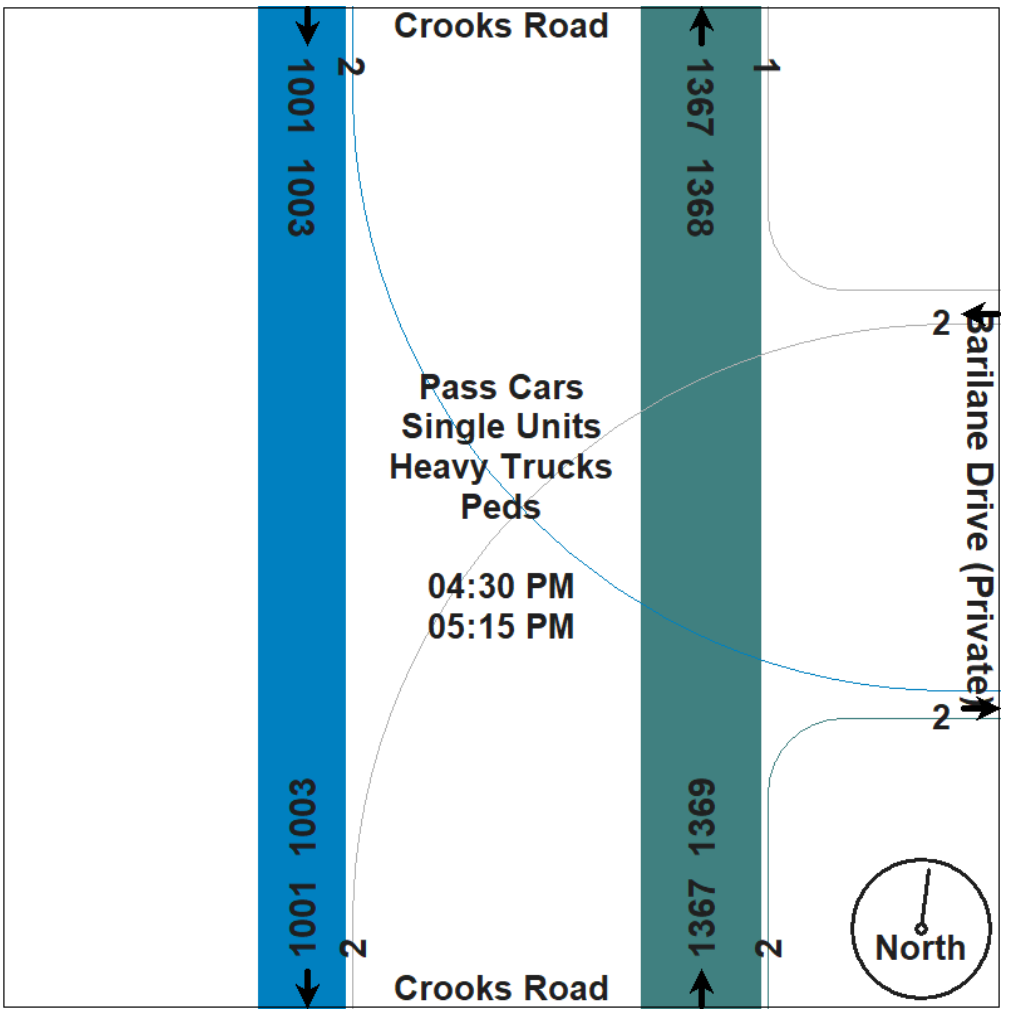
Traffic Study Performed For:

FLEIS & VANDENBRINK

Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 1US SE

File Name : TMC_3 Wattles & Barilane_9-29-21
Site Code : TMC_3
Start Date : 9/29/2021
Page No : 4

	Crooks Road Southbound			Barilane Drive (Private) Westbound			Crooks Road Northbound			
Start Time	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	221	**1**	222	**1**	**1**	**2**	**2**	340	342	566
04:45 PM	227	1	228	0	0	0	0	314	314	542
05:00 PM	265	0	265	0	0	0	0	**386**	**386**	**651**
05:15 PM	**288**	0	**288**	0	1	1	0	327	327	616
Total Volume	1001	2	1003	1	2	3	2	1367	1369	2375
% App. Total	99.8	0.2		33.3	66.7		0.1	99.9		
PHF	.869	.500	.871	.250	.500	.375	.250	.885	.887	.912
Pass Cars	987	2	989	1	2	3	2	1349	1351	2343
% Pass Cars	98.6	100	98.6	100	100	100	100	98.7	98.7	98.7
Single Units	13	0	13	0	0	0	0	14	14	27
% Single Units	1.3	0	1.3	0	0	0	0	1.0	1.0	1.1
Heavy Trucks	1	0	1	0	0	0	0	4	4	5
% Heavy Trucks	0.1	0	0.1	0	0	0	0	0.3	0.3	0.2
Peds	0	0	0	0	0	0	0	0	0	0
% Peds	0	0	0	0	0	0	0	0	0	0



Traffic Data Collection, LLC

www:tdccounts.com

Phone: 586.786-5407

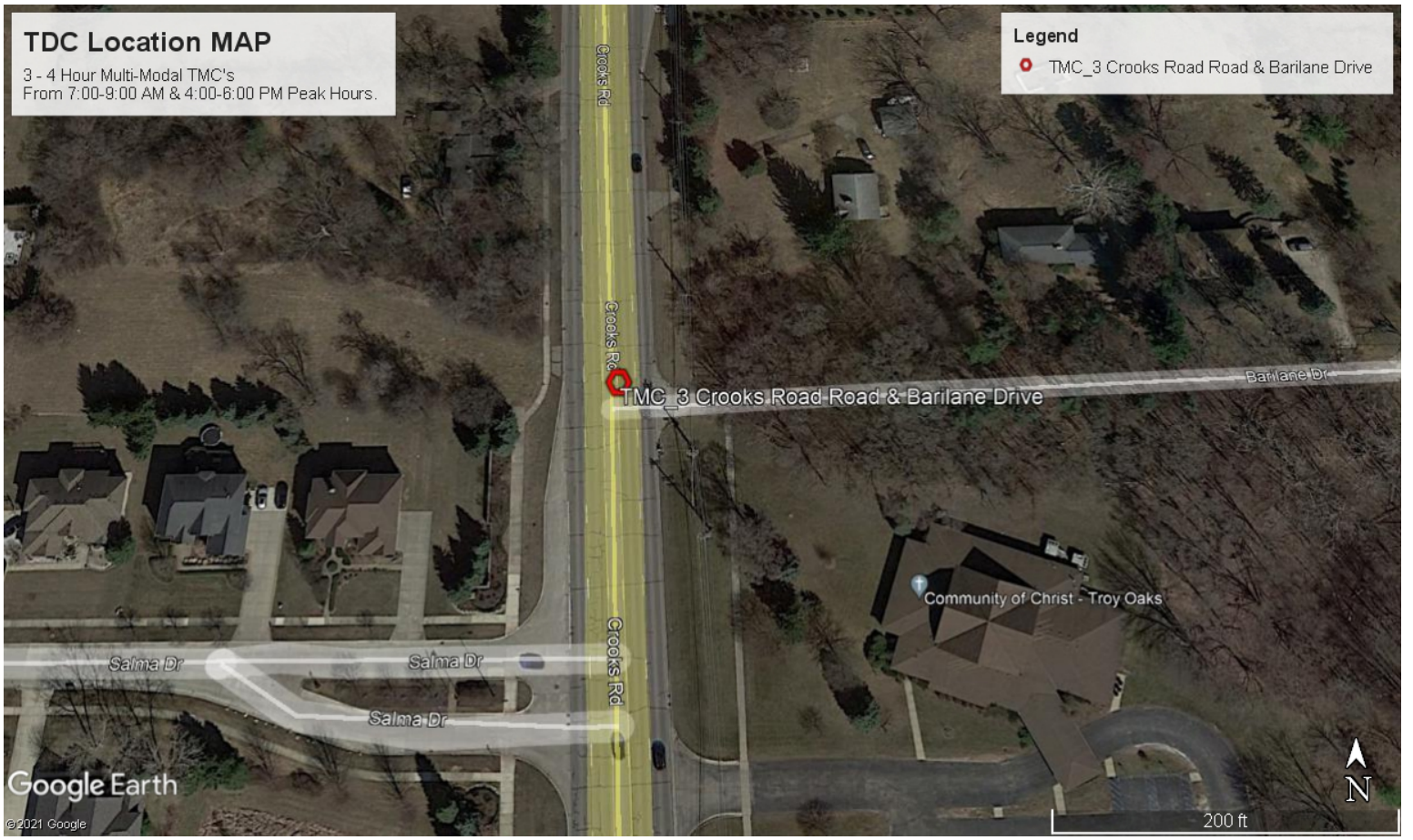
Traffic Study Performed For:

FLEIS & VANDENBRINK

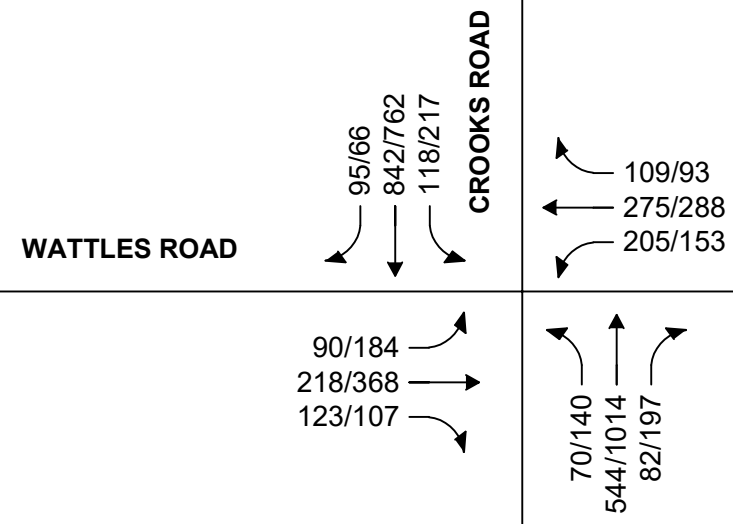
Project: Troy West Traffic Impact Study
Study:4 Hr. Video Turning Movement Count
Weather: Sunny, Dry Deg's 70s
Count By Miovision Video VCU 1US SE

File Name : TMC_3 Wattles & Barilane_9-29-21
Site Code : TMC_3
Start Date : 9/29/2021
Page No : 5

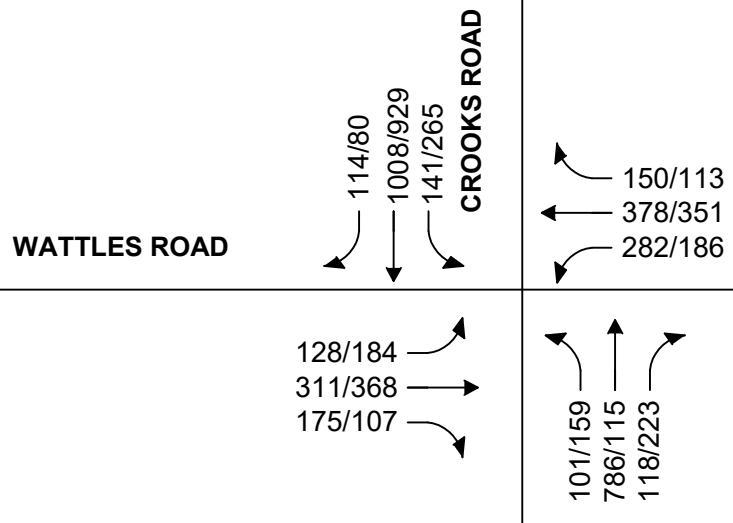
Aerial Photo



COLLECTED TRAFFIC VOLUME



ADJUSTED TRAFFIC VOLUME



NORTH
SCALE: NOT TO SCALE

FIGURE
COLLECTED AND ADJUSTED TRAFFIC VOLUMES

WESTINGTON AND WEST HILLS RESIDENTIAL DEVELOPMENT
TIS - TROY, MI

LEGEND

- ROADS
- PROPOSED ROADS
- TRAFFIC VOLUMES (AM/PM)

OAKLAND COUNTY ROAD COMMISSION
TRAFFIC - SAFETY DEPARTMENT
SIGNAL WORK ORDER

LOCATION: Crooks & Wattles DATE: 11/13/18

CITY/TOWNSHIP: TROY BY: ELA

COUNTY#: 406 STATE#: _____ CHARGES: 78 00999 0 (Labor & Materials)

PLEASE PERFORM THE FOLLOWING:

_____ ELECTRICAL DEVICE: ____ INSTALL _____ MODERNIZE _____ MAINTENANCE

_____ UNDERGROUND: _____

_____ EDISON OK: _____ YES _____ NO JOB#: _____ APR 3 2019

_____ COORDINATE W/DISTRICT 7: _____

DIAL..	1	1	1	1		2	2	2	2		3	3	3	3		4	4	4	4
SPLIT.	1	2	3	4		1	2	3	4		1	2	3	4		1	2	3	4
_____ CHANGE TIMING.....																			
_____ CHANGE OFFSET.....																			
_____ CHANGE CYCLE LENGTH.....																			
_____ ADD DIAL/SPLIT.....																			

_____ CHANGE BREAKOUT OR EPROM: _____

_____ CHANGE HOURS OF OPERATION:

OLD: _____

NEW: _____

_____ REPROGRAM TBC

_____ INSTALL INTERCONNECT: _____ TBC _____ MINITROL _____ TONE

_____ MBT OK: _____ YES _____ NO

_____ NO CHANGE - RECORD CORRECTION

X OTHER: PLEASE SWAP OUT EXISTING FLIR CAMERAS WITH AIS-IV CAMERAS (relocate/Abandon NB/SB away from DTE) – (NB & SB)

(2 No. CAMERAS). PLEASE CALL TOC TO CONFIRM CAMERA VIEW & COMMS. TURN ON LED GUARD IN MMU OPTIONS- CONFIRM JUMPER 16-MMU Flash -116 Monitor ST Out (Already has 2 AIS CAMS)

** Personality not changed, paperwork updated for AIS-IV cameras **

APPROVED BY: _____ DATE: 1/8/19

DATE INSTALLED: 4/1/19

INSTALLED BY: JAMES PIERCE

INTERSECTION :- 406 CROOKS & WATTLES
DESCRIPTION PROMS :- X00406 / F4808
CONTROLLER TYPE :- STANDARD PERSONALITY CONTROLLER
SOFTWARE TYPE :- MOD 52 SCATS S30 **TS2**
INPUTS :-

1. WB WATTLES LT (LK)
2. WB WATTLES THRU (LK)
3. WB WATTLES RT (LK)
4. SB CROOKS LT (NL)
5. SB CROOKS L (LK)
6. SB CROOKS R (LK)
7. SB CROOKS RT (LK)
8. EB WATTLES LT (LK)
9. EB WATTLES THRU (LK)
10. EB WATTLES RT (LK)
11. NB CROOKS LT (NL)
12. NB CROOKS L (LK)
13. NB CROOKS R (LK)
14. NB CROOKS RT (LK)

NOTE :- ALL DETECTORS ARE AUTOSCOPE (RACKVISION, AIS-IV CAMERAS).

PED 2: NB CROOKS PED EAST P.B.
PED 4: WB WATTLES PED NORTH P.B.
PED 6: SB CROOKS PED WEST P.B.
PED 8: EB WATTLES PED SOUTH P.B.

Opticom 1: TB2 PREEMPT INPUT 3 (CALLS NB & SB CROOKS).
Opticom 2: TB2 PREEMPT INPUT 4 (CALLS EB & WB WATTLES).

APPROACHES :-

A APP 1 : SB CROOKS L,R,RT	A APP 2 : NB CROOKS L,R,RT
B APP 1 : SB CROOKS LT	B APP 2 : NB CROOKS LT
B APP 3 : NB CROOKS LT - TEST DETECTOR	
C APP 1 : WB WATTLES THRU,RT	C APP 2 : EB WATTLES THRU,RT
D APP 1 : WB WATTLES LT	D APP 2 : EB WATTLES LT
D APP 3 : WB WATTLES LT - TEST DETECTOR	

FLEXIDATA :-

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

PEDESTRIANS :-

1. NO PED1
2. NB CROOKS PED EAST
3. NO PED3
4. WB WATTLES PED NORTH
5. NO PED5
6. SB CROOKS PED WEST
7. NO PED7
8. EB WATTLES PED SOUTH

SPECIAL FEATURES :-
Personality revision is 3 (=C).

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

SB CROOKS LT has flashing red display (filter) in A stage(s).
EB WATTLES LT has flashing red display (filter) in C stage(s).
NB CROOKS LT has flashing red display (filter) in A stage(s).
WB WATTLES LT has flashing red display (filter) in C stage(s).

OPTICOM 1 CALLS NB & SB CROOKS. OPTICOM 2 CALLS EB & WB WATTLES.

Pedestrians have automatic introduction using SCATS Y-.
NB CROOKS PED EAST introduction is suppressed when OPTICOM is active.

WB WATTLES PED NORTH introduction is suppressed when OPTICOM is active.
SB CROOKS PED WEST introduction is suppressed when OPTICOM is active.
EB WATTLES PED SOUTH introduction is suppressed when OPTICOM is active.

BACKPANEL :- SIZE P44-16 **TS2** CABINET

Load Switch 1:	SB CROOKS LT	AL	FLR
Load Switch 2:	NB CROOKS	C	FLR
Load Switch 3:	EB WATTLES LT	BL	FLR
Load Switch 4:	WB WATTLES	D	FLR
Load Switch 5:	NB CROOKS LT	CL	FLR
Load Switch 6:	SB CROOKS	A	FLR
Load Switch 7:	WB WATTLES LT	DL	FLR
Load Switch 8:	EB WATTLES	B	FLR
Load Switch 9:	NB CROOKS PED EAST	P2	
Load Switch 10:	WB WATTLES PED NORTH	P4	
Load Switch 11:	SB CROOKS PED WEST	P1	
Load Switch 12:	EB WATTLES PED SOUTH	P3	

MMU :- (MENU : SET/VIEW CONFIG)

Field Check Enable:	Channel 1: G, Y, R Channel 2: G, Y, R Channel 3: G, Y, R Channel 4: G, Y, R Channel 5: G, Y, R Channel 6: G, Y, R Channel 7: G, Y, R Channel 8: G, Y, R
Dual Indication Enable:	R+G: Channel 1,2,3,4,5,6,7,8,9,10,11,12 R+Y: Channel 1,2,3,4,5,6,7,8 G+Y: Channel 1,2,3,4,5,6,7,8
Red Fail Enable:	Enable: Channel 1,2,3,4,5,6,7,8
Unit Options:	All OFF except: Recurrent pulse LED Guard Program Memory Card
Y & R Clearance Disable:	Channel 1,2,3,4,5,6,7,8 Enabled
Flashing Yellow Arrow:	None
Program Card:	Compatible Channels: 1-5, 2-6, 2-9, 2-11, 3-7, 4-8, 4-10, 4-12, 6-9, 6-11, 8-10, 8-12, 9-11, 10-12. Min Flash Time : 4+2+1 Min Yellow Change Disable: 9,10,11,12 Voltage Monitor Latch: NONE

Note :- Add Jumper 16 MMU Flash - 116 Monitor ST Out

```
*********************************
* CONTROLLER INFORMATION SHEET *
*     FOR SITE NO. 406         *
*       CARISSA MARKEL         *
*        06-APR-2018           *
*********************************
```

CHECKSUMS
TIMES: 81/201
PERS: 07/007
TOTAL: 86/206

FLEXILINK PLAN DATA

Intersection # 406 **State #** _____ **Date:** 04/06/18 **Prepared By:** Carissa Markel

Intersection: Crooks & Wattles **City:** Troy

Hours of Operation: 7 Days: 24 Hours **Approved By:** Rachel Jones

Hours of Flash: None

		PL0	PL1	PL2	PL3	PL4	PL5	PL6	PL7	PL8
0	CL		80	130	130					
1	A		0	0	0					
2	B		35	50	55					
3	C		45	65	70					
4	D		70	115	115					
5	E									
6	F									
7	G									
8	R-									
9	R+									
10	Y-		51	71	71					
11	Y+	C								
12	Z-									
13	Z+									
14	Q-		65	85	90					
15	Q+									
16										
17										

NOTE: Stages with 1 second of phase time are skipped. Blank entries are default values equal to 0.
Except for an AWA controller, entries #8 to #15 (=254) and 'C' entry means continuous (=255).

							Timers		
Phase	**Direction**	**Min**	**Max**	**ECO**	**Amber**	**All Red**	**Gap**	**Hdwy**	**Waste**
A	Crooks	10.0	50.0		4.3	1.8	3.0	1.2	10.0
B	Crooks LT	3.0	15.0		4.3	1.8	3.0	1.2	10.0
C	Wattles	10.0	30.0		3.9	2.0	3.0	1.2	10.0
D	Wattles LT	3.0	15.0		3.9	2.0	3.0	1.2	10.0
E									
F									
G									

	Day	Hours	Plan#
SC1	14	0:00	1
SC2	8	6:00	2
SC3	8	9:00	1
SC4	8	15:00	3
SC5	8	19:00	1
SC6			
SC7			
SC8			
SC9			
SC10			

Pedestrian Crossing Times

Direction	Walk	CL 1	CL 2
NB Crooks Ped East (Ped 2)	7.0	13.0	3.1
WB Wattles Ped North (Ped 4)	7.0	16.0	2.9
SB Crooks Ped West (Ped 6)	7.0	13.0	3.1
EB Wattles Ped South (Ped 8)	7.0	16.0	2.9

TSM15 = Opticom Min Alarm Time = 10
TSM16 = Opticom Max Alarm Time = 200

Normal Operating Mode

Isolated	Flexilink	Masterlink	Master Isolated	Flexi Isolated
		X		

DAY OF WEEK CODE NUMBER

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

TS2 Autoscope AIS-IV Cameras

CO#406 - CROOKS & WATTLES

Camera #	Rack Select Switch Position / Detector BIU	Input/Output LED	Description	Detector Number on Print	Phase
1	1	1	WB WATTLES LT	1	7
1	1	2	WB WATTLES THRU	2	4
1	1	3	WB WATTLES RT	3	4
2	1	4	SB CROOKS LT	4	1
2	1	5	SB CROOKS L	5	6
2	1	6	SB CROOKS R	6	6
2	1	7	SB CROOKS RT	7	6
3	1	8	EB WATTLES LT	8	3
3	1	9	EB WATTLES THRU	9	8
3	1	10	EB WATTLES RT	10	8
4	1	11	NB CROOKS LT	11	5
4	1	12	NB CROOKS L	12	2
4	1	13	NB CROOKS R	13	2
4	1	14	NB CROOKS RT	14	2
	1	15		15	
	1	16		16	
	2	17		17	
	2	18		18	
	2	19		19	
	2	20		20	
	2	21		21	
	2	22		22	
	2	23		23	
	2	24		24	

Input / Output Indicators

TS2 Rack Select Switch Position 1 - Detectors 1-16
TS2 Rack Select Switch Position 2 - Detectors 17-32
TS2 Rack Select Switch Position 3 - Detectors 33-48
TS2 Rack Select Switch Position 4 - Detectors 49-64
TS2 Rack Select Switch Position 5 - Red Phases
TS2 Rack Select Switch Position 6 - Green Phases
TS2 Rack Select Switch Position 7-10 - All OFF

MVP Status LEDs

TS2 Rack Select Switch Position 1-7 - Cameras 1-4
TS2 Rack Select Switch Position 8 - Cameras 5-8
TS2 Rack Select Switch Position 9-10 - NOT USED

AutoScope Detection Camera - IP Port Worksheet

Site: 406 **Crooks & Wattles**

WWAN IP: 10.32.144.232

AutoScope Property Editor // Communications Tab

	Camera #1	Camera #2	Camera #3	Camera #4
Network Address:	10.32.56.228	10.32.56.229	10.32.56.230	10.32.56.231
Subnet Mask:	255.255.255.240	255.255.255.240	255.255.255.240	255.255.255.240
Default Gateway:	10.32.56.225	10.32.56.225	10.32.56.225	10.32.56.225

AutoScope Property Editor // Advanced Comm Tab

Supervisor IP Port (54321):	56011	56021	56031	56041
Detector IP Port (54322):	56012	56022	56032	56042
Video Streaming IP Port (554):	56013	56023	56033	56043
Web IP Port (80):	56014	56024	56034	56044
Traffic Data IP Port (54323):	56015	56025	56035	56045

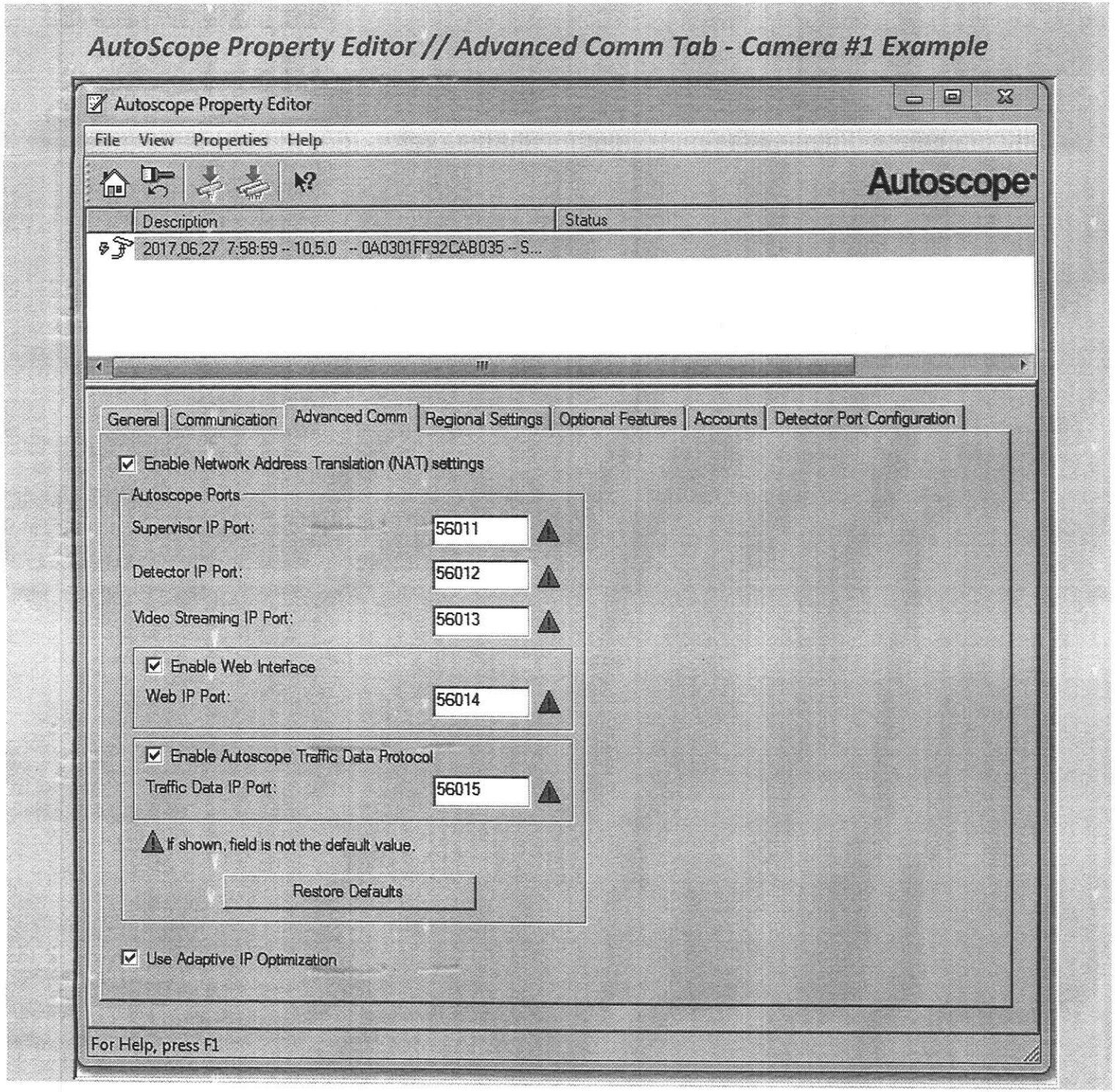
AutoScope Property Editor // Communications Tab

	Camera #5	Camera #6	Camera #7	Camera #8
Network Address:	10.32.56.232	10.32.56.233	10.32.56.234	10.32.56.235
Subnet Mask:	255.255.255.240	255.255.255.240	255.255.255.240	255.255.255.240
Default Gateway:	10.32.56.225	10.32.56.225	10.32.56.225	10.32.56.225

AutoScope Property Editor // Advanced Comm Tab

Supervisor IP Port (54321):	56051	56061	56071	56081
Detector IP Port (54322):	56052	56062	56072	56082
Video Streaming IP Port (554):	56053	56063	56073	56083
Web IP Port (80):	56054	56064	56074	56084
Traffic Data IP Port (54323):	56055	56065	56075	56085

AutoScope Property Editor // Advanced Comm Tab - Camera #1 Example



NOTES:

1. ALL PEDESTRIAN SIGNALS ON THIS PROJECT SHALL BE COUNTDOWN TYPE.
2. INSTALL 1-1 1/4" D.B. CONDUIT FROM NEW SUPPORT POST TO HANDHOLE FOR GROUND WIRE.
3. EXACT LOCATION FOR SUPPORT POSTS SHALL BE DETERMINED BY THE ENGINEER
4. EXISTING PHONE LINE SHALL BE MAINTAINED BY THE CONTRACTOR CONTINUOUSLY. (INCLUDED IN INSTALLATION OF THE T.S. ON THIS CONTRACT)

LIST OF MATERIALS

NO.	ITEM	QUANTITIES
(1)	TS, Pedestrian, One Way Pedestal Mtd (LED) Countdown	1 Ea
(2)	TS, Pedestrian, One Way Bracket Arm Mtd (LED) Countdown	1 Ea
(3)	TS, Pedestrian, Two Way Bracket Arm Mtd (LED) Countdown	3 Ea
(4)	Pushbutton Support Post	8 Ea
(5)	Pushbutton and Sign, RCOC	8 Ea
(6)	Hh, Square, RCOC	1 Ea
(7)	Hh, Round	2 Ea
Conduit, DB, 1, 1 1/4 inch		180 Ft
Conduit, DB, 1, 3 inch		30 Ft
Wood Pole, Fit Up, TS Cable Pole		1 Ea

✳ ALL SPAN WIRE POLE CONTACT HEIGHTS SHALL BE COORDINATED WITH THE FIELD ENGINEER SO THAT A MINIMUM 17FT. UNDERCLEARANCE IS MAINTAINED. (INCLUDED IN THE INSTALLATION OF SPAN WIRE, BOX ON THIS CONTRACT.)

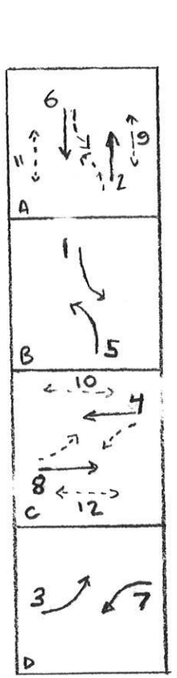
APPROACH SPEEDS:

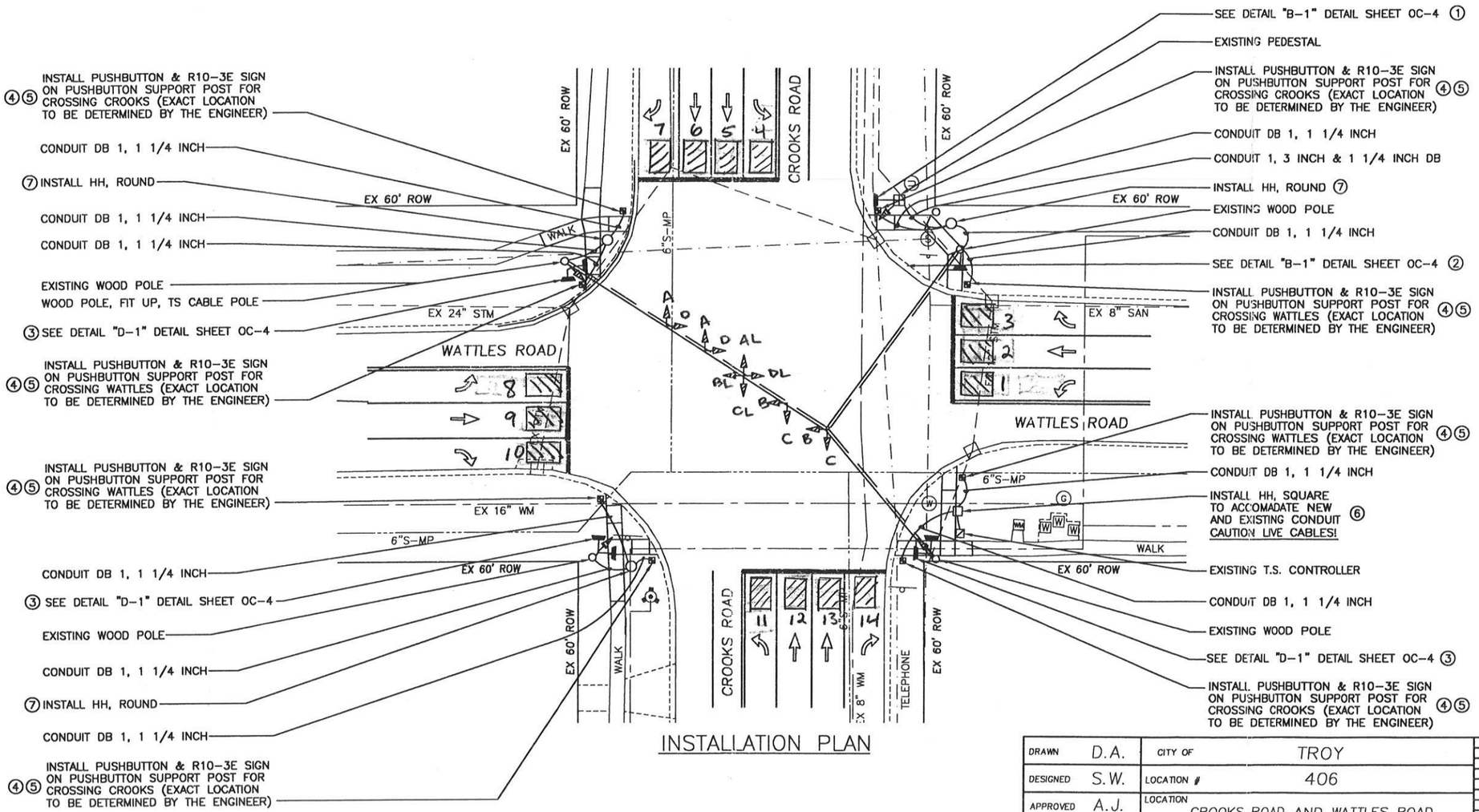
N.BD. 45 MPH
S.BD. 45 MPH
E.BD. 40 MPH
W.BD. 40 MPH

Know what's below. Call before you dig.

N

SCALE 1"=30'





INSTALLATION PLAN

SCALE 1"=20' 22"x34"
SCALE 1"=40' 11"x17"

DRAWN D.A.	CITY OF TROY		TRAFFIC-SAFETY DEPARTMENT
DESIGNED S.W.	LOCATION # 406		
APPROVED A.J.	LOCATION CROOKS ROAD AND WATTLES ROAD	DATE	REVISION

ROAD COMMISSION FOR OAKLAND COUNTY Beverly Hills, Michigan	DATE	PROJECT NO.	PROJECT NAME	SHEET NO.	TOTAL SHEETS
	5/27/11	50671	CROOKS ROAD	44	53

CONTROL SECTION STU 63459
MDOT JOB NO. 113807A

PROJECT NO. 50671 PROJECT NAME: CROOKS ROAD
SQUAD NO. SQUAD 3

T:\SQUAD 3\50671 - CROOKS (BANMOOR TO FOUNTAIN)\PLAN SETS\50671 TOC FINAL May. 24, 11 - 2:11 PM

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Troy

500 W Big Beaver Rd
Troy, MI 48084-5285
http://troymi.gov/

SEMCOG MEMBER

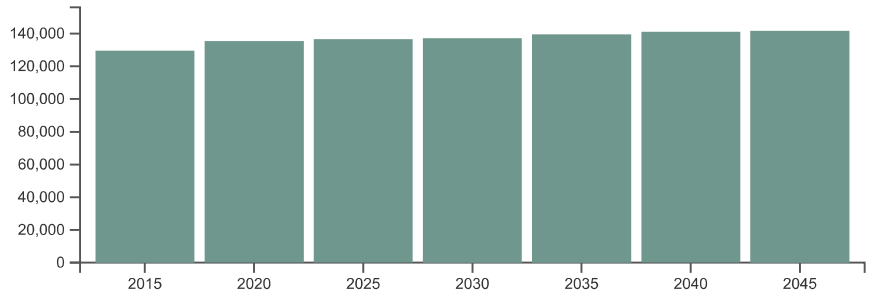
Census 2020 Population: 87,294
Area: 33.6 square miles

VIEW COMMUNITY EXPLORER MAP VIEW 2020 CENSUS MAP

Economy & Jobs

Link to American Community Survey (ACS) Profiles: **Select a Year** 2019 **Economic**

Forecasted Jobs



Source: **SEMCOG 2045 Regional Development Forecast**

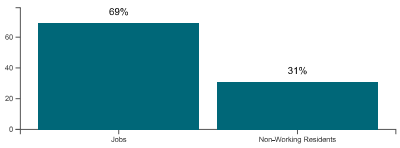
Forecasted Jobs by Industry Sector

Forecasted Jobs By Industry Sector	2015	2020	2025	2030	2035	2040	2045	Change 2015-2045	Pct Change 2015-2045
Natural Resources, Mining, & Construction	3,382	3,866	3,674	3,615	3,660	3,707	3,757	375	11.1%
Manufacturing	9,741	9,087	8,502	7,859	7,446	7,092	6,706	-3,035	-31.2%
Wholesale Trade	7,343	7,575	7,563	7,479	7,479	7,471	7,420	77	1%
Retail Trade	13,170	13,211	13,196	12,790	12,650	12,321	12,029	-1,141	-8.7%
Transportation, Warehousing, & Utilities	2,005	1,924	1,904	1,878	1,890	1,920	1,934	-71	-3.5%
Information & Financial Activities	20,010	19,620	19,939	20,138	20,688	21,117	21,399	1,389	6.9%
Professional and Technical Services & Corporate HQ	28,941	32,973	33,905	35,412	36,643	37,167	37,528	8,587	29.7%
Administrative, Support, & Waste Services	11,811	12,183	12,339	12,407	12,679	12,959	13,130	1,319	11.2%
Education Services	4,279	4,483	4,477	4,466	4,539	4,600	4,655	376	8.8%
Healthcare Services	13,239	14,096	14,543	14,751	15,424	16,202	16,758	3,519	26.6%
Leisure & Hospitality	8,640	9,167	9,494	9,454	9,550	9,586	9,644	1,004	11.6%
Other Services	5,269	5,380	5,253	5,154	5,139	5,104	5,034	-235	-4.5%
Public Administration	1,812	1,830	1,825	1,810	1,805	1,804	1,796	-16	-0.9%
Total Employment Numbers	129,642	135,395	136,614	137,213	139,592	141,050	141,790	12,148	9.4%

Source: **SEMCOG 2045 Regional Development Forecast**

Daytime Population

Daytime Population	ACS 2016
Jobs	94,365
Non-Working Residents	42,007
Age 15 and under	15,653
Not in labor force	24,045
Unemployed	2,309
Daytime Population	136,372



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

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

SEMCOG | Southeast Michigan Council of Governments

Community Profiles

YOU ARE VIEWING DATA FOR:

City of Troy

500 W Big Beaver Rd
Troy, MI 48084-5285
http://troymi.gov/

SEMCOG MEMBER

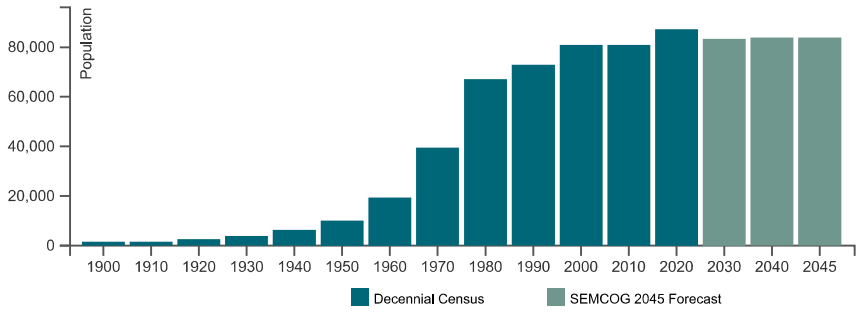
Census 2020 Population: 87,294
Area: 33.6 square miles

VIEW COMMUNITY EXPLORER MAP VIEW 2020 CENSUS MAP

Population and Households

Link to American Community Survey (ACS) Profiles: **Select a Year** 2019 **Social** | **Demographic**

Population Forecast



Note for City of Troy : Incorporated as of the 1960 Census from Troy Township. Population numbers prior to 1960 are of the township.

Population and Households

Population and Households	Census 2020	Census 2010	Change 2010-2020	Pct Change 2010-2020	SEMCOG 2045
Total Population	87,294	80,980	6,314	7.8%	83,911
Group Quarters Population	510	310	200	64.5%	1,498
Household Population	86,784	80,670	6,114	7.6%	82,413
Housing Units	34,488	32,907	1,581	4.8%	-
Households (Occupied Units)	32,961	30,703	2,258	7.4%	33,400
Residential Vacancy Rate	4.4%	6.7%	-2.3%	-	-
Average Household Size	2.63	2.63	0.01	-	2.47

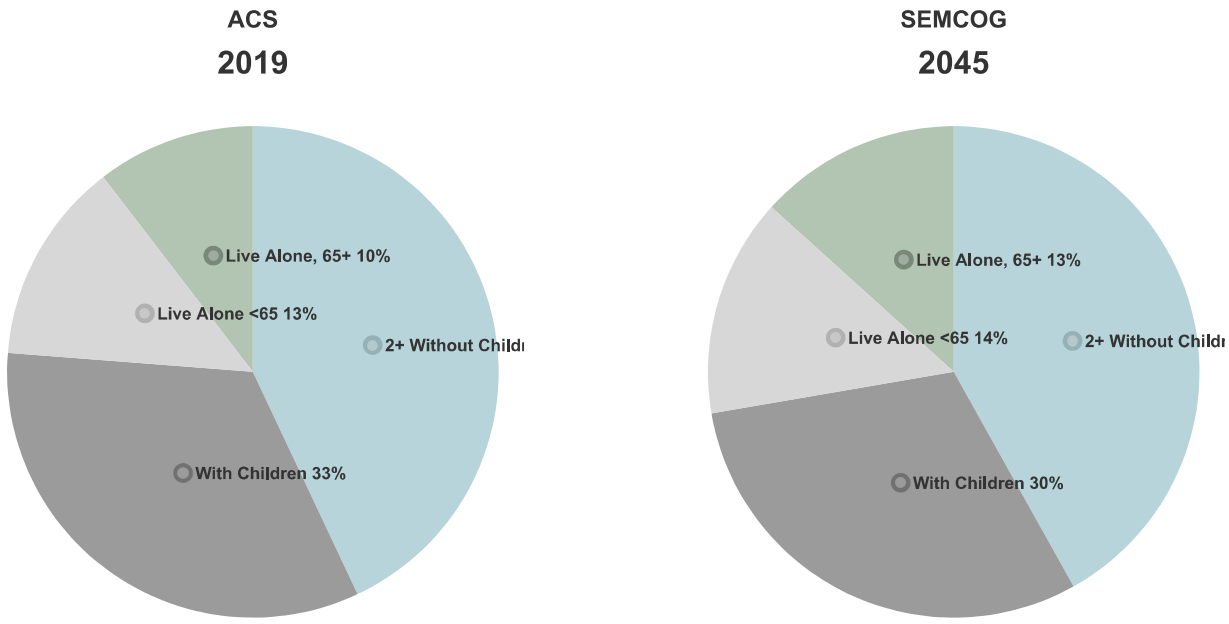
Source: **U.S. Census Bureau** and **SEMCOG 2045 Regional Development Forecast**

Components of Population Change

Components of Population Change	2000-2005 Avg.	2006-2010 Avg.	2011-2018 Avg.
Natural Increase (Births - Deaths)	455	281	251
Births	1,045	782	805
Deaths	590	501	554
Net Migration (Movement In - Movement Out)	-572	-160	325
Population Change (Natural Increase + Net Migration)	-117	121	576

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

Household Types



SEMCOG | Southeast Michigan Council of Governments

Crash and Road Data

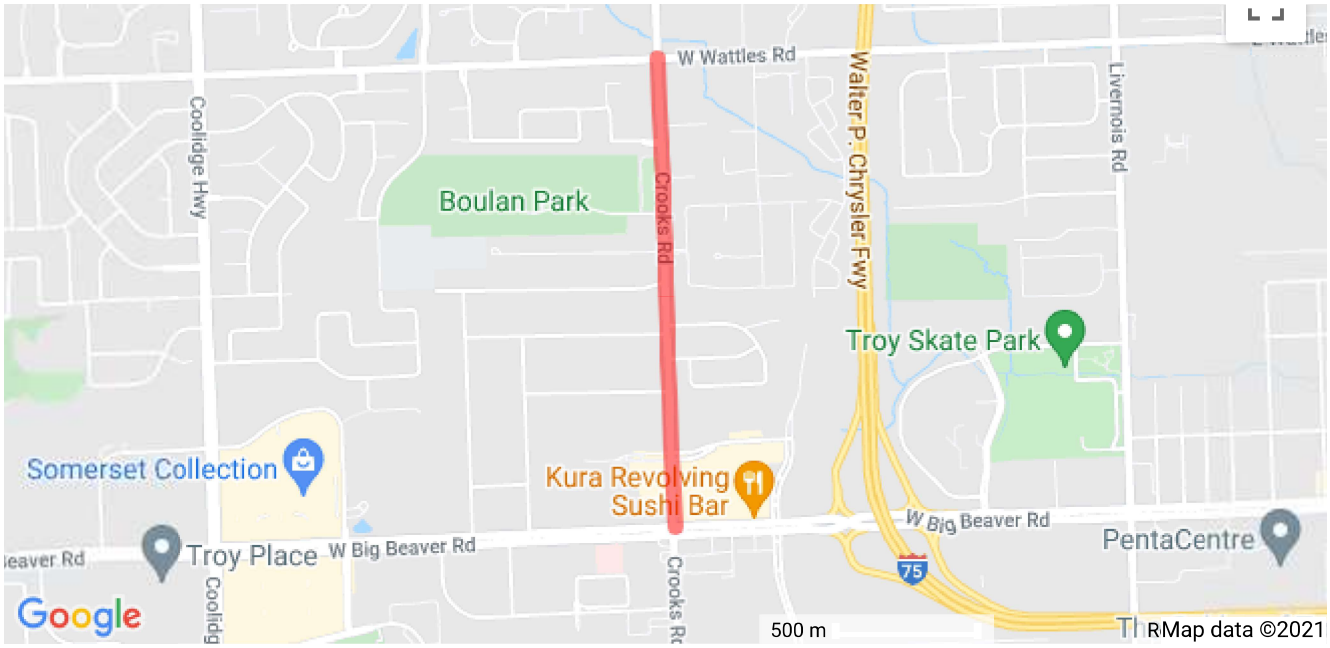
Road Segment Report

Crooks Rd, (PR Number 659810)

From:	Big Beaver Rd W 4.714 BMP
To:	Wattles Rd W 5.733 EMP
FALINK ID:	2268
Community:	City of Troy
County:	Oakland
Functional Class:	3 - Other Principal Arterial
Direction:	1 Way
Length:	1.019 miles
Number of Lanes:	5
Posted Speed:	45 (source: TCO)
Route Classification:	I-696 / M-5 Connector
Annual Crash Average 2016-2020:	35
Traffic Volume (2016)*:	25,400 (Observed AADT)
Pavement Type (2019):	Asphalt
Pavement Rating (2019):	Fair
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

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

Street View


W Wattles Rd
Coolidge Hwy
Boulan Park
Crooks Rd
Walter P. Chrysler Fwy
Livernois Rd
Troy Skate Park
Somerset Collection
Kura Revolving Sushi Bar
W Big Beaver Rd
Troy Place
PentaCentre
75
Google
500 m
Map data ©2021

SEMCOG | Southeast Michigan Council of Governments

Crash and Road Data

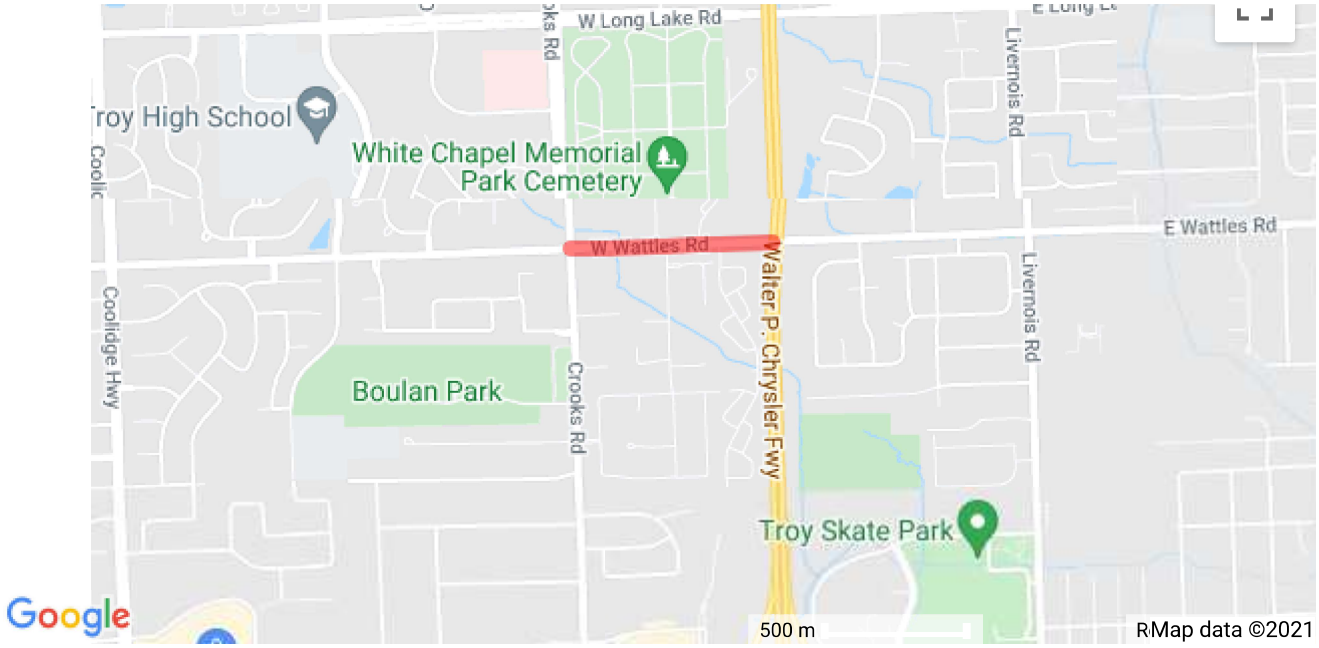
Road Segment Report

Wattles Rd W, (PR Number 618802)

From:	Crooks Rd 2.894 BMP
To:	S I 75 3.337 EMP
FALINK ID:	417
Community:	City of Troy
County:	Oakland
Functional Class:	4 - Minor Arterial
Direction:	1 Way
Length:	0.443 miles
Number of Lanes:	2
Posted Speed:	45 (source: TCO)
Route Classification:	M-1
Annual Crash Average 2016-2020:	4
Traffic Volume (2016)*:	13,400 (Observed AADT)
Pavement Type (2019):	Asphalt
Pavement Rating (2019):	Fair
Short Range (TIP) Projects:	No TIP projects for this segment.
Long Range (RTP) Projects:	No long-range projects for this segment.

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

Street View


W Long Lake Rd
Troy High School
White Chapel Memorial Park Cemetery
W Wattles Rd
E Wattles Rd
Livernois Rd
Coolidge Hwy
Boulan Park
Crooks Rd
Walter P. Chrysler Fwy
Troy Skate Park
Google
500 m
Map data ©2021

Appendix B

EXISTING TRAFFIC CONDITIONS

Level of Service Criteria for Stop Sign Controlled Intersections

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

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

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

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

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

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

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

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

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

Level of Service for Signalized Intersections

Level of service for signalized intersections is defined in terms of delay, which is a measure of driver discomfort and frustration, fuel consumption, and lost travel time. LOS can be characterized for the entire intersection, each intersection approach, and each lane group. Specifically, level-of-service (LOS) criteria are stated in terms of the average stopped delay per vehicle. The criteria are given in Exhibit 19-8. Delay may be measured in the field or estimated using procedures presented later in this chapter. Delay is a complex measure and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group in question.

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

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

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

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

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

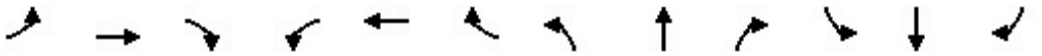
LOS C describes operations with control delay between 20 and 35 s/veh. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e. one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle)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

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

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

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

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	128	311	175	282	378	150	101	786	118	141	1008	114
Future Volume (veh/h)	128	311	175	282	378	150	101	786	118	141	1008	114
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	142	346	194	324	434	172	116	903	136	148	1061	120
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	0	0	0
Cap, veh/h	248	379	321	353	485	411	312	1302	581	373	1371	611
Arrive On Green	0.10	0.19	0.19	0.15	0.24	0.24	0.11	0.35	0.35	0.13	0.36	0.36
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1890	3770	1682	1905	3800	1695
Grp Volume(v), veh/h	142	346	194	324	434	172	116	903	136	148	1061	120
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1890	1885	1682	1905	1900	1695
Q Serve(g_s), s	5.3	22.0	13.6	17.7	27.3	11.1	0.1	26.8	7.5	0.0	32.2	6.3
Cycle Q Clear(g_c), s	5.3	22.0	13.6	17.7	27.3	11.1	0.1	26.8	7.5	0.0	32.2	6.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	248	379	321	353	485	411	312	1302	581	373	1371	611
V/C Ratio(X)	0.57	0.91	0.60	0.92	0.90	0.42	0.37	0.69	0.23	0.40	0.77	0.20
Avail Cap(c_a), veh/h	248	402	340	412	602	510	312	1302	581	373	1371	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.8	51.6	48.2	52.3	47.7	41.5	48.8	36.6	30.3	44.9	36.8	28.6
Incr Delay (d2), s/veh	3.1	24.2	2.8	23.1	13.8	0.7	0.7	3.1	0.9	0.7	4.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	13.4	5.9	12.4	15.2	4.7	3.4	12.5	3.2	4.2	15.2	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.0	75.9	51.0	75.4	61.5	42.2	49.6	39.7	31.2	45.6	41.2	29.3
LnGrp LOS	E	E	D	E	E	D	D	D	C	D	D	C
Approach Vol, veh/h		682			930			1155			1329	
Approach Delay, s/veh		64.9			62.8			39.7			40.6	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.5	51.0	26.0	30.5	20.5	53.0	19.1	37.4
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 11	* 45	24.1	26.1	* 8.9	* 47	11.1	39.1
Max Q Clear Time (g_c+I1), s	2.0	28.8	19.7	24.0	2.1	34.2	7.3	29.3
Green Ext Time (p_c), s	0.2	5.7	0.4	0.6	0.1	5.9	0.1	2.2

Intersection Summary	
HCM 6th Ctrl Delay	49.4
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	7	998	10	3	1462
Future Vol, veh/h	11	7	998	10	3	1462
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	87	87	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	15	10	1147	11	3	1624

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1971	579	0	0	1158	0
Stage 1	1153	-	-	-	-	-
Stage 2	818	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.34	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.12	-
Pot Cap-1 Maneuver	*521	397	-	-	328	-
Stage 1	*202	-	-	-	-	-
Stage 2	*561	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*472	397	-	-	328	-
Mov Cap-2 Maneuver	*469	-	-	-	-	-
Stage 1	*202	-	-	-	-	-
Stage 2	*508	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	438	328	-
HCM Lane V/C Ratio	-	-	0.057	0.01	-
HCM Control Delay (s)	-	-	13.7	16.1	0.8
HCM Lane LOS	-	-	B	C	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

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

Intersection	
Int Delay, s/veh	0

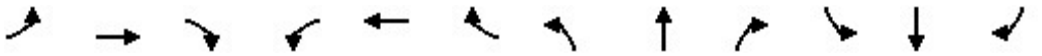
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	0	1008	0	1	1472
Future Vol, veh/h	1	0	1008	0	1	1472
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	2	0	1072	0	1	1636

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1892	536	0	0	1072	0
Stage 1	1072	-	-	-	-	-
Stage 2	820	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.22	-
Pot Cap-1 Maneuver	*213	494	-	-	646	-
Stage 1	*294	-	-	-	-	-
Stage 2	*464	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*213	494	-	-	646	-
Mov Cap-2 Maneuver	*250	-	-	-	-	-
Stage 1	*294	-	-	-	-	-
Stage 2	*463	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.5	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	250	646	-
HCM Lane V/C Ratio	-	-	0.007	0.002	-
HCM Control Delay (s)	-	-	19.5	10.6	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0	0	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	184	368	107	186	351	113	159	1150	223	265	929	80
Future Volume (veh/h)	184	368	107	186	351	113	159	1150	223	265	929	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	198	396	115	196	369	119	169	1223	237	294	1032	89
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	249	424	359	225	413	350	384	1283	572	409	1429	638
Arrive On Green	0.09	0.21	0.21	0.08	0.21	0.21	0.14	0.34	0.34	0.18	0.38	0.38
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1905	3800	1695	1905	3800	1695
Grp Volume(v), veh/h	198	396	115	196	369	119	169	1223	237	294	1032	89
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1905	1900	1695	1905	1900	1695
Q Serve(g_s), s	7.6	25.3	7.5	8.6	23.3	7.8	2.7	40.9	14.0	14.4	30.2	4.5
Cycle Q Clear(g_c), s	7.6	25.3	7.5	8.6	23.3	7.8	2.7	40.9	14.0	14.4	30.2	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	249	424	359	225	413	350	384	1283	572	409	1429	638
V/C Ratio(X)	0.80	0.93	0.32	0.87	0.89	0.34	0.44	0.95	0.41	0.72	0.72	0.14
Avail Cap(c_a), veh/h	249	432	366	287	509	432	384	1283	572	409	1429	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.7	50.4	43.3	57.1	50.2	44.0	45.7	42.0	33.1	47.8	34.7	26.7
Incr Delay (d2), s/veh	16.2	27.4	0.5	20.2	15.6	0.6	0.8	16.1	2.2	6.0	3.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.3	15.6	3.1	7.5	13.3	3.3	4.8	21.2	6.0	9.3	14.1	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	71.9	77.7	43.8	77.3	65.8	44.6	46.5	58.2	35.4	53.8	37.9	27.2
LnGrp LOS	E	E	D	E	E	D	D	E	D	D	D	C
Approach Vol, veh/h		709			684			1629			1415	
Approach Delay, s/veh		70.6			65.4			53.7			40.5	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.8	50.0	16.7	33.4	24.8	55.0	17.4	32.8
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 19	* 44	15.1	28.1	* 14	* 49	10.1	33.1
Max Q Clear Time (g_c+I1), s	16.4	42.9	10.6	27.3	4.7	32.2	9.6	25.3
Green Ext Time (p_c), s	0.2	0.8	0.2	0.2	0.3	6.5	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	54.0
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	16	1516	14	1	1221
Future Vol, veh/h	3	16	1516	14	1	1221
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	90	90	88	89
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	5	26	1684	16	1	1372

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2380	850	0	0	1700	0
Stage 1	1692	-	-	-	-	-
Stage 2	688	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.32	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.11	-
Pot Cap-1 Maneuver	*140	264	-	-	179	-
Stage 1	*93	-	-	-	-	-
Stage 2	*628	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*136	264	-	-	179	-
Mov Cap-2 Maneuver	*81	-	-	-	-	-
Stage 1	*93	-	-	-	-	-
Stage 2	*614	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.9	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	195	179	-
HCM Lane V/C Ratio	-	-	0.157	0.006	-
HCM Control Delay (s)	-	-	26.9	25.2	0.3
HCM Lane LOS	-	-	D	D	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

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

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	1	1529	2	2	1222
Future Vol, veh/h	2	1	1529	2	2	1222
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	89	89	87	87
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	3	2	1718	2	2	1405

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2426	860	0	0	1720	0
Stage 1	1719	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.12	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.21	-
Pot Cap-1 Maneuver	*32	303	-	-	368	-
Stage 1	*133	-	-	-	-	-
Stage 2	*553	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*32	303	-	-	368	-
Mov Cap-2 Maneuver	*106	-	-	-	-	-
Stage 1	*133	-	-	-	-	-
Stage 2	*551	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	32.7	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	135	368	-
HCM Lane V/C Ratio	-	-	0.037	0.006	-
HCM Control Delay (s)	-	-	32.7	14.8	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

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

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	224	341	122	351	334	82	134	116	128	89	324	503
Average Queue (ft)	104	226	56	199	235	30	87	110	102	39	114	267
95th Queue (ft)	192	328	111	302	339	61	147	117	126	79	214	407
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)							26	43	19	0		
Queuing Penalty (veh)							66	109	48	1		
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)												0
Queuing Penalty (veh)												0

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	372	185
Average Queue (ft)	233	88
95th Queue (ft)	354	215
Link Distance (ft)	850	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)	28	
Queuing Penalty (veh)	32	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	LT	T
Maximum Queue (ft)	52	118	215	198	99	82
Average Queue (ft)	13	27	155	106	14	6
95th Queue (ft)	43	91	221	192	65	40
Link Distance (ft)	261	512	512	512	86	86
Upstream Blk Time (%)					1	0
Queuing Penalty (veh)					5	1
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Crooks Road & Barilane Drive

Movement	WB	SB	SB
Directions Served	LR	T	T
Maximum Queue (ft)	31	52	65
Average Queue (ft)	4	6	3
95th Queue (ft)	20	31	24
Link Distance (ft)	446	25	25
Upstream Blk Time (%)		0	0
Queuing Penalty (veh)		0	1
Storage Bay Dist (ft)			
Storage Blk Time (%)		0	
Queuing Penalty (veh)		0	

Zone Summary

Zone wide Queuing Penalty: 263

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	525	1112	795	380	409	127	148	135	120	111	413	448
Average Queue (ft)	365	651	251	168	265	37	105	117	111	73	309	246
95th Queue (ft)	632	1118	807	330	404	84	138	130	120	119	407	378
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)		1		0	2		46	62	57	11		
Queuing Penalty (veh)		0		0	7		180	239	219	43		
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)	0	38		0	2							
Queuing Penalty (veh)	1	107		0	4							

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	419	185
Average Queue (ft)	237	73
95th Queue (ft)	391	205
Link Distance (ft)	850	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)	29	
Queuing Penalty (veh)	23	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	TR	LT	T
Maximum Queue (ft)	276	290	563	558	335	55	56
Average Queue (ft)	110	75	393	362	82	3	2
95th Queue (ft)	280	201	564	555	317	20	19
Link Distance (ft)	261	512	512	512		86	86
Upstream Blk Time (%)	13		3	2			
Queuing Penalty (veh)	0		18	12			
Storage Bay Dist (ft)					245		
Storage Blk Time (%)				21			
Queuing Penalty (veh)				85			

Intersection: 3: Crooks Road & Barilane Drive

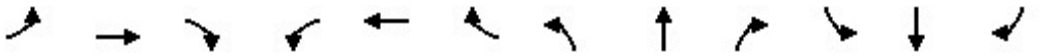
Movement	WB	NB	NB	SB	SB	SB
Directions Served	LR	T	TR	L	T	T
Maximum Queue (ft)	52	462	481	24	31	47
Average Queue (ft)	11	66	93	3	4	3
95th Queue (ft)	35	328	395	15	21	19
Link Distance (ft)	446	447	447		25	25
Upstream Blk Time (%)		3	3	2	0	0
Queuing Penalty (veh)		0	0	0	1	0
Storage Bay Dist (ft)				500		
Storage Blk Time (%)				2	0	
Queuing Penalty (veh)				9	0	

Zone Summary

Zone wide Queuing Penalty: 950

Appendix C

BACKGROUND TRAFFIC CONDITIONS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	129	314	177	285	382	152	102	794	119	142	1018	115
Future Volume (veh/h)	129	314	177	285	382	152	102	794	119	142	1018	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	143	349	197	328	439	175	117	913	137	149	1072	121
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	0	0	0
Cap, veh/h	250	381	323	357	489	415	303	1302	581	364	1371	611
Arrive On Green	0.10	0.19	0.19	0.16	0.24	0.24	0.11	0.35	0.35	0.12	0.36	0.36
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1890	3770	1682	1905	3800	1695
Grp Volume(v), veh/h	143	349	197	328	439	175	117	913	137	149	1072	121
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1890	1885	1682	1905	1900	1695
Q Serve(g_s), s	5.4	22.2	13.8	18.0	27.6	11.3	0.3	27.2	7.5	0.1	32.7	6.4
Cycle Q Clear(g_c), s	5.4	22.2	13.8	18.0	27.6	11.3	0.3	27.2	7.5	0.1	32.7	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	250	381	323	357	489	415	303	1302	581	364	1371	611
V/C Ratio(X)	0.57	0.92	0.61	0.92	0.90	0.42	0.39	0.70	0.24	0.41	0.78	0.20
Avail Cap(c_a), veh/h	250	402	340	412	602	510	303	1302	581	364	1371	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	53.8	51.6	48.2	52.2	47.5	41.3	49.4	36.8	30.3	45.6	37.0	28.6
Incr Delay (d2), s/veh	3.1	24.7	2.9	23.6	14.1	0.7	0.8	3.2	1.0	0.7	4.5	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	13.6	6.0	12.6	15.4	4.7	3.4	12.7	3.2	4.3	15.4	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	56.8	76.3	51.1	75.8	61.6	42.0	50.2	39.9	31.3	46.3	41.5	29.3
LnGrp LOS	E	E	D	E	E	D	D	D	C	D	D	C
Approach Vol, veh/h		689			942			1167			1342	
Approach Delay, s/veh		65.0			62.9			39.9			40.9	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	22.1	51.0	26.2	30.7	20.1	53.0	19.2	37.7
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 11	* 45	24.1	26.1	* 8.9	* 47	11.1	39.1
Max Q Clear Time (g_c+I1), s	2.1	29.2	20.0	24.2	2.3	34.7	7.4	29.6
Green Ext Time (p_c), s	0.2	5.7	0.4	0.5	0.1	5.8	0.1	2.2

Intersection Summary	
HCM 6th Ctrl Delay	49.7
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	7	1008	10	3	1477
Future Vol, veh/h	11	7	1008	10	3	1477
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	87	87	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	15	10	1159	11	3	1641

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1992	585	0	0	1170	0
Stage 1	1165	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.34	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.12	-
Pot Cap-1 Maneuver	*498	393	-	-	324	-
Stage 1	*199	-	-	-	-	-
Stage 2	*561	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*446	393	-	-	324	-
Mov Cap-2 Maneuver	*473	-	-	-	-	-
Stage 1	*199	-	-	-	-	-
Stage 2	*502	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	438	324	-
HCM Lane V/C Ratio	-	-	0.057	0.01	-
HCM Control Delay (s)	-	-	13.7	16.2	0.8
HCM Lane LOS	-	-	B	C	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

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

Intersection	
Int Delay, s/veh	0

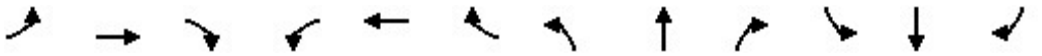
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	0	1018	0	1	1487
Future Vol, veh/h	1	0	1018	0	1	1487
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	2	0	1083	0	1	1652

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1911	542	0	0	1083	0
Stage 1	1083	-	-	-	-	-
Stage 2	828	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.22	-
Pot Cap-1 Maneuver	*228	490	-	-	640	-
Stage 1	*291	-	-	-	-	-
Stage 2	*442	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*227	490	-	-	640	-
Mov Cap-2 Maneuver	*252	-	-	-	-	-
Stage 1	*291	-	-	-	-	-
Stage 2	*441	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.4	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	252	640	-
HCM Lane V/C Ratio	-	-	0.007	0.002	-
HCM Control Delay (s)	-	-	19.4	10.6	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0	0	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	186	372	108	188	355	114	161	1161	225	268	938	81
Future Volume (veh/h)	186	372	108	188	355	114	161	1161	225	268	938	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	200	400	116	198	374	120	171	1235	239	298	1042	90
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	249	427	362	227	418	354	377	1283	572	403	1429	638
Arrive On Green	0.09	0.21	0.21	0.08	0.21	0.21	0.14	0.34	0.34	0.18	0.38	0.38
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1905	3800	1695	1905	3800	1695
Grp Volume(v), veh/h	200	400	116	198	374	120	171	1235	239	298	1042	90
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1905	1900	1695	1905	1900	1695
Q Serve(g_s), s	7.8	25.6	7.5	8.8	23.7	7.8	3.0	41.5	14.1	14.9	30.6	4.5
Cycle Q Clear(g_c), s	7.8	25.6	7.5	8.8	23.7	7.8	3.0	41.5	14.1	14.9	30.6	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	249	427	362	227	418	354	377	1283	572	403	1429	638
V/C Ratio(X)	0.80	0.94	0.32	0.87	0.90	0.34	0.45	0.96	0.42	0.74	0.73	0.14
Avail Cap(c_a), veh/h	249	432	366	288	509	432	377	1283	572	403	1429	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.8	50.3	43.2	57.0	50.0	43.8	46.2	42.2	33.2	48.3	34.9	26.7
Incr Delay (d2), s/veh	17.1	28.0	0.5	20.5	16.0	0.6	0.9	17.6	2.2	7.1	3.3	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.5	15.9	3.2	7.6	13.5	3.3	4.9	21.7	6.1	9.6	14.3	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.9	78.3	43.7	77.6	66.1	44.3	47.1	59.8	35.4	55.4	38.2	27.2
LnGrp LOS	E	E	D	E	E	D	D	E	D	E	D	C
Approach Vol, veh/h		716			692			1645			1430	
Approach Delay, s/veh		71.2			65.6			55.0			41.1	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.5	50.0	16.8	33.6	24.5	55.0	17.4	33.1
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 19	* 44	15.1	28.1	* 14	* 49	10.1	33.1
Max Q Clear Time (g_c+I1), s	16.9	43.5	10.8	27.6	5.0	32.6	9.8	25.7
Green Ext Time (p_c), s	0.2	0.4	0.2	0.2	0.3	6.5	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	54.8
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	0.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	16	1531	14	1	1233
Future Vol, veh/h	3	16	1531	14	1	1233
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	90	90	88	89
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	5	26	1701	16	1	1385

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2404	859	0	0	1717	0
Stage 1	1709	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.32	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.11	-
Pot Cap-1 Maneuver	*133	261	-	-	176	-
Stage 1	*90	-	-	-	-	-
Stage 2	*628	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*129	261	-	-	176	-
Mov Cap-2 Maneuver	*79	-	-	-	-	-
Stage 1	*90	-	-	-	-	-
Stage 2	*613	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	27.4	0	0.3
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	191	176	-
HCM Lane V/C Ratio	-	-	0.16	0.006	-
HCM Control Delay (s)	-	-	27.4	25.6	0.3
HCM Lane LOS	-	-	D	D	A
HCM 95th %tile Q(veh)	-	-	0.6	0	-

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

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	1	1544	2	2	1234
Future Vol, veh/h	2	1	1544	2	2	1234
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	89	89	87	87
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	3	2	1735	2	2	1418

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2449	869	0	0	1737	0
Stage 1	1736	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.12	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.21	-
Pot Cap-1 Maneuver	*30	299	-	-	363	-
Stage 1	*130	-	-	-	-	-
Stage 2	*553	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*29	299	-	-	363	-
Mov Cap-2 Maneuver	*104	-	-	-	-	-
Stage 1	*130	-	-	-	-	-
Stage 2	*550	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	133	363	-
HCM Lane V/C Ratio	-	-	0.038	0.006	-
HCM Control Delay (s)	-	-	33.1	15	-
HCM Lane LOS	-	-	D	B	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

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

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	267	342	229	355	303	156	137	130	128	84	198	367
Average Queue (ft)	125	220	61	206	219	45	84	111	92	32	112	245
95th Queue (ft)	235	315	140	320	302	103	145	120	125	57	178	345
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)							18	40	13	0		
Queuing Penalty (veh)							47	102	34	1		
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)												
Queuing Penalty (veh)												

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	301	185
Average Queue (ft)	206	77
95th Queue (ft)	309	204
Link Distance (ft)	850	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)	24	
Queuing Penalty (veh)	28	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	LT	T
Maximum Queue (ft)	52	210	227	198	73	80
Average Queue (ft)	13	22	145	99	5	3
95th Queue (ft)	39	105	225	205	34	27
Link Distance (ft)	261	512	512	512	86	86
Upstream Blk Time (%)					0	0
Queuing Penalty (veh)					0	0
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Crooks Road & Barilane Drive

Movement	SB	SB
Directions Served	T	T
Maximum Queue (ft)	52	59
Average Queue (ft)	8	8
95th Queue (ft)	35	38
Link Distance (ft)	25	25
Upstream Blk Time (%)	0	0
Queuing Penalty (veh)	0	1
Storage Bay Dist (ft)		
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Zone Summary

Zone wide Queuing Penalty: 214

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	344	413	83	380	413	104	140	135	133	112	525	813
Average Queue (ft)	198	273	37	138	247	46	108	117	114	75	485	487
95th Queue (ft)	347	421	76	272	399	93	142	128	124	124	577	824
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)				0	4		56	64	61	16		
Queuing Penalty (veh)				0	13		217	247	236	62		
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)				0	4						29	0
Queuing Penalty (veh)				0	8						132	1

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	741	185
Average Queue (ft)	390	83
95th Queue (ft)	720	213
Link Distance (ft)	850	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)	37	
Queuing Penalty (veh)	30	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	TR	LT	T
Maximum Queue (ft)	266	529	563	562	335	96	112
Average Queue (ft)	167	195	474	467	199	7	9
95th Queue (ft)	322	501	644	651	465	46	52
Link Distance (ft)	261	512	512	512		86	86
Upstream Blk Time (%)	42	2	18	14		0	0
Queuing Penalty (veh)	0	12	90	71		2	1
Storage Bay Dist (ft)					245		
Storage Blk Time (%)				43			
Queuing Penalty (veh)				170			

Intersection: 3: Crooks Road & Barilane Drive

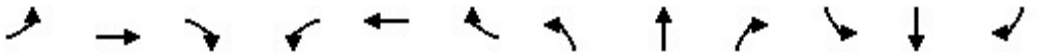
Movement	WB	NB	NB	SB	SB
Directions Served	LR	T	TR	L	T
Maximum Queue (ft)	31	481	477	24	47
Average Queue (ft)	3	287	305	1	3
95th Queue (ft)	17	658	664	10	20
Link Distance (ft)	446	447	447		25
Upstream Blk Time (%)		20	28	2	0
Queuing Penalty (veh)		0	0	0	0
Storage Bay Dist (ft)				500	
Storage Blk Time (%)				2	0
Queuing Penalty (veh)				13	0

Zone Summary

Zone wide Queuing Penalty: 1305

Appendix D

FUTURE TRAFFIC CONDITIONS



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	129	316	179	285	388	163	106	800	120	145	1020	115
Future Volume (veh/h)	129	316	179	285	388	163	106	800	120	145	1020	115
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	1984	1984	1984	2000	2000	2000
Adj Flow Rate, veh/h	143	351	199	328	446	187	122	920	138	153	1074	121
Peak Hour Factor	0.90	0.90	0.90	0.87	0.87	0.87	0.87	0.87	0.87	0.95	0.95	0.95
Percent Heavy Veh, %	0	0	0	0	0	0	1	1	1	0	0	0
Cap, veh/h	245	383	324	357	496	421	297	1273	568	370	1371	611
Arrive On Green	0.10	0.19	0.19	0.16	0.25	0.25	0.11	0.34	0.34	0.13	0.36	0.36
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1890	3770	1682	1905	3800	1695
Grp Volume(v), veh/h	143	351	199	328	446	187	122	920	138	153	1074	121
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1890	1885	1682	1905	1900	1695
Q Serve(g_s), s	5.4	22.4	14.0	18.0	28.1	12.1	1.0	27.8	7.7	0.8	32.7	6.4
Cycle Q Clear(g_c), s	5.4	22.4	14.0	18.0	28.1	12.1	1.0	27.8	7.7	0.8	32.7	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	245	383	324	357	496	421	297	1273	568	370	1371	611
V/C Ratio(X)	0.58	0.92	0.61	0.92	0.90	0.44	0.41	0.72	0.24	0.41	0.78	0.20
Avail Cap(c_a), veh/h	245	402	340	412	602	510	297	1273	568	370	1371	611
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	54.1	51.6	48.2	52.2	47.3	41.3	50.1	37.7	31.1	45.7	37.0	28.6
Incr Delay (d2), s/veh	3.5	25.0	3.0	23.6	14.5	0.7	0.9	3.6	1.0	0.7	4.5	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.6	13.7	6.1	12.6	15.7	5.1	3.6	13.0	3.3	4.3	15.5	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	57.5	76.6	51.2	75.8	61.8	42.0	51.0	41.3	32.1	46.5	41.6	29.3
LnGrp LOS	E	E	D	E	E	D	D	D	C	D	D	C
Approach Vol, veh/h		693			961			1180			1348	
Approach Delay, s/veh		65.3			62.7			41.2			41.0	
Approach LOS		E			E			D			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	23.0	50.0	26.3	30.8	20.0	53.0	18.9	38.2
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 12	* 44	24.1	26.1	* 8.9	* 47	11.1	39.1
Max Q Clear Time (g_c+I1), s	2.8	29.8	20.0	24.4	3.0	34.7	7.4	30.1
Green Ext Time (p_c), s	0.2	5.4	0.4	0.5	0.1	5.8	0.1	2.2

Intersection Summary	
HCM 6th Ctrl Delay	50.1
HCM 6th LOS	D

Notes

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

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	15	12	1014	12	5	1479
Future Vol, veh/h	15	12	1014	12	5	1479
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	87	87	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	21	17	1166	14	6	1643

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2007	590	0	0	1180	0
Stage 1	1173	-	-	-	-	-
Stage 2	834	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.34	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.12	-
Pot Cap-1 Maneuver	*483	390	-	-	320	-
Stage 1	*196	-	-	-	-	-
Stage 2	*561	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*379	390	-	-	320	-
Mov Cap-2 Maneuver	*429	-	-	-	-	-
Stage 1	*196	-	-	-	-	-
Stage 2	*440	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.6	0	1.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	411	320	-
HCM Lane V/C Ratio	-	-	0.091	0.017	-
HCM Control Delay (s)	-	-	14.6	16.4	1.8
HCM Lane LOS	-	-	B	C	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

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

Intersection	
Int Delay, s/veh	0

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	0	1025	0	1	1508
Future Vol, veh/h	1	0	1025	0	1	1508
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	94	94	90	90
Heavy Vehicles, %	0	0	4	4	2	2
Mvmt Flow	2	0	1090	0	1	1676

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1930	545	0	0	1090	0
Stage 1	1090	-	-	-	-	-
Stage 2	840	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.14	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.22	-
Pot Cap-1 Maneuver	*214	488	-	-	636	-
Stage 1	*288	-	-	-	-	-
Stage 2	*442	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*213	488	-	-	636	-
Mov Cap-2 Maneuver	*246	-	-	-	-	-
Stage 1	*288	-	-	-	-	-
Stage 2	*441	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	246	636	-
HCM Lane V/C Ratio	-	-	0.007	0.002	-
HCM Control Delay (s)	-	-	19.7	10.7	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0	0	-

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

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	17	6	1020	5	2	1492
Future Vol, veh/h	17	6	1020	5	2	1492
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	95	95
Heavy Vehicles, %	2	2	2	2	0	0
Mvmt Flow	18	7	1109	5	2	1571

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1902	557	0	0	1114	0
Stage 1	1112	-	-	-	-	-
Stage 2	790	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.1	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.2	-
Pot Cap-1 Maneuver	*233	474	-	-	634	-
Stage 1	*276	-	-	-	-	-
Stage 2	*439	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*232	474	-	-	634	-
Mov Cap-2 Maneuver	*245	-	-	-	-	-
Stage 1	*276	-	-	-	-	-
Stage 2	*438	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.1	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	280	634	-
HCM Lane V/C Ratio	-	-	0.089	0.003	-
HCM Control Delay (s)	-	-	19.1	10.7	-
HCM Lane LOS	-	-	C	B	-
HCM 95th %tile Q(veh)	-	-	0.3	0	-

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

Intersection	
Int Delay, s/veh	0.2

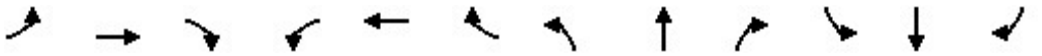
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	576	5	2	819	17	6
Future Vol, veh/h	576	5	2	819	17	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	87	87	92	92
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	640	6	2	941	18	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	646	0	1118	643
Stage 1	-	-	-	-	643	-
Stage 2	-	-	-	-	475	-
Critical Hdwy	-	-	4.1	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.2	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	*917	-	*573	*607
Stage 1	-	-	-	-	*573	-
Stage 2	-	-	-	-	*593	-
Platoon blocked, %	-	-	1	-	1	1
Mov Cap-1 Maneuver	-	-	*917	-	*572	*607
Mov Cap-2 Maneuver	-	-	-	-	*523	-
Stage 1	-	-	-	-	*573	-
Stage 2	-	-	-	-	*592	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	543	-	-	* 917	-
HCM Lane V/C Ratio	0.046	-	-	0.003	-
HCM Control Delay (s)	12	-	-	8.9	-
HCM Lane LOS	B	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

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



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	186	377	110	188	358	120	163	1165	226	278	944	81
Future Volume (veh/h)	186	377	110	188	358	120	163	1165	226	278	944	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
Adj Flow Rate, veh/h	200	405	118	198	377	126	173	1239	240	309	1049	90
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.94	0.94	0.94	0.90	0.90	0.90
Percent Heavy Veh, %	0	0	0	0	0	0	0	0	0	0	0	0
Cap, veh/h	250	430	365	227	421	357	371	1283	572	398	1429	638
Arrive On Green	0.09	0.22	0.22	0.08	0.21	0.21	0.14	0.34	0.34	0.18	0.38	0.38
Sat Flow, veh/h	1905	2000	1695	1905	2000	1695	1905	3800	1695	1905	3800	1695
Grp Volume(v), veh/h	200	405	118	198	377	126	173	1239	240	309	1049	90
Grp Sat Flow(s),veh/h/ln	1905	2000	1695	1905	2000	1695	1905	1900	1695	1905	1900	1695
Q Serve(g_s), s	7.8	25.9	7.6	8.8	23.8	8.2	3.3	41.7	14.2	15.9	30.9	4.5
Cycle Q Clear(g_c), s	7.8	25.9	7.6	8.8	23.8	8.2	3.3	41.7	14.2	15.9	30.9	4.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	250	430	365	227	421	357	371	1283	572	398	1429	638
V/C Ratio(X)	0.80	0.94	0.32	0.87	0.90	0.35	0.47	0.97	0.42	0.78	0.73	0.14
Avail Cap(c_a), veh/h	250	432	366	287	509	432	371	1283	572	398	1429	638
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	55.7	50.2	43.0	57.0	49.9	43.8	46.7	42.3	33.2	48.9	34.9	26.7
Incr Delay (d2), s/veh	16.5	28.9	0.5	20.7	16.2	0.6	0.9	18.1	2.3	9.4	3.4	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.4	16.1	3.2	7.6	13.6	3.5	5.0	21.9	6.1	10.3	14.4	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.1	79.1	43.5	77.7	66.2	44.4	47.6	60.4	35.5	58.3	38.3	27.2
LnGrp LOS	E	E	D	E	E	D	D	E	D	E	D	C
Approach Vol, veh/h		723			701			1652			1448	
Approach Delay, s/veh		71.4			65.5			55.5			41.9	
Approach LOS		E			E			E			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	29.2	50.0	16.9	33.9	24.2	55.0	17.5	33.2
Change Period (Y+Rc), s	* 6.1	* 6.1	5.9	5.9	* 6.1	* 6.1	5.9	5.9
Max Green Setting (Gmax), s	* 19	* 44	15.1	28.1	* 14	* 49	10.1	33.1
Max Q Clear Time (g_c+I1), s	17.9	43.7	10.8	27.9	5.3	32.9	9.8	25.8
Green Ext Time (p_c), s	0.1	0.2	0.2	0.1	0.3	6.5	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	55.2
HCM 6th LOS	E

Notes

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

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	5	20	1534	19	5	1237
Future Vol, veh/h	5	20	1534	19	5	1237
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	-	-	245	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	62	62	90	90	88	89
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	8	32	1704	21	6	1390

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2422	863	0	0	1725	0
Stage 1	1715	-	-	-	-	-
Stage 2	707	-	-	-	-	-
Critical Hdwy	6.25	7.1	-	-	5.32	-
Critical Hdwy Stg 1	6.6	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.65	3.9	-	-	3.11	-
Pot Cap-1 Maneuver	*128	259	-	-	174	-
Stage 1	*90	-	-	-	-	-
Stage 2	*628	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*109	259	-	-	174	-
Mov Cap-2 Maneuver	*81	-	-	-	-	-
Stage 1	*90	-	-	-	-	-
Stage 2	*533	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	30.7	0	2.1
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	180	174	-
HCM Lane V/C Ratio	-	-	0.224	0.033	-
HCM Control Delay (s)	-	-	30.7	26.4	2
HCM Lane LOS	-	-	D	D	A
HCM 95th %tile Q(veh)	-	-	0.8	0.1	-

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

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	1	1568	2	2	1247
Future Vol, veh/h	2	1	1568	2	2	1247
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	89	89	87	87
Heavy Vehicles, %	0	0	1	1	1	1
Mvmt Flow	3	2	1762	2	2	1433

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2484	882	0	0	1764	0
Stage 1	1763	-	-	-	-	-
Stage 2	721	-	-	-	-	-
Critical Hdwy	6.8	6.9	-	-	4.12	-
Critical Hdwy Stg 1	5.8	-	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.21	-
Pot Cap-1 Maneuver	*27	293	-	-	354	-
Stage 1	*126	-	-	-	-	-
Stage 2	*553	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*27	293	-	-	354	-
Mov Cap-2 Maneuver	*101	-	-	-	-	-
Stage 1	*126	-	-	-	-	-
Stage 2	*550	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	129	354	-
HCM Lane V/C Ratio	-	-	0.039	0.006	-
HCM Control Delay (s)	-	-	34	15.2	-
HCM Lane LOS	-	-	D	C	-
HCM 95th %tile Q(veh)	-	-	0.1	0	-

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

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	11	3	1550	19	4	1238
Future Vol, veh/h	11	3	1550	19	4	1238
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	-	-	-	500	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	90	90
Heavy Vehicles, %	2	2	2	2	0	0
Mvmt Flow	12	3	1685	21	4	1376

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	2392	853	0	0	1706	0
Stage 1	1696	-	-	-	-	-
Stage 2	696	-	-	-	-	-
Critical Hdwy	6.84	6.94	-	-	4.1	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	-	-	2.2	-
Pot Cap-1 Maneuver	*34	302	-	-	378	-
Stage 1	*134	-	-	-	-	-
Stage 2	*551	-	-	-	-	-
Platoon blocked, %	1		-	-		-
Mov Cap-1 Maneuver	*34	302	-	-	378	-
Mov Cap-2 Maneuver	*107	-	-	-	-	-
Stage 1	*134	-	-	-	-	-
Stage 2	*545	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	38.1	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	124	378	-
HCM Lane V/C Ratio	-	-	0.123	0.012	-
HCM Control Delay (s)	-	-	38.1	14.6	-
HCM Lane LOS	-	-	E	B	-
HCM 95th %tile Q(veh)	-	-	0.4	0	-

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

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	866	15	10	657	9	4
Future Vol, veh/h	866	15	10	657	9	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	500	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	95	95	92	92
Heavy Vehicles, %	0	0	0	0	2	2
Mvmt Flow	931	16	11	692	10	4

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	947	0	1307	939
Stage 1	-	-	-	-	939	-
Stage 2	-	-	-	-	368	-
Critical Hdwy	-	-	4.1	-	6.63	6.23
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.83	-
Follow-up Hdwy	-	-	2.2	-	3.519	3.319
Pot Cap-1 Maneuver	-	-	*561	-	*351	*372
Stage 1	-	-	-	-	*351	-
Stage 2	-	-	-	-	*671	-
Platoon blocked, %	-	-	1	-	1	1
Mov Cap-1 Maneuver	-	-	*561	-	*344	*372
Mov Cap-2 Maneuver	-	-	-	-	*320	-
Stage 1	-	-	-	-	*351	-
Stage 2	-	-	-	-	*658	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	16.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	334	-	-	* 561	-
HCM Lane V/C Ratio	0.042	-	-	0.019	-
HCM Control Delay (s)	16.3	-	-	11.5	-
HCM Lane LOS	C	-	-	B	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

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

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	184	395	149	380	418	101	154	133	127	67	241	422
Average Queue (ft)	94	232	68	206	237	35	101	110	97	33	119	285
95th Queue (ft)	153	356	122	347	369	71	154	126	135	60	201	408
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)				0	1		51	44	22	0		
Queuing Penalty (veh)				0	2		137	112	58	0		
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)				0	1							
Queuing Penalty (veh)				0	1							

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	376	185
Average Queue (ft)	260	79
95th Queue (ft)	372	208
Link Distance (ft)	850	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		110
Storage Blk Time (%)	30	
Queuing Penalty (veh)	34	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	LT	T
Maximum Queue (ft)	75	272	246	208	118	106
Average Queue (ft)	25	80	162	116	25	14
95th Queue (ft)	60	215	237	212	85	64
Link Distance (ft)	261	512	512	512	86	86
Upstream Blk Time (%)					1	0
Queuing Penalty (veh)					5	1
Storage Bay Dist (ft)						
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 3: Crooks Road & Barilane Drive

Movement	WB	SB	SB	SB
Directions Served	LR	L	T	T
Maximum Queue (ft)	30	24	65	47
Average Queue (ft)	1	1	13	5
95th Queue (ft)	10	8	50	28
Link Distance (ft)	446		25	25
Upstream Blk Time (%)		0	0	0
Queuing Penalty (veh)		0	1	1
Storage Bay Dist (ft)		500		
Storage Blk Time (%)		0	0	
Queuing Penalty (veh)		1	0	

Intersection: 4: Crooks Road & Site Drive (Hills West)

Movement	WB	NB	NB	SB	SB
Directions Served	LR	T	TR	L	T
Maximum Queue (ft)	51	28	28	30	36
Average Queue (ft)	20	1	0	1	1
95th Queue (ft)	44	9	0	10	12
Link Distance (ft)	451	25	25		512
Upstream Blk Time (%)		0	0		
Queuing Penalty (veh)		0	0		
Storage Bay Dist (ft)				200	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 5: Site Drive (Westington) & Wattles Road

Movement	WB	WB	NB
Directions Served	L	T	LR
Maximum Queue (ft)	29	51	31
Average Queue (ft)	1	3	16
95th Queue (ft)	10	21	40
Link Distance (ft)		1876	234
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	500		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 354

Intersection: 1: Crooks Road & Wattles Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T
Maximum Queue (ft)	525	1112	795	367	364	112	134	134	115	110	525	866
Average Queue (ft)	477	1112	617	145	201	38	110	113	109	70	454	659
95th Queue (ft)	705	1112	1136	252	313	82	143	123	117	113	636	1131
Link Distance (ft)		1097			380	380	86	86	86	86		850
Upstream Blk Time (%)		77		0	0		58	60	43	5		56
Queuing Penalty (veh)		0		0	0		229	231	164	20		0
Storage Bay Dist (ft)	500		645	500							500	
Storage Blk Time (%)	0	79		0	0						62	0
Queuing Penalty (veh)	0	233		0	0						290	0

Intersection: 1: Crooks Road & Wattles Road

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	865	185
Average Queue (ft)	619	94
95th Queue (ft)	1077	230
Link Distance (ft)	850	
Upstream Blk Time (%)	1	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		110
Storage Blk Time (%)	37	
Queuing Penalty (veh)	30	

Intersection: 2: Crooks Road & 7-11 Drive/Site Drive

Movement	WB	NB	NB	NB	NB	SB	SB
Directions Served	LR	T	T	T	TR	LT	T
Maximum Queue (ft)	276	261	429	417	334	120	142
Average Queue (ft)	125	88	295	267	13	17	15
95th Queue (ft)	289	220	400	364	113	78	78
Link Distance (ft)	261	512	512	512		86	86
Upstream Blk Time (%)	17					2	1
Queuing Penalty (veh)	0					11	5
Storage Bay Dist (ft)					245		
Storage Blk Time (%)				5			
Queuing Penalty (veh)				18			

Intersection: 3: Crooks Road & Barilane Drive

Movement	WB	SB	SB	SB
Directions Served	LR	L	T	T
Maximum Queue (ft)	31	24	54	28
Average Queue (ft)	7	3	6	2
95th Queue (ft)	27	15	31	13
Link Distance (ft)	446		25	25
Upstream Blk Time (%)		2	0	0
Queuing Penalty (veh)		0	1	0
Storage Bay Dist (ft)		500		
Storage Blk Time (%)		2	0	
Queuing Penalty (veh)		14	0	

Intersection: 4: Crooks Road & Site Drive (Hills West)

Movement	WB	NB	SB
Directions Served	LR	TR	L
Maximum Queue (ft)	51	56	68
Average Queue (ft)	17	9	6
95th Queue (ft)	43	40	34
Link Distance (ft)	451	25	
Upstream Blk Time (%)		0	
Queuing Penalty (veh)		0	
Storage Bay Dist (ft)			200
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Site Drive (Westington) & Wattles Road

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	28	31
Average Queue (ft)	5	11
95th Queue (ft)	22	34
Link Distance (ft)		234
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	500	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 1247

memorandum

Date: December 6, 2021

To: William Huotari, PE

cc:

From: Stephen Dearing, PE, PTOE

Re: Traffic Impact Study

I have reviewed the Traffic Impact Study for the Westington & West Hills development site, a proposed residential development located at the corner of Crooks and Wattles Roads. The applicant has proposed 162 dwelling units. The Traffic Impact Study was prepared by Fleis & Vandenbrink and is dated November 11, 2021.

OHM recommends approval of the TIS. While there are a few corrections and changes that could be made for this report, they are minor and would not impact the conclusions contained in the TIS.

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memorandum

Date: March 2, 2022

To: Bill Huotari, PE

From: Genevieve Schneemann & Sara Merrill, PE, PTOE

Re: The Westington Phase 2
Preliminary Site Plan Review

We have reviewed the preliminary site plans for The Westington Phase II, a residential development consisting of a new 20-unit 2-story building. Westington Phase I, previously approved, consists of 102 units spread across four buildings. The development is located on the south side of Wattles Road, approximately 300' east of Crooks Road. The plans were prepared by DesignHaus Architecture and PEA, Inc. and dated February 17th, 2022.

At this time, OHM recommends approval of the preliminary site plan, subject to the comments below being incorporated into the final engineering plans. We note these changes may result in a slight reduction of proposed parking spaces.

OHM's comments on the proposed site plan are noted below:

1. There are some discrepancies in site layout and parking configuration. For example, Sheet S100 and S101 show different configurations for parking stalls, sidewalk, and location of ADA spaces along the north side of the proposed Phase II building. Additionally, the retaining wall configuration and gazebo location varies between the Civil and Architectural sheets. Revise the sheets to eliminate discrepancies.

2. Parking:

    a. The parking aisle layout to the north of the proposed Phase II building has been modified from prior plans. It appears that this area is now proposed for two-way traffic flow (perpendicular parking, aisle width). This area should be modified to provide only one-way traffic flow up to the dumpster. If the parking spaces on the north side of Building 2 are fully occupied, there is insufficient space for a southeast bound vehicle to turnaround, which may inadvertently lead to wrong-way movements on the north and east side of the proposed building.

    b. Perpendicular parking spaces must be 9.5 feet in width. The parking space at the northwest corner of the proposed Phase II building measures approximately 8.5 feet wide to face of curb.

3. Sidewalks:

    a. Improve pedestrian connectivity between the proposed Phase II buildings and the rest of the site. OHM notes this may require some parking reconfiguration to achieve.

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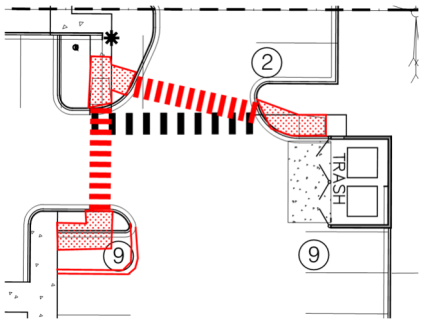
i. Add sidewalk along the west side of the building proposed in Phase II to allow for easy access to those who park along the west side.

ii. Add pedestrian crosswalks along the north end of the Phase II building to allow for connectivity to the rest of the Phase I buildings and the proposed gazebo.

iii. Add a pedestrian crosswalk near the southwest corner of Building 2, providing connectivity to the existing southerly 3-story building and to the proposed development at 3902 Crooks Rd. For optimal placement, eliminate the parking spot and enlarge the island on the west side, allowing a perpendicular aligned crosswalk at the junction of drive aisles.



b. Widen sidewalks to provide seven (7) feet of sidewalk width adjacent to vehicular travel ways or abutting parking. The proposed sidewalk along the east and south sides of the proposed Phase II building, are approximately only 5 feet wide.

c. Show curb cuts and ramps at each proposed crosswalk. There are several locations, such as along the northeast corner of the proposed Phase II building, where sidewalks and ramps are not shown.

d. The proposed pedestrian crosswalk leading to the dumpster area along Bari lane Drive is awkwardly configured. Reorient the ramp and crosswalk such that the sidewalk ramps are aligned with one another.

e. Extend sidewalk to the proposed pavilion area.

f. Circuitous sidewalk layouts (such as at the northwest corner of the proposed Phase II building, with sidewalk following the back of curb) are difficult to navigate and should be revised to reduce the number of jogs or turns.

4. The retaining wall along the curved drive aisle (north of the proposed Phase II building) has a vertical drop-off of over seven feet. It is unclear whether the railing along the top of wall is ornamental or an appropriate vehicular barrier. The retaining wall should extend approximately 3 feet above the pavement surface, or a guardrail-style barrier be provided.

5. Label proposed dimensions for curb radii.

6. Provide AutoTurn turning diagram for firetruck access around Phase II.

7. A detail for bollards has been provided on Sheet S101. Proposed bollard locations should be clearly shown on the plans.

8. Add “One Way” and “Do Not Enter” signs to convey the direction of traffic flow for the one-way aisle.

DATE: April 7, 2022

TO: Planning Commission

FROM: R. Brent Savidant, Community Development Director

SUBJECT: PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0009) - Proposed Hills West, East side of Crooks, South of Wattles (3902 Crooks; 88-20-21-101-003), Section 21, Currently Zoned NN (Neighborhood Node "I") District

The petitioner Hills West LLC. submitted the above referenced Preliminary Site Plan application for one 15-unit building and one 14-unit multi-family apartment buildings (29 units total). Both buildings are 2 ½ stories/30 feet in height. Multi-family is permitted by right in the NN (Neighborhood Node "I") Zoning District.

The applicant submitted a Preliminary Site Plan application for the same site that included two15-unit apartment buildings (30 units total). The application was denied by the Planning Commission on January 25, 2022. This is considered a new application.

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

Attachments:

1. Maps
2. Report prepared by Carlisle/Wortman Associates, Inc.
3. Preliminary Site Plan.
4. Memo from OHM, dated March 10, 2022.

G:\SITE PLANS\SP JPLN2022-0009 HILLS WEST NEW SUBMITTAL\PC Memo 2022 04 12 Hills West.docx

PC 2022.04.12
Agenda Item # 6

PROPOSED RESOLUTION

PRELIMINARY SITE PLAN REVIEW (SP JPLN2022-0009) - Proposed Hills West, East side of Crooks, South of Wattles (3902 Crooks; 88-20-21-101-003), Section 21, Currently Zoned NN (Neighborhood Node "I") District

Resolution # PC-2022-04-
Moved by:
Seconded by:

RESOLVED, That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed Hills West 29-unit apartment development, East side of Crooks, South of Wattles, Section 21, Currently Zoned NN (Neighborhood Node "I") District, be granted, subject to the following:

_____) or

(denied, for the following reasons: _____) or

(postponed, for the following reasons: _____)

Yes:
No:

MOTION CARRIED/FAILED

GIS Online

835 0 417 835 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

GIS Online

835 0 417 835 Feet

Note: The information provided by this application has been compiled from recorded deeds, plats, tax maps, surveys, and other public records and data. It is not a legally recorded map survey. Users of this data are hereby notified that the source information represented should be consulted for verification.

Carlisle | Wortman
ASSOCIATES, INC.

117 NORTH FIRST STREET SUITE 70 ANN ARBOR, MI 48104 734.662.2200 734.662.1935 FAX

Date: January 20, 2022
March 22, 2022

Preliminary Site Plan Review
For
City of Troy, Michigan

Applicant: DesignHaus

Project Name: Hills West

Plan Date: February 24, 2022

Location: Crooks Road, south of Wattles

Zoning: Neighborhood Node (NN) – I

Action Requested: Site Plan Approval

SITE DESCRIPTION

The subject site is located on the east side of Crooks Road, south of Crooks Road. The site is approximately 1.33 acres in area, and is proposed for development as multiple-family residential. The applicant is proposing to construct two (2) multi-family buildings on the site, one with fifteen (15) dwelling units and one with fourteen (14) units. Both buildings will be 2.5 stories in height.

Access is via Crooks Road, with a cross-access to the Westington development. There is no direct access to Barilane Court. The property is zoned Neighborhood Node (NN) and multiple family residential is a permitted use.

The properties to the south of the subject site is zoned R1-B, One Family Residential, and NN, Neighborhood Node to the north, east, and west.

Site Location:

Proposed Uses of Subject Parcel:
Twenty-nine (29) multi-family dwelling units.

Current Use of Subject Property:
Single Family Home

Current Zoning:
The property is currently zoned NN, Neighborhood Node District.

Surrounding Property Details:

Direction	Zoning	Use
North	NN, Neighborhood Node	Commercial
South	R1-B, Single Family	Single Family Residential
East	NN, Neighborhood Node	Multi-Family Residential
West	NN, Neighborhood Node	Vacant

PREVIOUS PLANNING COMMISSION REVIEW

The Planning Commission discussed the project at the January 25, 2022 meeting. There was lengthy discussion on a variety of topics including traffic, guest parking, tree mitigation, open space/landscaping calculations, compliance with Design Standards, compliance with Site Plan Review Standards, cross-access, Neighborhood Node zoning designations, intensity of Site Type A and Site Type B.

See the January 22 meeting minutes for more details.

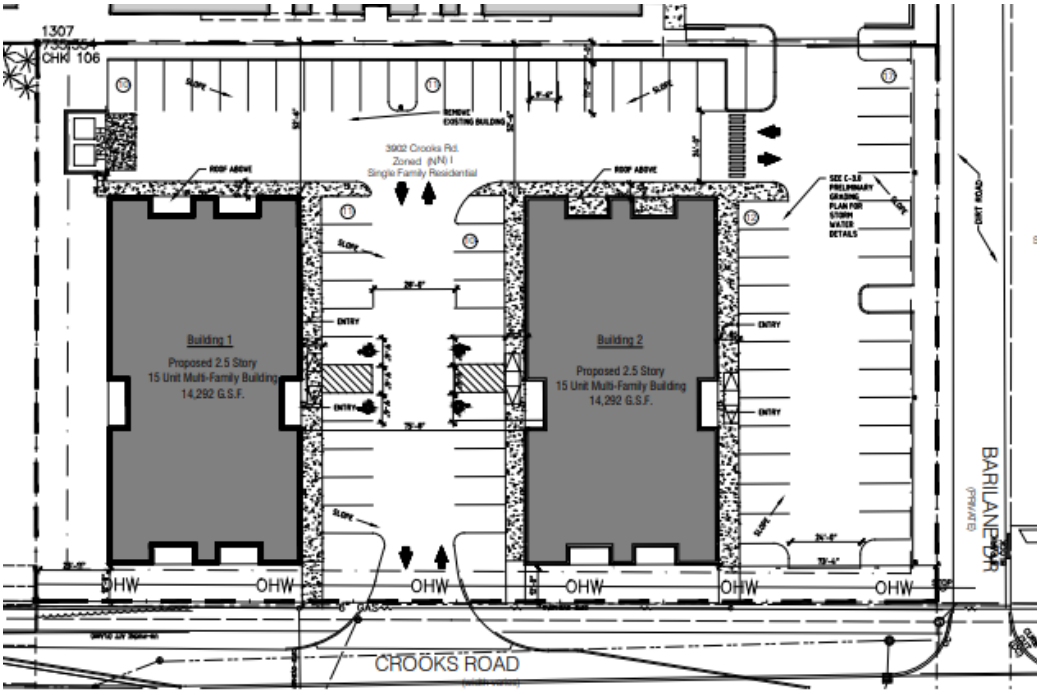
After discussion, the Planning Commission, the Planning Commission moved:

That Preliminary Site Plan Approval, pursuant to Article 8 of the Zoning Ordinance, as requested for the proposed Hills West 30-unit apartment development, East side of Crooks, South of Wattles, (3902 Crooks, PIN 88-20-21-101-003), Section 21, Currently Zoned NN (Neighborhood Node "I") District, be denied, for the following reasons:

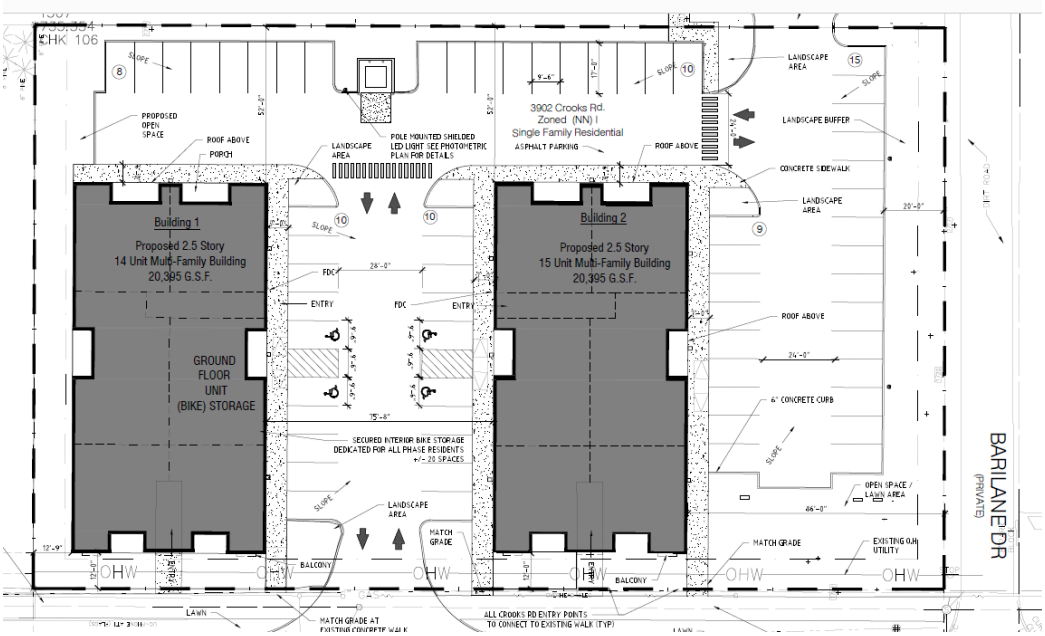
1. *The orientation of the buildings violates the Zoning Ordinance*
2. *Planning Commission does not approve the tree mitigation requirement.*
3. *The open space failed the Zoning Ordinance calculations*
4. *The site Design Standards fail to promote public health, safety and welfare, primarily due to traffic issues.*
5. *The project fails to meet the transition requirements of the zoning ordinance as well as density requirements.*

The motion passed 8-0.

CHANGES SINCE LAST PLANNING COMMISSION REVIEW



January 2022 Plan



March 2022 Plan

The applicant has proposed the following changes to the Site Plan since the last submittal:

- Reduced the number of units from thirty (30) to twenty-nine (29)
- Relocated trash enclosure location
- Changed floor plans and elevations to have entrance front on Crooks
- Increased open spaces by 2.68% to 22.68%

- Shifted building to the north to provide additional buffering along Barilane Drive.
- Increased lot coverage by 0.8%
- By eliminating one (1) unit, they decreased the guest parking by eight (8) spaces, to provide a total of four (4) guest spaces.

NATURAL FEATURES

Topography: A topographic survey has been provided on sheet C-2.0. The site has a slightly higher elevations in the northeast section of the site.

Wetlands: There are no wetlands on site.

Floodplain: There is no floodplain on site.

Woodlands: A tree inventory and replacement plan has been provided on Sheet L100, with replacement trees shown in the landscape plan on Sheet L101. The applicant notes that a total of 230 inches will be removed, requiring 115 inches of replacement.

Replacement Details		
Protected Tree	**Inches Removed**	**Replacement Required**
Landmark	154 inches	154 inches
Woodland	234 inches	117 inches
Preservation/Mitigation	**Inches Preserved**	**Credit**
Landmark	0 inches	0 inches
Woodland	0 inches	0 inches
Protected Replacement Required	271 Inches	
Preservation Credit	0 Inches	
Total	**271-inches**	
Total Tree Mitigation	271 trees / 3 inches = 91 3-inch trees	

The applicant is not preserving any onsite trees. There is a clumping of along the southern property line/ Barilane Street. Is the applicant able to shift the site to preserve additional trees?

Items to be addressed: *Is the applicant able to shift the site to preserve additional trees?*

SITE ARRANGEMENT

The applicant is proposing to construct two (2) multi-family buildings on the site, one with fifteen (15) units and one with fourteen (14) units. The buildings will be located on the western side of the site with parking and an access drive between the two buildings.

Items to be addressed: *None.*

AREA, WIDTH, HEIGHT, SETBACKS

Table 5.03.B.3, Building Form C, Standards Applicable to All Districts of the Zoning Ordinance establishes the dimensional requirements for the NN, Neighborhood Node District. The requirements of Building form C and the proposed dimensions are shown in the following table.

	Required	Provided	Compliance
Front (Crooks)	10-foot build-to-line	12-feet	Complies
Side (north)	N/A, building may be placed up to property line	12-feet	Complies
Side (south)	N/A, building may be placed up to property line	86-feet	Complies
Rear (South)	30-foot minimum setback	52-feet	Complies
Building Height	Any building, or portion of a building, on a parcel abutting a one-family residentially zoned parcel shall not exceed 2.5-stories, 30 feet in height.	2.5 stories, 30.0 feet (to mid-point of ridge), 34 feet to roof peak.	Complies but see discussion below
Lot Coverage (Building)	30%	28.33%	Complies
Minimum Open Space	20%	22.68%	Complies
Parking Location	Cannot be located in front yard	Parking lots not in front yard	Complies

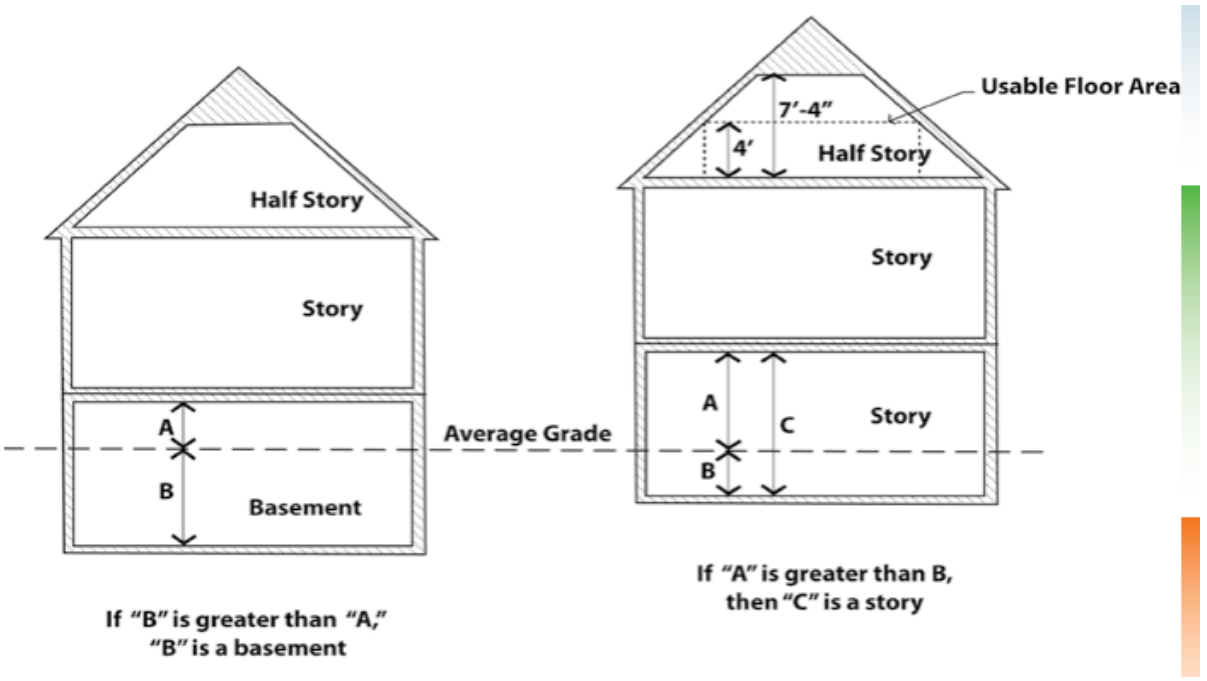
Building Height and Story Discussion:

Because this site is adjunct to one-family residentially zoned property, the applicant shall comply with Section 5.06.E.3.c, which limits height and stories to 2.5 stories and 30-feet. As set forth in the Zoning Ordinance, building height is defined as the following:

> *The term "building height" shall mean the vertical distance as measured from the established grade to the highest point of the roof for flat roofs, including walls or parapets that extend above the horizontal roof surface; to the deck line of mansard roofs; and to the average height between eaves and ridge for gable, hip, and gambrel roofs. When a non-residential building is located on sloping terrain, the height may be measured from the average ground level of the grade at the building wall. When a residential building is located on sloping terrain, the height shall be measured from the highest grade adjacent to the front of the structure to the highest point of the roof for flat roofs, including walls or parapets that extend above the horizontal roof surface; to the deck line of mansard roofs; and to the average height between eaves and ridge for gable, hip, and gambrel roofs. For residential buildings, the major or main roof over the living area shall be used to determine building height, with the following exception: when the total horizontal roof area of dormers and/or minor gables enclosing the living area exceeds twenty (20) percent of the total horizontal area of the roof to which such dormers or gables are attached, the predominant height of such dormers or gables shall be used as the basis for the determination of the building height.*

Story and half-story is defined as the following:

> *STORY: That part of a building, except a mezzanine, included between the surface of one (1) floor and the surface of the next floor, or if there is not a floor above, then the ceiling next above. A story thus defined shall not be counted as a story when more than fifty (50) percent by cubic content, is below the height level of the adjoining ground.*
>
> *STORY, HALF: An uppermost story lying under a sloping roof, the usable floor area of which, at a height of four feet above the floor, does not exceed two-thirds (2/3) of the floor area in the story directly below and the height above at least two hundred (200) square feet of floor space is seven feet four inches (7'4"). When the usable floor area of such a story, at a height of four (4) feet above the floor, does exceed two-thirds (2/3) of the floor area of the story directly below, it shall be counted as a full story.*



During the review process, we had asked the applicant to confirm that the building complied with the 2.5 story maximum. The applicant's architect provided additional plans and the required calculations. The City's Building Official reviewed the plans and the calculations and confirmed that the building meets the 2.5 story requirement as defined in the Zoning Ordinance. The applicant's architect plans and calculations, and the Building Official's response are provided in your packet.

Items to be addressed: *None*

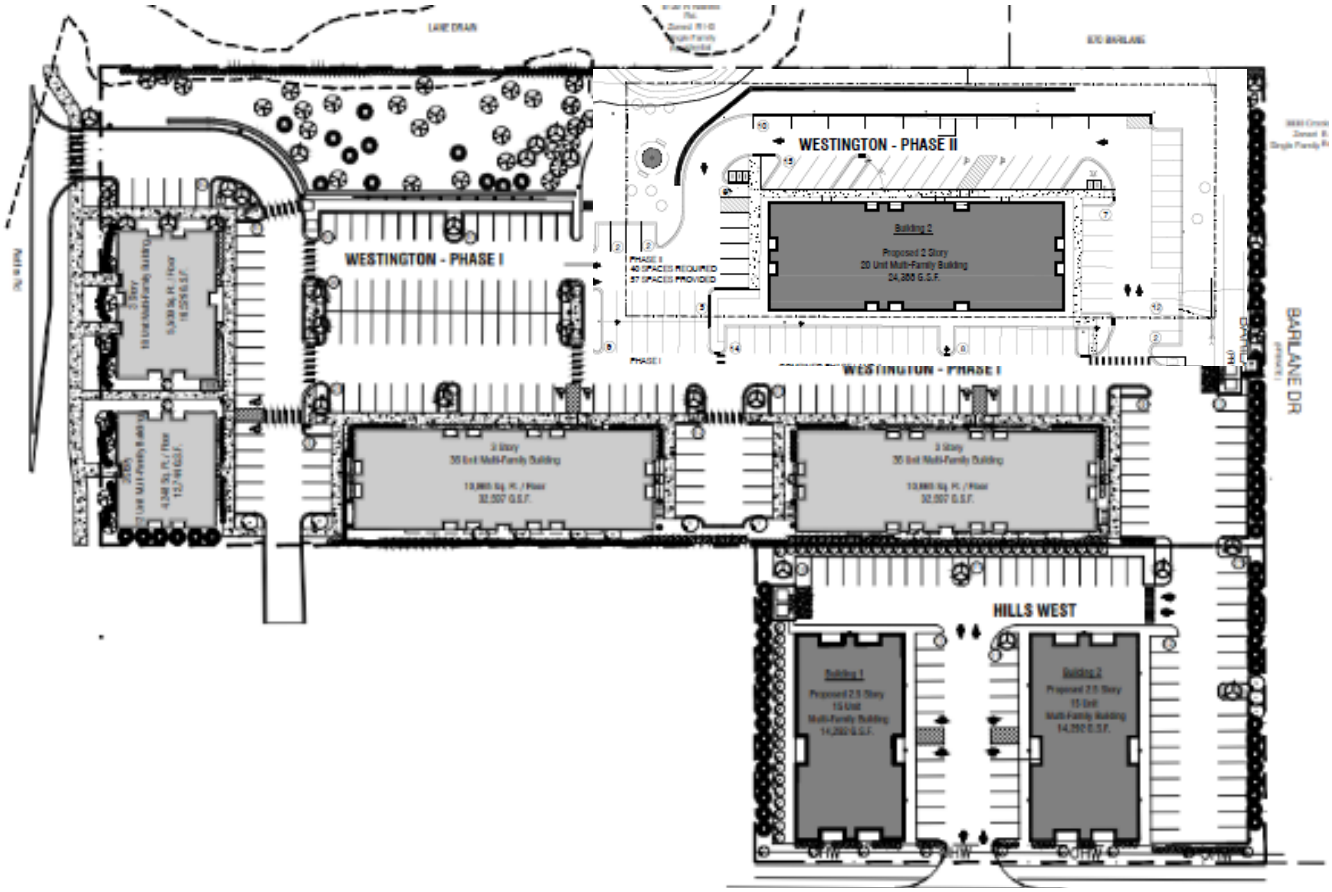
PARKING

Section 13.06.G of the Zoning Ordinance requires:

	Required	Provided
Residential (General): 2 spaces per unit	29 units = 58 spaces	62 spaces
Barrier Free	4	4
Bicycle Parking	2	Internal to building
Loading	0	0
Total	**58 spaces**	**62 spaces**

Items to be Addressed: None

SITE ACCESS AND CIRCULATION



Access is via Crooks Road, with a cross-access to the Westington development. There is no direct access to Barilane Court. The site plan was reviewed by the Citys Engineer and Engineering Consultant OHM. In there review they note the following site circulation and pedestrian circulation deficiencies:

1. At the site driveway, extend the concrete sidewalk (with sidewalk jointing) through the driveway approach, as shown in the City's Engineering Standards.
2. On the site civil plans, the proposed sidewalk connection on this site does not match up with the sidewalk on the adjacent Westington site. Revise plans to provide a continuous and accessible pedestrian route between the two sites.
3. The proposed sidewalk along the Crooks Road right-o-fway, just north of the site drive, appears to conflict with an existing electric pole. The utility pole near the southwest corner of Building 1 is located immediately adjacent to the public sidewalk. Utility poles should be located two (2) feet off the edge of walk. Plans should clearly indicate which poles are being relocated, as well as show proposed pole locations (if applicable).
4. At Barilane Drive, proposed sidewalk along the right-of-way must be aligned with the existing sidewalk on the south side of the street. Extend proposed sidewalk and reconfigure to provide a pedestrian crossing perpendicular to the road

Items to be addressed: *Address Engineering noted comments*

TRAFFIC

As directed by the City the applicant has provided a Traffic Impact Study for both the Westington Phase II and the Hills West developments. Please note that the traffic study has not been revised as the applicant has reduced the overall number of units and thus reduced the traffic impact. The traffic review is based on 162 units. The revised total is 151 units

Summary:

The proposed development includes three (3) multi-family residential homes developments: Westington Phase I, Westington Phase II, and West Hills. The number of peak hour (AM and PM), and daily vehicle trips that would be generated by the proposed residential were forecast based on data published in the Institute of Transportation Engineers (ITE) Trip Generation Manual 11 th Edition, and the ITE Trip Generation Handbook, 3rd Edition. The site trip generation was reviewed and approved by the City of Troy (OHM) prior to use in the analysis and is summarized in Table E2.

Land Use	***Phase***	***Amount (units)***	***Average Daily Traffic (vpd)***	***AM Peak Hour (vph)***			***PM Peak Hour (vph)***		
				In	***Out***	***Total***	***In***	***Out***	***Total***
Multifamily Residential	*Westington Phase I*	*102*	*701*	*11*	*35*	*46*	*36*	*21*	*57*
	Westington Phase II	*30*	*206*	*4*	*10*	*14*	*11*	*6*	*17*
	West Hills	*30*	*206*	*3*	*10*	*13*	*10*	*6*	*16*
Total Trips		***162***	***1,114***	***18***	***55***	***73***	***57***	***33***	***90***

To/From	***Via***	***AM***	***PM***
North	*Crooks Road*	*31%*	*28%*
South	*Crooks Road*	*39%*	*41%*
East	*Wattles Road*	*14%*	*16%*
West	*Wattles Road*	*16%*	*15%*
Total		***100%***	***100%***

ANALYSIS SUMMARY

The conclusions of this TIS are as follows:

1. *Existing Conditions (2021): The result of the existing condition analysis indicates that all the study intersection approaches will operate at LOS D or better with the exceptions as follows:*

- *Crooks Road & Wattles Road: The eastbound and westbound left and through movements are operating at LOS E during both AM and PM peak periods. Review of SimTraffic network simulations indicates long vehicle queues for these movements especially for eastbound through movement during the PM peak hour; however, these vehicle queues were observed to dissipate and were not present throughout the peak periods.*
- *Crooks Road & 7-11 Drive: Although the westbound egress movements at 7-11 driveway currently operate at LOS D or better during the peak periods, long vehicle queue are observed on the site driveway during the PM peak hour. The northbound traffic at Wattles Road intersection occasionally extends past this driveway during peak periods and blocks the egress movements at the 7-11 Drive. This causes westbound egress vehicles to wait longer to find gaps within the through traffic along Crooks Road.*

2. *Background Conditions (2023): The results of the background conditions analysis indicates that all study intersection approaches and movements will continue to operate in a manner similar to existing conditions with the following exceptions:*
   - *Crooks Road & Wattles Road: The southbound left-turn movement is expected to operate in LOS E during the PM peak hour at the intersection of Crooks Road & Wattles Road intersection due to the traffic growth in background (2023) conditions. However, the projected additional delay is only 1.6 seconds, which is not significant.*
3. *Future Conditions (2023): The results of the future conditions analysis indicates that with the addition of site generated traffic, all the study intersection approaches and delays continue to operate in a manner similar to background conditions with the exceptions as follows:*
   - *Crooks Road & Wattles Road: The overall intersection is expected to operate at LOS E during the PM peak hour. However, the overall delay at this intersection is expected to increase by only 0.4 seconds, which will be indiscernible from background condition intersection operations.*
   - *Crooks Road & Site Drive (West Hills): The westbound egress movements at West Hills driveway are expected to operate at LOS E during the PM peak periods with a 95th percentile queue length of 43 feet (2 vehicles), which is not significant. These vehicles will be contained within the project site and will not impact traffic operations at the adjacent streets. Moreover, the review of SimTraffic network simulation indicates the egress vehicles are able to find adequate gaps within through traffic along Crooks Road.*

RECOMMENDATIONS

The results of this study indicate that with the addition of site generated traffic, all the study intersection approaches and delays will continue to operate in a manner similar to existing conditions with minor additional delays. Therefore, no mitigation measures are recommended to accommodate the site generated traffic volumes.

The applicant TIS was reviewed by OHM, the City's Traffic Consultant. OHM concludes:

I have reviewed the Traffic Impact Study for the Westington & West Hills development site, a proposed residential development located at the corner of Crooks and Wattles Roads. The applicant has proposed 162 dwelling units. The Traffic Impact Study was prepared by Fleis & Vandenbrink and is dated November 1, 2021.

OHM recommends approval of the TIS. While there are a few corrections and changes that could be made for this report, they are minor and would not impact the conclusions contained in the TIS.

Items to be addressed: *None*

LANDSCAPING

A landscaping plan has been provided on Sheet L101. The following table discusses the development's compliance with the landscape requirements set forth in Section 13.02.

	Required:	**Provided:**	**Compliance:**
Greenbelt Planting			
Crooks: 1 tree every 30 feet	306 / 30 = 11	11 trees	Complies
Southern property line:			
Landscape buffering: Required buffering between two differentiating land uses. Alternative 1 or 2.	1 large evergreen every 10 feet or 1 narrow evergreen every 3 feet. Alternative screening method may be considered by the Planning Commission.	1 large evergreen every 10 feet along northern property line.	Complies
Parking Lot Landscaping			
1 tree per every 8 parking spaces	8 trees	8 trees	Complies
Overall			
Site landscaping: A minimum of twenty percent (20%) of the site area shall be comprised of landscape material. Up to twenty-five percent (25%) of the required landscape area may be brink, stone, pavers, or other public plaza elements, but shall not	20%	Applicant notes 22%	Complies

include any parking area or required sidewalks.			
Mitigation	91	75 trees	Deficient by 16 trees

Transformer / Trash Enclosure:

The applicant has indicated a central trash enclosure. There will be one trash enclosure with two trash containers contained within a 6-foot-high masonry brick wall.

***Items to be Addressed**: Provide sixteen (16) replacement trees.*

PHOTOMETRICS

Applicant did not provide photometric plan.

***Items to be Addressed:** Provide Photometric Plan.*

FLOOR PLAN AND ELEVATIONS

Floor plans and elevations have been provided on sheets A100, A101, A102, and A200,. The elevations provided show architectural details, variations in material and pattern (brick, hardiboard siding, and limestone headers roof), as well as general color scheme.

***Items to be Addressed:** Applicant should confirm that they meet the transparency requirements.*

DESIGN STANDARDS AND SITE PLAN REVIEW STANDARDS

The Neighborhood Node design standards as well as Site Plan review standards provide the Planning Commission with direction when reviewing the proposed site plan and design features of this development.

Section 5.06.E. outlines Design Standards:

1. *Building Orientation and Entrance*
2. *Ground Story Activation*
3. *Transitional Features*
4. *Site Access, Parking, and Loading*

Please see Section 5.06.E for standard details.

Section 8.06 outlines Site Plan Review Design Standards.

Section 8.06 outlines Site Plan Review Design Standards.

1. *Development shall ensure compatibility to existing commercial districts and provide a transition between land uses.*
    a. *Building design shall enhance the character of the surrounding area in relation to building and parking placement, landscape and streetscape features, and architectural design.*
    b. *Street fronts shall provide a variety of architectural expression that is appropriate in its context and prevents monotony.*
    c. *Building design shall achieve a compatible transition between areas with different height, massing, scale, and architectural style.*

2. *Development shall incorporate the recognized best architectural building design practices.*
    a. *Foster a lasting impact on the community through the provision of high quality design, construction, and detailing.*
    b. *Provide high quality, durable materials, such as but not limited to stone, brick, glass, and metal. E.I.F.S. or material equivalent shall only be used as an accent material.*
    c. *Develop buildings with creativity that includes balanced compositions and forms.*
    d. *Design roofs that are appropriate to the architectural style of the building and create an appropriate visual exterior mass of the building given the context of the site.*
    e. *For commercial buildings, incorporate clearly defined, highly visible customer entrances using features such as canopies, porticos, arcades, arches, wing walls, ground plane elements, and/or landscape planters.*
    f. *Include community amenities that add value to the development such as patio/ seating areas, water features, art work or sculpture, clock towers, pedestrian plazas with park benches or other features located in areas accessible to the public.*

3. *Enhance the character, environment and safety for pedestrians and motorists.*
    a. *Provide elements that define the street and the pedestrian realm.*
    b. *Create a connection between the public right of way and ground floor activities.*
    c. *Create a safe environment by employing design features to reduce vehicular and pedestrian conflict, while not sacrificing design excellence.*
    d. *Enhance the pedestrian realm by framing the sidewalk area with trees, awnings, and other features.*
    e. *Improve safety for pedestrians through site design measures.*

SUMMARY

As part of the deliberation, the Planning Commission and applicant shall discuss:

1. Can the applicant shift the buildings or reduce the size to preserve additional trees?
2. Compliance with Design Standards
3. Compliance with Site Plan Review Standards

Based on the Planning Commission discussion, the applicant shall also address engineering noted comments, provide required tree mitigation, provide photometric plan, and confirm transparency requirements.

Sincerely,

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

Hills West

3902 Crooks Rd.
Troy, MI 48098

PROJECT TEAM

OWNER
TOLLBROOK BROKERAGE, LLC
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CONTACT: ARBAN STAFA

ARCHITECT
DESIGNHAUS ARCHITECTURE
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T: 248.601.4422
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PROJECT MANAGER: JOE LATOZAS
PROJECT ARCHITECT:
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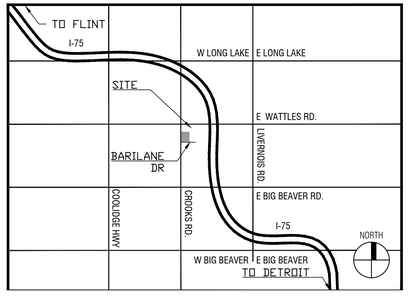
CONTACT: GREG BONO

STATEMENT OF SELECTED DESIGN PROFESSIONAL

THESE CONSTRUCTION DOCUMENTS WERE PREPARED FOR COMPLIANCE WITH THE MICHIGAN CONSTRUCTION CODES IN EFFECT AT THE TIME OF PERMIT SUBMITTAL. ALL ENGINEERS, CONTRACTORS AND SUPPLIERS INVOLVED WITH THIS PROJECT SHALL COMPLY WITH THE SAME CODES ISSUED AND APPROVED CODE MODIFICATIONS AND/OR MUNICIPAL CONSTRUCTION BOARDS OF APPEALS RULINGS AND WHENEVER REQUIRED SHALL PROVIDE SHOP DRAWINGS AND SUBMITTALS CLEARLY DESCRIBING COMPLIANCE TO THE REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE FOR REVIEW AND APPROVAL.

REGISTERED DESIGN PROFESSIONAL IN CHARGE:
PETER STUHLREYER, A.I.A.
MICHIGAN IDENTIFICATION # 44668
DESIGNHAUS ARCHITECTURE

LOCATION MAP



INDEX OF DRAWINGS

SHEET ISSUED
REVISED
SHEET REISSUED

SPA Resubmittal 22.02.24	SPA Resubmittal 21.10.28	SPA Review Set 21.10.06	SPA Review Set 21.09.02	SHEET NO:	DRAWING NAME
				GENERAL	
☐	☐	☐	☐	G001	Title Sheet and Index
				CIVIL	
☐	☐	☐	☐	C.10	Topographic Survey
					Site Survey
☐	☐	☐	☐	C.2	Preliminary Grading Plan
☐	☐	☐	☐	C.3	Preliminary Utility Plan
				LANDSCAPE	
☐	☐	☐	☐	S101	Preliminary Site Plan
☐	☐	☐	☐	L100	Tree Removal & Preservation Plan
☐	☐	☐	☐	L101	Landscape Plan
☐	☐	☐	☐	1 of 1	Lighting Plan
				ARCHITECTURAL	
☐	☐	☐	☐	A100	Typical Ground & Middle Floor Plan
☐	☐	☐	☐	A101	Typical Upper Floor and Roof Plan
☐	☐	☐	☐	A102	Building 1 & 2 Ground Floor Plans
☐	☐	☐	☐	A103	Typical Unit Plan
☐	☐	☐	☐	A200	Elevations

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PETER M. STUHLREYER ARCHITECT 44668

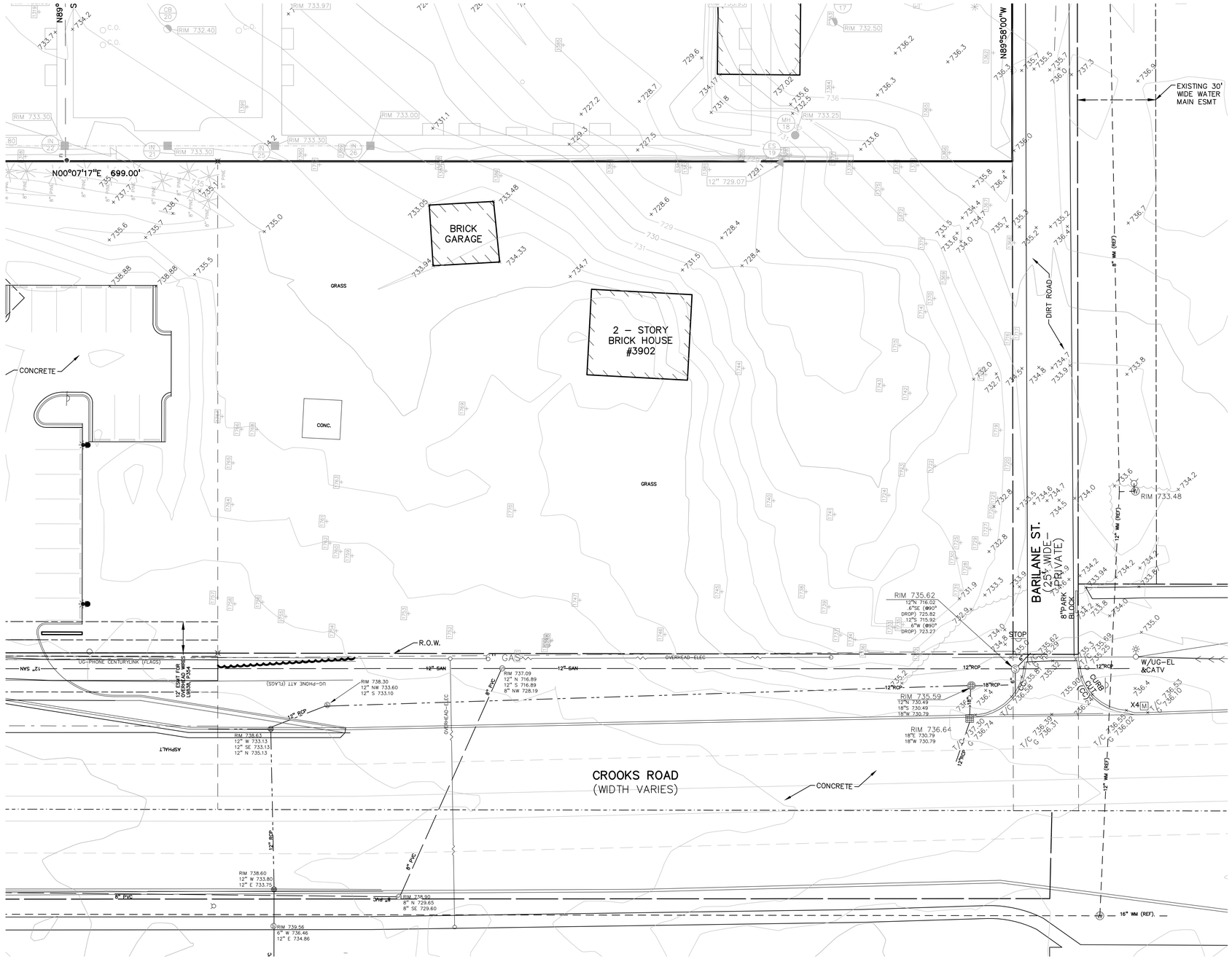
Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Title Sheet and Index

021241

G001



LEGEND

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

EXISTING

- ELEC., PHONE OR CABLE TV O.H. LINE, POLE & GUY WIRE
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- TELEPHONE U.G. CABLE, PEDESTAL & MANHOLE
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- STREET LIGHT
- SIGN
- CONCRETE
- ASPHALT
- GRAVEL SHOULDER
- WETLAND

BENCHMARKS (GPS DERIVED – NAVD88 DATUM)

BM#300
SET BENCH TIE IN SOUTH FACE POWER POLE ±200 FEET SOUTH OF CENTERLINE OF W. WATTLES RD. ±15 FEET EAST OF BACK OF CURB OF CROOKS RD.
ELEVATION – 742.48

BM#302
ARROW ON HYDRANT SOUTH SIDE OF W. WATTLES RD. NEAR WEST PROPERTY LINE.
ELEVATION – 738.25

WETLAND NOTE:
THERE ARE NO REGULATED WETLANDS ON SITE.

NORTH

0 10 20 40
SCALE: 1" = 20'

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

CAUTION!!
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LOCATION MAP

PEA GROUP
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www.peagroup.com

STATE OF MICHIGAN
GREGORY BONO
ENGINEER
No. 54435
LICENSED PROFESSIONAL ENGINEER

CLIENT

TROY WESTINGTON LLC
1612 MUER RD
TROY, MI 48084

PROJECT TITLE

HILLS WEST
3902 CROOKS ROAD
TROY, MI 48098

REVISIONS
- -

ORIGINAL ISSUE DATE:
OCTOBER 20, 2021

DRAWING TITLE

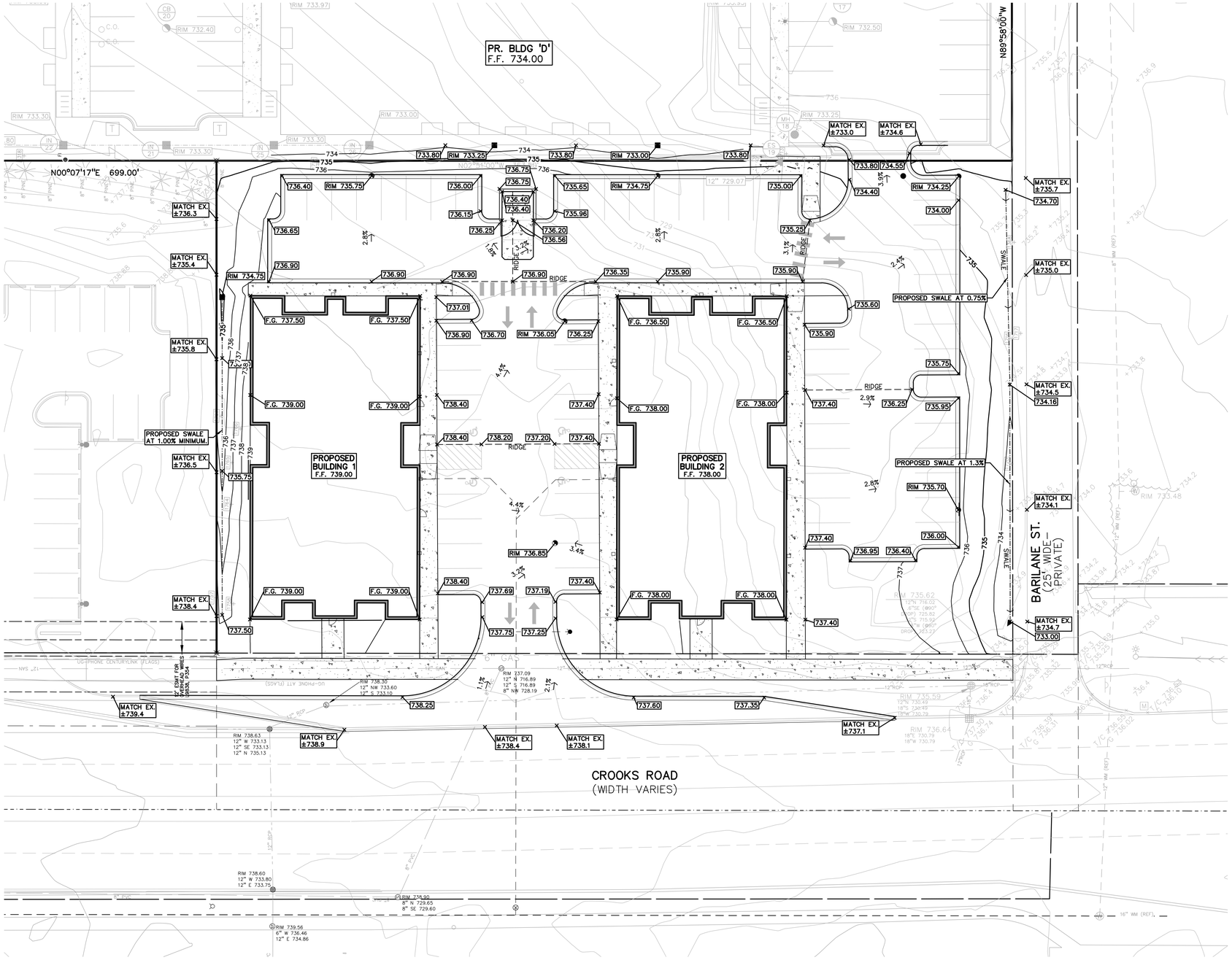
TOPOGRAPHIC SURVEY

PEA JOB NO.	2019-268
P.M.	GMB
DN.	KRD
DES.	GMB

DRAWING NUMBER:

C-1.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON – OAK\DWG\SITE PLANS\HILLS WEST\(C-1.0) TOPO-192608.dwg



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SYMBOLS: GRADING

PROPOSED SPOT ELEVATION:
TYPICALLY TOP OF PAVEMENT IN PAVED AREAS, GUTTER GRADE IN CURB LINES. 622.50

PROPOSED CONTOUR LINE —922—

ABBREVIATIONS:
T/C = TOP OF CURB
G = GUTTER GRADE
T/P = TOP OF PAVEMENT
T/S = TOP OF SIDEWALK
T/W = TOP OF WALL
B/W = BOTTOM OF WALL
F.G. = FINISH GRADE
RIM = RIM ELEVATION

SIDEWALK RAMP LEGEND:

SIDEWALK RAMP 'TYPE P' (P)

REFER TO LATEST MDOT R-28 STANDARD RAMP AND DETECTABLE WARNING DETAILS

NORTH

0 10 20 40
SCALE: 1" = 20'

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REVISIONS
- -

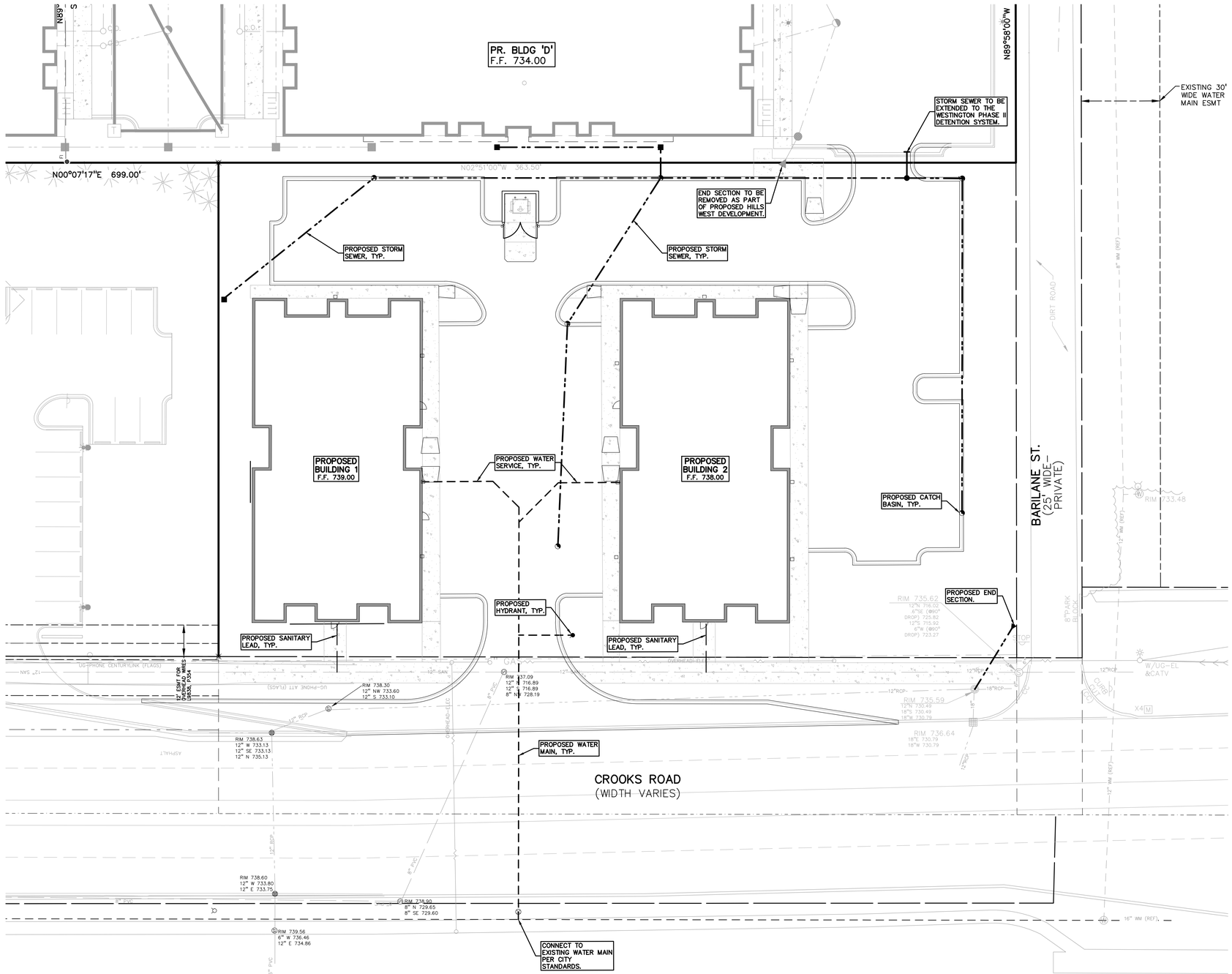
ORIGINAL ISSUE DATE:
OCTOBER 20, 2021

DRAWING TITLE
PRELIMINARY GRADING PLAN

PEA JOB NO.	2019-268
P.M.	GMB
DN.	KRD
DES.	GMB

DRAWING NUMBER:
C-2.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON - CMD\DWG\SITE PLANS (HILLS WEST)\C-2.0 GRADE-19268.dwg



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	STREET LIGHT	
	SIGN	
CONC.	CONCRETE	STD DUTY / HEAVY DUTY / R.O.W. ONLY
ASPH.	ASPHALT	STD DUTY / HEAVY DUTY / DEEP STRENGTH
GRAVEL	GRAVEL SHOULDER	
	WETLAND	

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CLIENT
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1612 MUER RD
TROY, MI 48084

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3902 CROOKS ROAD
TROY, MI 48098

REVISIONS
- -

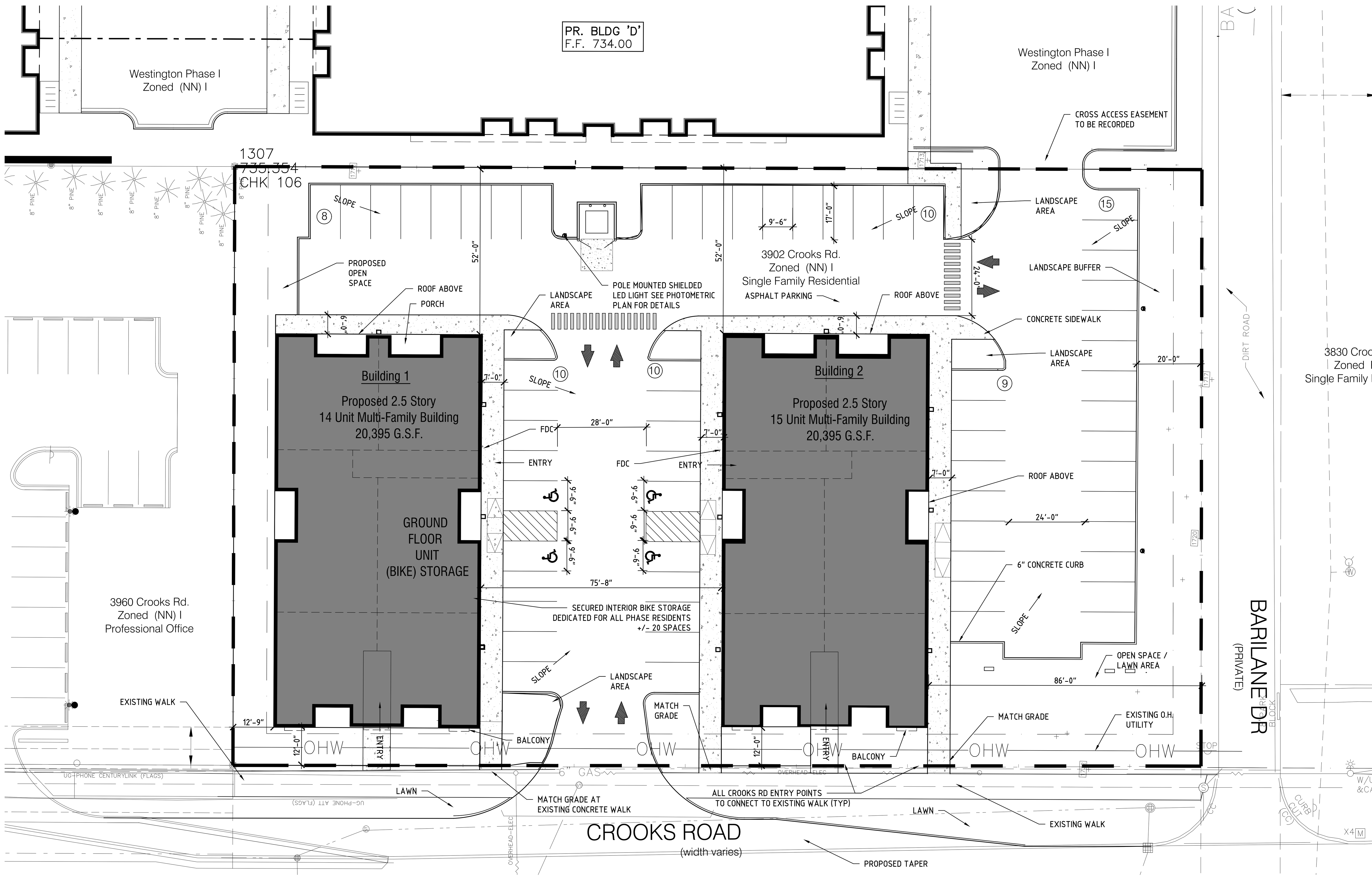
ORIGINAL ISSUE DATE:
OCTOBER 20, 2021

DRAWING TITLE
PRELIMINARY UTILITY PLAN

PEA JOB NO.	2019-268
P.M.	GMB
DN.	KRD
DES.	GMB

DRAWING NUMBER:
C-3.0

S:\PROJECTS\2019\2019-268 THE WESTINGTON - CMD\DWG\SITE PLANS (HILLS WEST)\[C-3.0] UTIL-19268.dwg



ZONING SCHEDULE OF REGULATIONS

Regulation	Provided per (NN) I
Setbacks	West Front Build to Line (Crooks Rd.): 12.0' South Side: 86'-00" North Side:12'-9" Rear: 52'-6"
Building Height	2.5 Stories - 29'-6" to Mid-Rise
Coverage	Maximum Building Coverage - 30% 28.33% Maximum Provided Coverage
Openspace	Minimum Open Space - 20% 13,679 Sq. Ft. (22.68%) Open Space Provided

SITE DATA

Regulation	Information
Parcel I.D.	20-21-101-003
Address	3902 Crooks Rd. Troy, MI 48098
Zoning	NN (Node I)
Parcel Area	(57,863 Sq.Ft.) 1.33 Acres

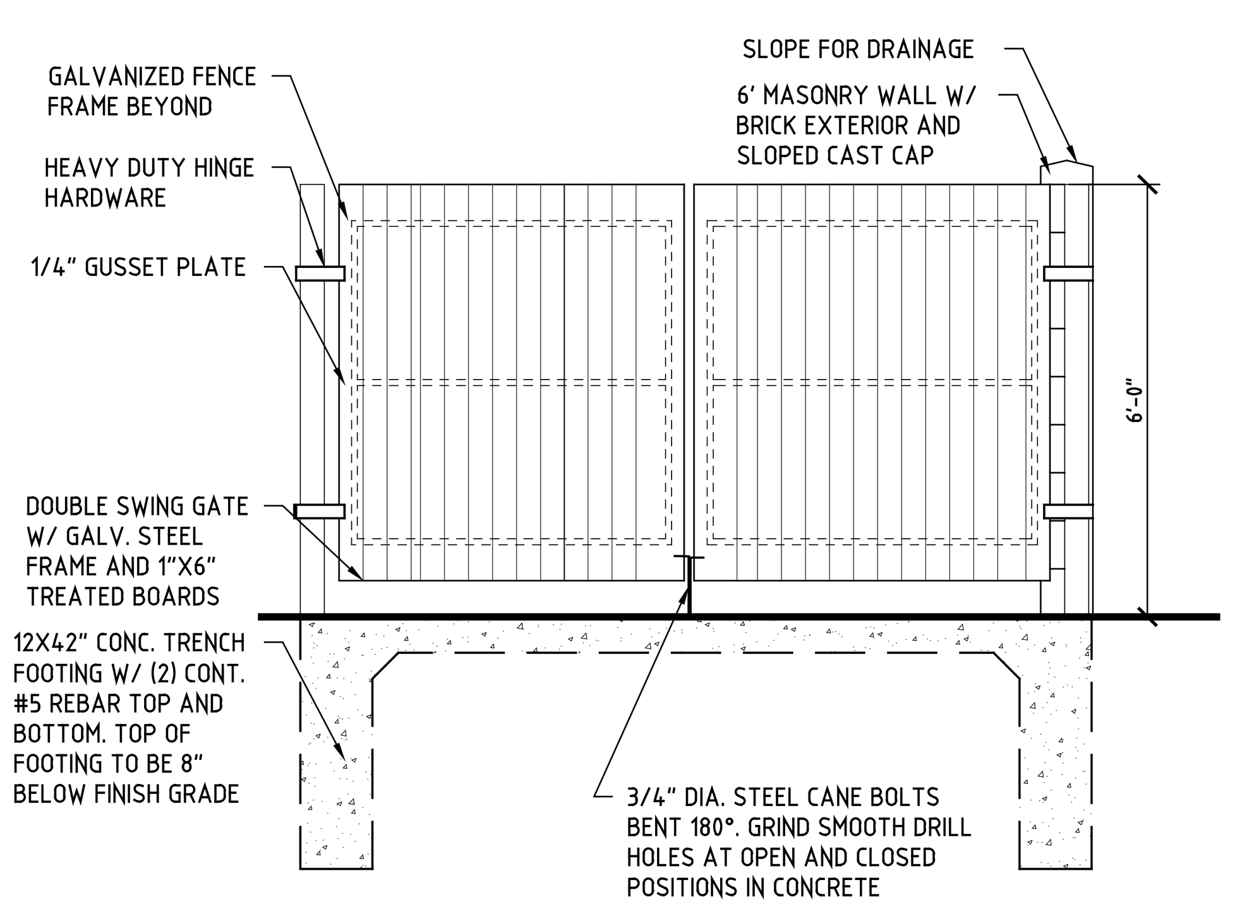
PARKING SUMMARY

Regulation	Required	Provided
Multi-Family	1 Spaces / Efficiency 2 Spaces / Unit	62 Spaces Provided Including 4 Accessible Spaces
	(29) 2 Bed Units = 58 Spaces (58) Spaces Required	

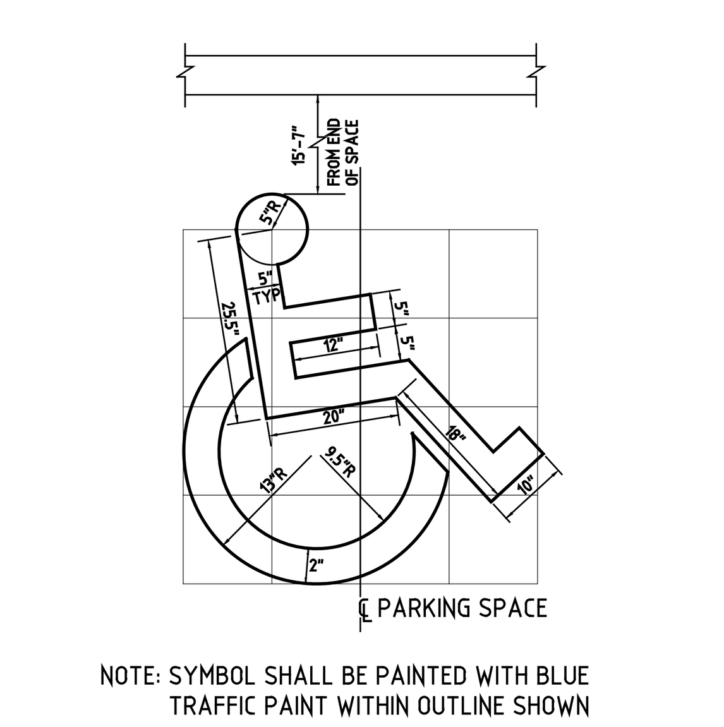
NOTES

1. Mechanical units to be wall mounted and internal (Magic Pack Units).
2. Lighting and photometric information provided on lighting plans.
3. All signs to meet Chapter 85 of City Code of Ordinances and be approved by Building Department.
4. Use MDOT R-28 series, sidewalk ramp and detectable warning details for sidewalk rams and detectable warning strips.
5. Maintain 10-foot horizontal separation between all underground utilities throughout.
6. Crooks Road is under MDOT jurisdiction.

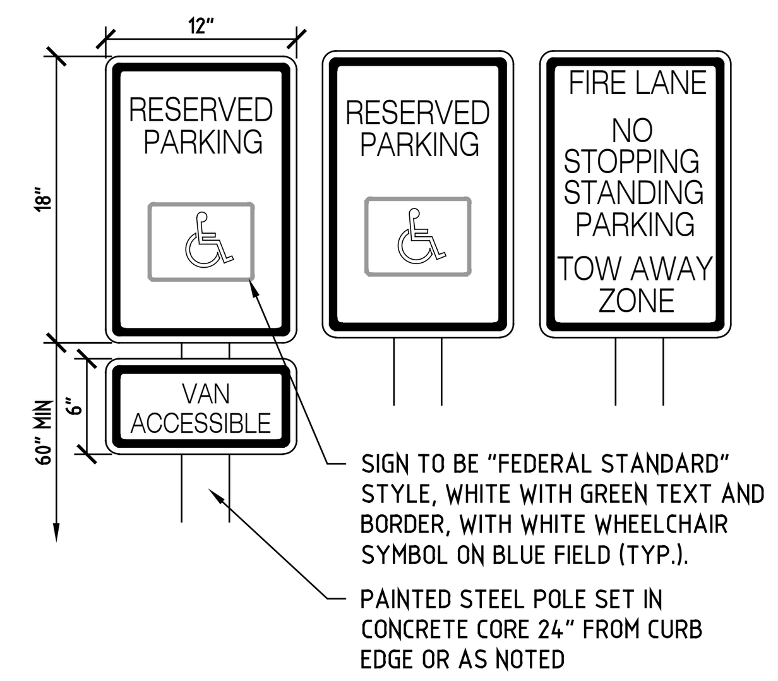
DUMPSTER ENCLOSURE DETAIL



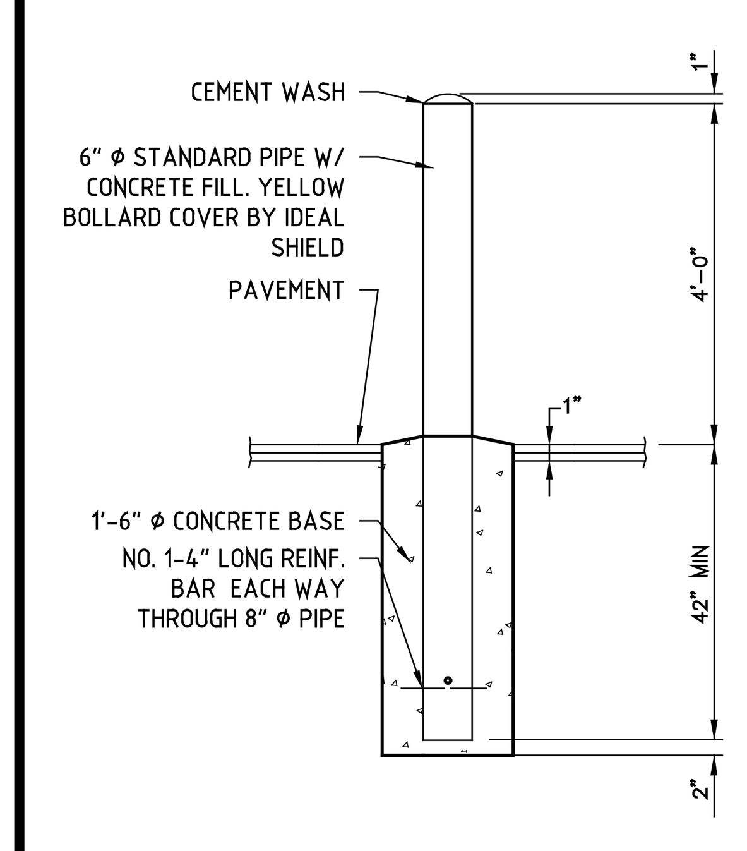
PARKING SPACE PAINT DETAIL



HANDICAP SIGN DETAIL



BOLLARD DETAIL



1 Site Plan
SCALE: 1" = 20'

NORTH

DESIGNHAUS ARCHITECTURE
EST 1998

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STATE OF MICHIGAN
MICHAEL E PIZZOLA
LANDSCAPE ARCHITECT
No. 3901001656
REGISTERED LANDSCAPE ARCHITECT

Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

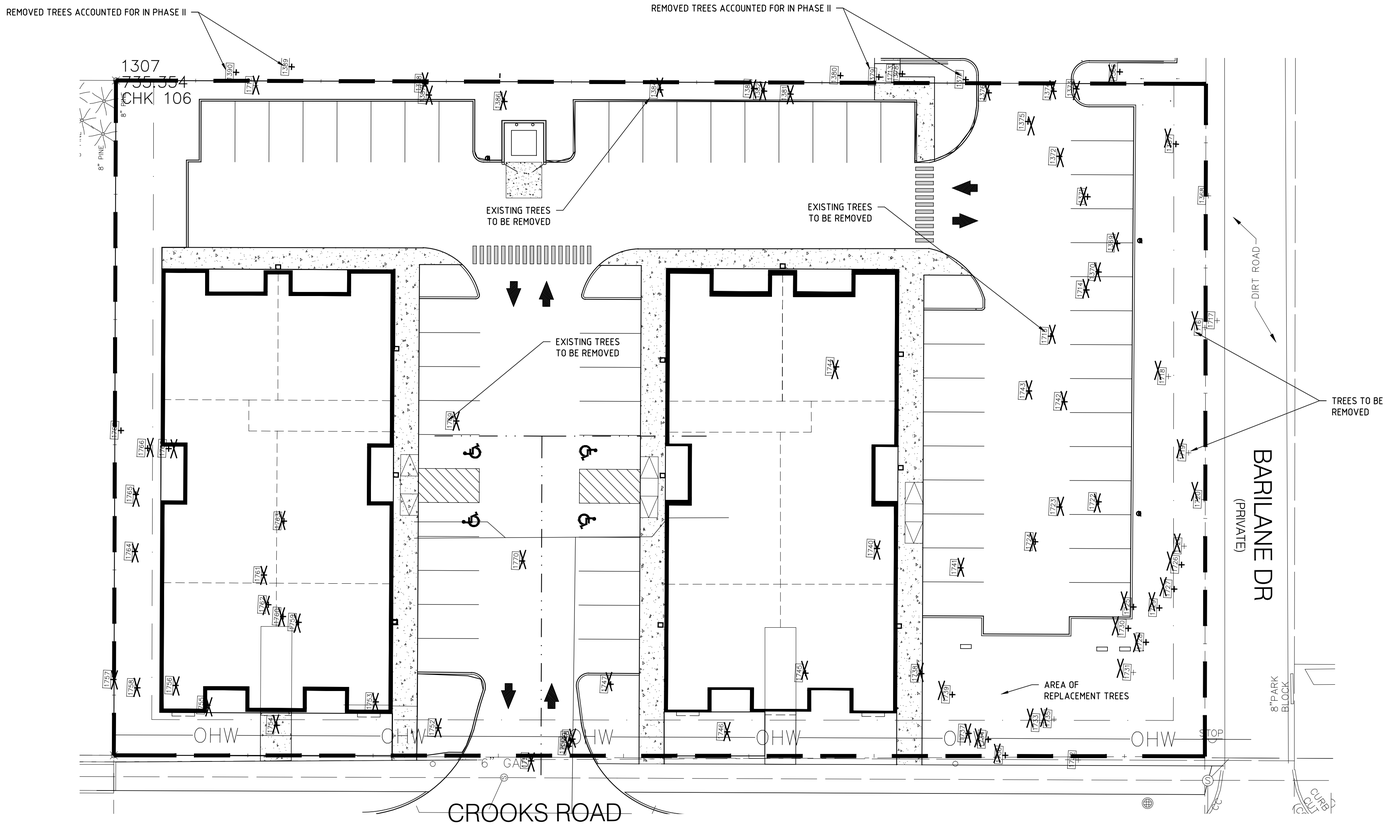
Hills West
3902 Crooks Rd.
Troy, MI 48098

Site Plan

021241

S101

S101 Site Plan.dwg
3/1/2022
Francesca Schovers



1 Tree Removal and Preservaton Plan
SCALE: 1' = 30'

NORTH

	A	B	C	D	E	F	G
1	TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
2	1712	AA	14	Tree-of-Heaven	Allanthus altissima	Fair	x1
3	1713	BW	10	Black Walnut	Juglans nigra	Good	
4	1714	E	21	American Elm	Ulmus americana	Good	
5	1715	SM	24	Silver Maple	Acer saccharinum	Fair	
6	1716	EE	24	Siberian Elm	Ulmus pumila	Fair	
7	1717	NM	8	Norway Maple	Acer platanoides	Good	
8	1718	BX	10	Box elder	Acer negundo	Fair	
9	1719	BX	10	Box elder	Acer negundo	Fair	
10	1720	BX	10	Box elder	Acer negundo	Fair	
11	1721	EE	14	Siberian Elm	Ulmus pumila	Good	
12	1722	E	8	American Elm	Ulmus americana	Good	
13	1723	EE	13	Siberian Elm	Ulmus pumila	Good	
14	1724	EE	11	Siberian Elm	Ulmus pumila	Fair	
15	1725	EE	13	Siberian Elm	Ulmus pumila	Good	
16	1726	E	12	American Elm	Ulmus americana	Good	
17	1727	EE	9	Siberian Elm	Ulmus pumila	Fair	
18	1728	EE	13	Siberian Elm	Ulmus pumila	Fair	
19	1729	EE	9	Siberian Elm	Ulmus pumila	Fair	
20	1730	E	9	American Elm	Ulmus americana	Good	
21	1731	EE	14	Siberian Elm	Ulmus pumila	Good	
22	1732	E	9	American Elm	Ulmus americana	Fair	x1
23	1733	BW	12	Black Walnut	Juglans nigra	Fair	
24	1734	MW	9	White Mulberry	Morus alba	Fair	
25	1735	E	8	American Elm	Ulmus americana	Fair	vine covered
26	1736	BX	8	Box elder	Acer negundo	Fair	
27	1737	E	8	American Elm	Ulmus americana	Poor	main leader cut under utility
28	1738	BX	17	Box elder	Acer negundo	Fair	
29	1739	E	11	American Elm	Ulmus americana	Fair	
30	1740	BrWW	25	Black Willow	Salix nigra	Poor	
31	1741	MW	8	White Mulberry	Morus alba	Fair	
32	1742	E	8	American Elm	Ulmus americana	Good	
33	1743	BX	8	Box elder	Acer negundo	Very Poor	
34	1744	NS	28	Norway Spruce	Picea abies	Good	
35	1745	EE	18	Siberian Elm	Ulmus pumila	Fair	
36	1746	SC	20	Scotch Pine	Pinus sylvestris	Good	
37	1747	SC	10	Scotch Pine	Pinus sylvestris	Fair	
38	1748	SC	8	Scotch Pine	Pinus sylvestris	Poor	
39	1749	SC	10	Scotch Pine	Pinus sylvestris	Poor	
40	1750	SC	10	Scotch Pine	Pinus sylvestris	Fair	
41	1751	SC	12	Scotch Pine	Pinus sylvestris	Poor	
42	1752	SC	8	Scotch Pine	Pinus sylvestris	Poor	
43	1753	SC	10	Scotch Pine	Pinus sylvestris	Fair	
44	1754	BX	11	Box elder	Acer negundo	Very Poor	x2
45	1755	SC	10	Scotch Pine	Pinus sylvestris	Fair	
46	1756	SC	12	Scotch Pine	Pinus sylvestris	Fair	
47	1757	SC	9	Scotch Pine	Pinus sylvestris	Fair	
48	1758	SC	9	Scotch Pine	Pinus sylvestris	Fair	
49	1759	EE	14	Siberian Elm	Ulmus pumila	Fair	
50	1760	EE	8	Siberian Elm	Ulmus pumila	Fair	
51	1761	EE	14	Siberian Elm	Ulmus pumila	Fair	
52	1762	EE	13	Siberian Elm	Ulmus pumila	Fair	
53	1763	MW	10	White Mulberry	Morus alba	Good	
54	1764	BX	10	Box elder	Acer negundo	Poor	
55	1765	EE	10	Siberian Elm	Ulmus pumila	Fair	
56	1766	EE	14	Siberian Elm	Ulmus pumila	Fair	
57	1767	BX	14	Box elder	Acer negundo	Fair	
58	1768	EE	20	Siberian Elm	Ulmus pumila	Fair	
59	1769	BX	14	Box elder	Acer negundo	Fair	
60	1770	WS	8	White Spruce	Picea glauca	Good	
61	1771	EE	24	Siberian Elm	Ulmus pumila	Good	

WOODLAND TREES REMOVED - 145" (50% REPLACEMENT VALUE) = 73" REQUIRED REPLACEMENT TREES

LANDMARK TREES REMOVED - 92" (100% REPLACEMENT VALUE) = 92" REQUIRED REPLACEMENT TREES

TREES PRESERVED - 0" (X2 REPLACEMENT VALUE)

	A	B	C	D	E	F	G
1	TAG NO.	CODE	DBH	COMMON NAME	LATIN NAME	COND	COMMENTS
168	1367	MW	8	White Mulberry	Morus alba	Fair	
169	1368	EE	6	Siberian Elm	Ulmus pumila	Fair	
170	1369	EE	13	Siberian Elm	Ulmus pumila	Poor	
171	1370	EE	19	Siberian Elm	Ulmus pumila	Fair	
172	1371	BC	10	Wild Black Cherry	Prunus serotina	Fair	
173	1372	PN	9	Pin Cherry	Prunus pennsylvanica	Fair	
174	1373	EE	7	Siberian Elm	Ulmus pumila	Fair	
175	1374	MW	9	White Mulberry	Morus alba	Fair	
176	1375	EE	9	Siberian Elm	Ulmus pumila	Very Poor	
177	1376	PN	10	Pin Cherry	Prunus pennsylvanica	Poor	
178	1377	BW	6	Black Walnut	Juglans nigra	Fair	
179	1378	BW	9	Black Walnut	Juglans nigra	Fair	
180	1379	EE	9	Siberian Elm	Ulmus pumila	Very Poor	
181	1380	EE	8	Siberian Elm	Ulmus pumila	Poor	
182	1381	JP	13	Jack Pine	Pinus banksiana	Fair	
183	1382	JP	9	Jack Pine	Pinus banksiana	Poor	
184	1383	JP	9	Jack Pine	Pinus banksiana	Fair	
185	1384	BX	14	Box elder	Acer negundo	Fair	
186	1385	SM	35	Silver Maple	Acer saccharinum	Fair	
187	1386	BW	18	Black Walnut	Juglans nigra	Fair	
188	1387	BW	14	Black Walnut	Juglans nigra	Fair	x1
189	1388	BW	18	Black Walnut	Juglans nigra	Fair	
190	1389	AA	18	Tree-of-Heaven	Allanthus Altissima	Fair	
191	1390	AA	17	Tree-of-Heaven	Allanthus Altissima	Fair	
192	1391	BW	26	Black Walnut	Juglans nigra	Poor	

WOODLAND TREES REMOVED - 89" (50% REPLACEMENT VALUE) = 45" REQUIRED REPLACEMENT TREES

LANDMARK TREES REMOVED - 62" (100% REPLACEMENT VALUE) = 62" REQUIRED REPLACEMENT TREES

TREES PRESERVED - 0" (X2 REPLACEMENT VALUE)

TREES DISPOSITION ON SITE

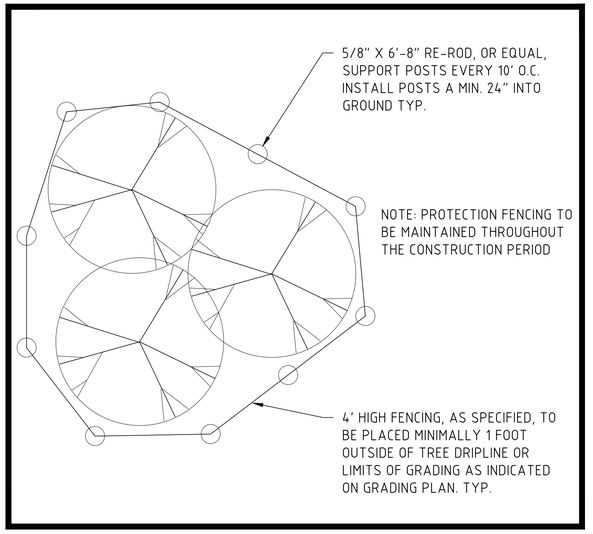
WOODLAND TREES TO BE REMOVED (50% REPLACEMENT)

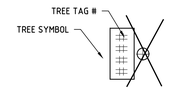
INVASIVE TREES TO BE REMOVED (0% REPLACEMENT)

EXISTING TREES TO REMAIN (X2 REPLACEMENT)

LANDMARK TREES REMOVED (100% REPLACEMENT)

TREE PROTECTION DETAIL





EXISTING TREE TO BE REMOVED

EXISTING TREE TO REMAIN

TOTAL TREES ON SITE - 85
ON SITE TREES REMOVED -85
ON SITE TREES PRESERVED - 0
ON SITE LANDMARK TREES REMOVED - 7
ON SITE WOODLAND TREES REMOVED - 23
LANDMARK CALIPER INCHES= 154" (@100% REPLACEMENT)
WOODLAND CALIPER INCHES - 234" (@ 50% REPLACEMENT) = 118"
CALIPER INCHES TO BE REPLACED = 272"
CALIPER INCHES PRESERVED- 0" (X2 REPLACEMENT CREDIT = 0")
TOTAL CALIPER INCHES TO BE REPLACED- 272"
272 REPLACEMENT INCHES / 3 = (91) 3" CALIPER TREES

NOTE: SEE L101 FOR ALLOCATION OF 91 REPLACEMENT 3" CALIPER TREES

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STATE OF MICHIGAN MICHAEL E. PIZZOLA LANDSCAPE ARCHITECT No. 3901001656 REGISTERED LANDSCAPE ARCHITECT

SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02
Revision/Issue	Date

Hills West
3902 Crooks Rd.
Troy, MI 48098

Tree Removal & Preservation Plan

021241

L100

L100 Tree Removal & Preservation Plan.dwg
3/1/2022
Mike Pizzola

Disposition	Landscaping Required	Landscaping Provided
General Site Landscaping:	20% Min.	+22.30% w Plant Material
Replacement Trees - R	91 Trees Required	91 Provided
Greenbelt Requirements:	1 Tree / 30' 306 / 30 = 10	10 Trees Along Crooks R.O.W.
Screening Requirements:	Buffer Type 1 or 2 Between Conflicting Land Uses	Type 1 @ North and South Property Lines
Parking Lot Requirements: P	1 Tree / 8 Spaces 60 / 8 = 8 Trees	10 Trees

GENERAL NOTES FOR LANDSCAPE DEVELOPMENT

1. LANDSCAPE CONTRACTOR SHALL VISIT THE SITE, INSPECT EXISTING SITE CONDITIONS AND REVIEW PROPOSED PLANTING AND RELATED WORK. IN CASE OF DISCREPANCY BETWEEN PLAN AND PLANT LIST, PLAN SHALL GOVERN QUANTITIES. CONTACT LANDSCAPE ARCHITECT WITH ANY CONCERNS.
2. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL ON SITE UTILITIES PRIOR TO BEGINNING CONSTRUCTION ON HIS/HER PHASE OF WORK. ELECTRIC, GAS, TELEPHONE, CABLE TELEVISION MAY BE LOCATED BY CALLING MISS DIG. ANY DAMAGE OR INTERRUPTION OF SERVICES SHALL BE THE RESPONSIBILITY OF CONTRACTOR. CONTRACTOR SHALL COORDINATE ALL RELATED ACTIVITIES WITH OTHER TRADES ON THE JOB AND SHALL REPORT ANY UNACCEPTABLE JOB CONDITIONS TO OWNER'S REPRESENTATIVE PRIOR TO COMMENCING.
3. ALL PLANT MATERIAL TO BE PREMIUM GRADE NURSERY STOCK AND SHALL SATISFY AMERICAN ASSOCIATION OF NURSERYMEN STANDARD FOR NURSERY STOCK. ALL LANDSCAPE MATERIAL SHALL BE NORTHERN GROWN, NO. 1 GRADE.
4. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL QUANTITIES SHOWN ON LANDSCAPE PLAN PRIOR TO PRICING THE WORK.
5. THE OWNERS REPRESENTATIVE RESERVES THE RIGHT TO REJECT ANY PLANT MATERIAL NOT MEETING SPECIFICATIONS.
6. ALL SINGLE STEM SHADE TREES TO HAVE STRAIGHT TRUNKS AND SYMMETRICAL CROWNS.
7. ALL SINGLE TRUNK SHADE TREES TO HAVE A CENTRAL LEADER; TREES WITH FORKED OR IRREGULAR TRUNKS WILL NOT BE ACCEPTED.
8. ALL TREES TO HAVE CLAY OR CLAY LOAM BALLS, TREES WITH SAND BALLS WILL BE REJECTED.
9. ALL TREE LOCATIONS SHALL BE STAKED BY LANDSCAPE CONTRACTOR AND ARE SUBJECT TO THE APPROVAL OF THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION OF THE PLANT MATERIAL.
10. CONCERNING GROUND COVER, ALL PLANTING BEDS SHALL RECEIVE 3" SHREDDED HARDWOOD BARK MULCH, SEE SPECIFICATIONS. ALL OTHER DISTURBED AREAS SHALL BE SODDED.
11. LANDSCAPING SHALL BE MAINTAINED IN A GOOD CONDITION TO PRESENT A HEALTHY, NEAT, AND ORDERLY APPEARANCE FREE FROM REFUSE AND DEBRIS. ALL UNHEALTHY AND DEAD MATERIAL SHALL BE REPLACED WITHIN ONE (1) YEAR OF THE NEXT APPROPRIATE PLANTING PERIOD.
12. OWNER TO ESTABLISH MAINTENANCE PROGRAM TO ENSURE GROUNDS AND LANDSCAPING TO REMAIN HEALTHY AND WELL GROOMED.
13. RECOMMENDED PLANTING DATES ARE MARCH 1ST TO MAY 15TH FOR ALL MATERIALS, AND OCTOBER 15TH TO DECEMBER 15TH FOR DECIDUOUS MATERIALS. PLANTINGS OUTSIDE THESE DATES SHALL HAVE PRIOR APPROVAL OF THE LANDSCAPE ARCHITECT.
14. UNDERGROUND IRRIGATION SYSTEM TO BE DESIGNED AND INSTALLED BY CONTRACTOR.
15. TURF GRASS TO BE COMMON TO OAKLAND COUNTY, MI.

PLANT SCHEDULE

QTY.	TAG	BOTANICAL NAME	COMMON NAME	SIZE/ROOT
16	HL	GLEDITSIA t INERMIS	THORNLESS HONEYLOCUST	3" B&B
25	AM	ACER ginallla	AMUR MAPLE	3" B&B
24	WP	PINUS strobus	WHITE PINE	7-8' B&B
24	RM	ACER rubrum 'ARMSTRONG'	ARMSTRONG RED MAPLE	3" B&B
9	RB	AESCULUS pavia	RED BUCKEYE	3" B&B
21	WS	PICEA glauca	WHITE SPRUCE	7-8' B&B
72	MK	SYRINGA p MISS KIM	MISS KIM LILAC	24" B&B

Total Trees: 119
Total Shrubs: 72
Total New Plant Material Provided: 191 Plants

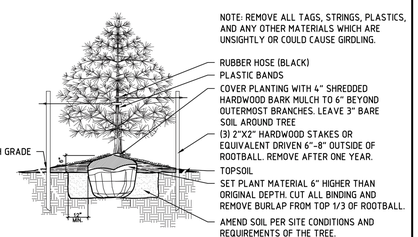
Irrigation Cost Estimate: $6,500.00
Total Landscape Cost Estimate: $50,745.00

2 WOODLAND REPLACEMENT TREES PROVIDED

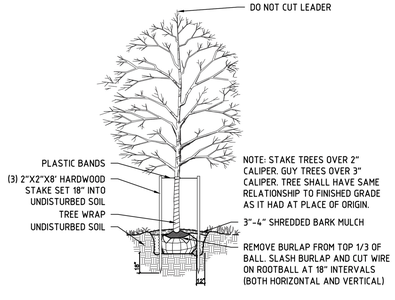
PLANT SPACING:
FRONTAGE TREES - 30' O.C.
EVERGREEN TREES - 10' O.C.
NARROW EVERGREEN TREES - 5' O.C.
SHRUBS - 3' O.C.
PERENNIALS / GRASSES - 3' O.C.

PLANTING DETAILS

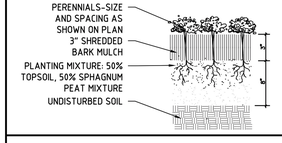
EVERGREEN TREES



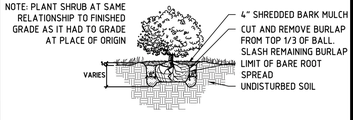
DECIDUOUS TREES



PERENNIALS



SHRUBS



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Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
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Hills West
3902 Crooks Rd.
Troy, MI 48098

Landscape Plan

021241

L101

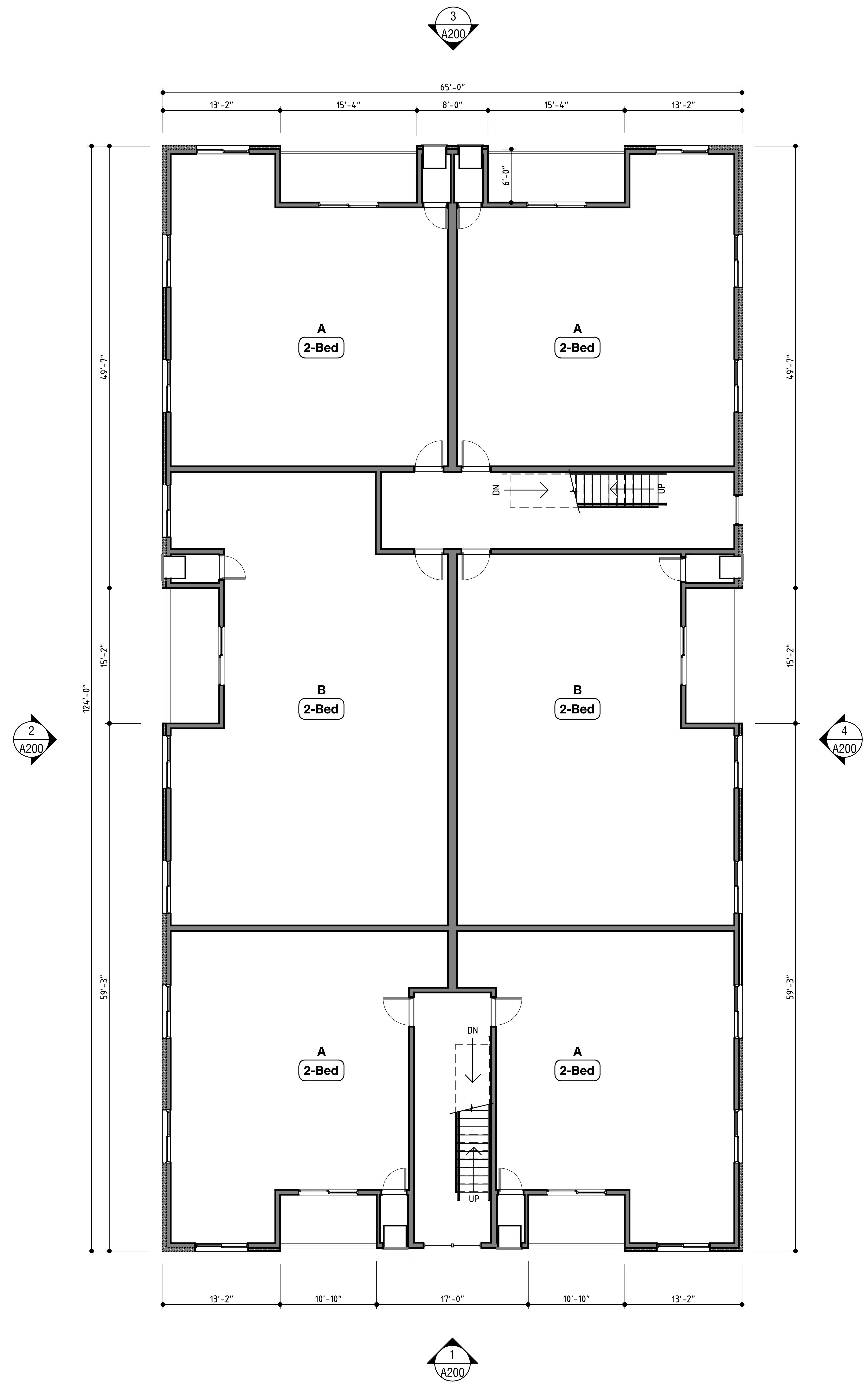
L101 Landscape Plan.dwg
2/28/2022
Mike Pizzola

UNIT MATRIX

	A	B	C	TOTAL
GROUND FLOOR	4	2*	0	5
MIDDLE FLOOR	4	2	0	6
UPPER FLOOR	0	0	3	3
TOTAL	8	4	3	14

ALL UNITS 2 BEDROOMS

* One B-Type Unit replaced with Bike Storage in North Building



2 Typical Middle Floor Plan

SCALE: 1/8" = 1'

NORTH

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STATE OF MICHIGAN
PETER M. STUHLREYER
ARCHITECT
NO. 44666
LICENSED ARCHITECT

[illegible]

Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Typical Ground & Middle Floor Plan

021241

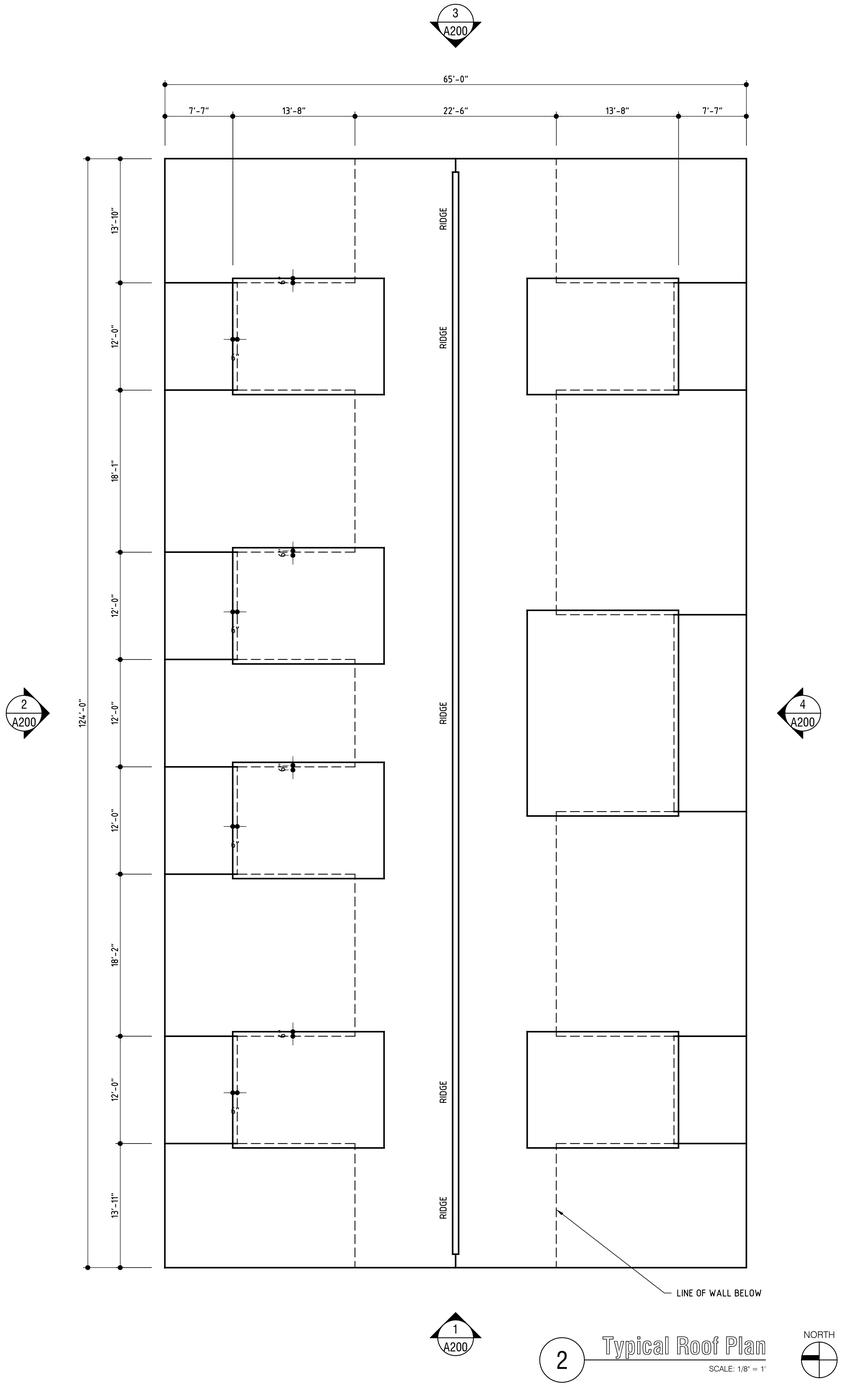
A100

UNIT MATRIX

	A	B	C	TOTAL
GROUND FLOOR	4	2*	0	5
MIDDLE FLOOR	4	2	0	6
UPPER FLOOR	0	0	3	3
TOTAL	8	4	3	14

ALL UNITS 2 BEDROOMS

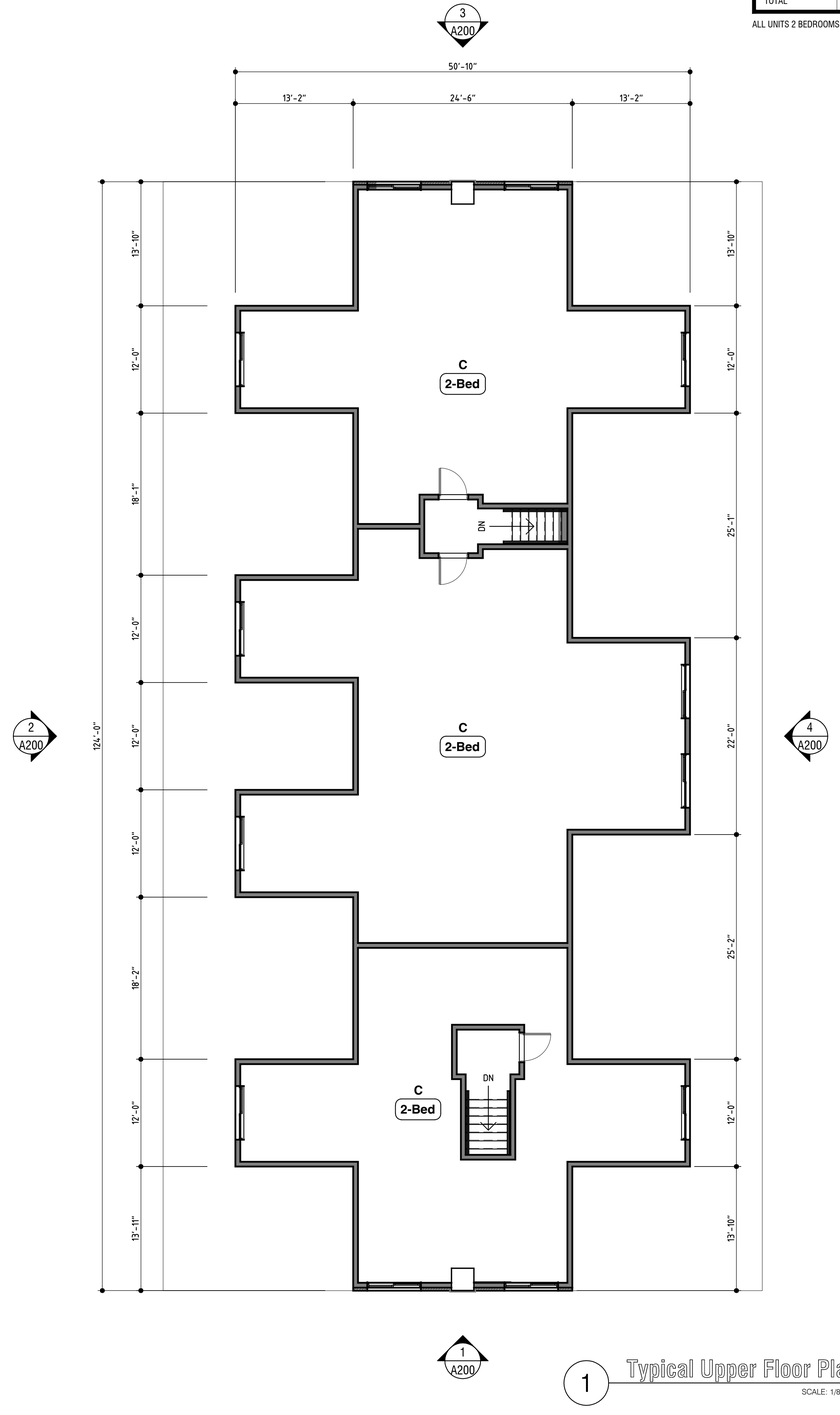
* One B-Type Unit replaced with Bike Storage in North Building



2 Typical Roof Plan

SCALE: 1/8" = 1'

NORTH



1 Typical Upper Floor Plan

SCALE: 1/8" = 1'

NORTH

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PETER M. STUHLREYER ARCHITECT 44008

Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Typical Upper Floor and Roof Plan

021241

A101

A101 Typical Third Floor Plan.dwg

3/1/2022

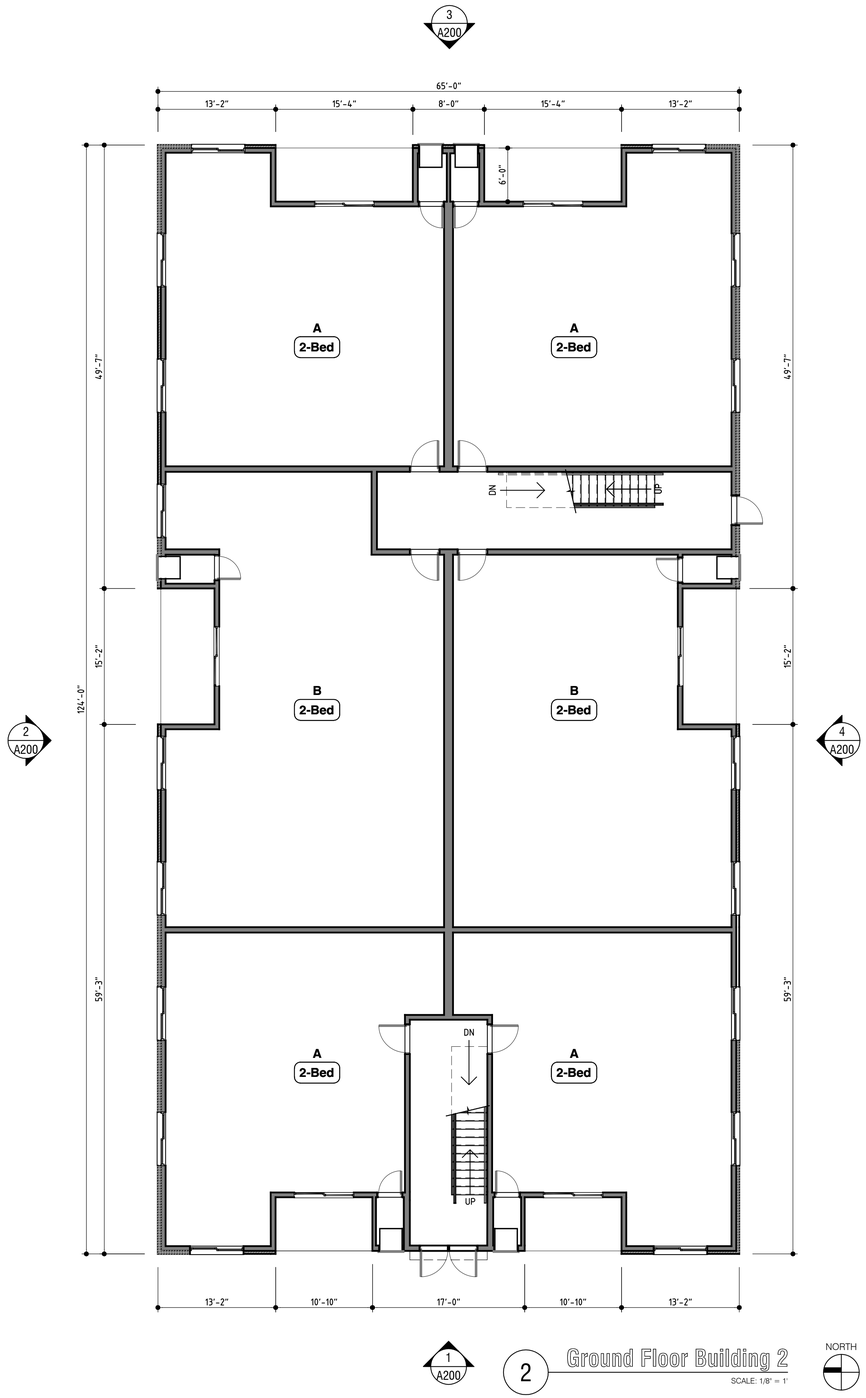
DHAROCCOM-020

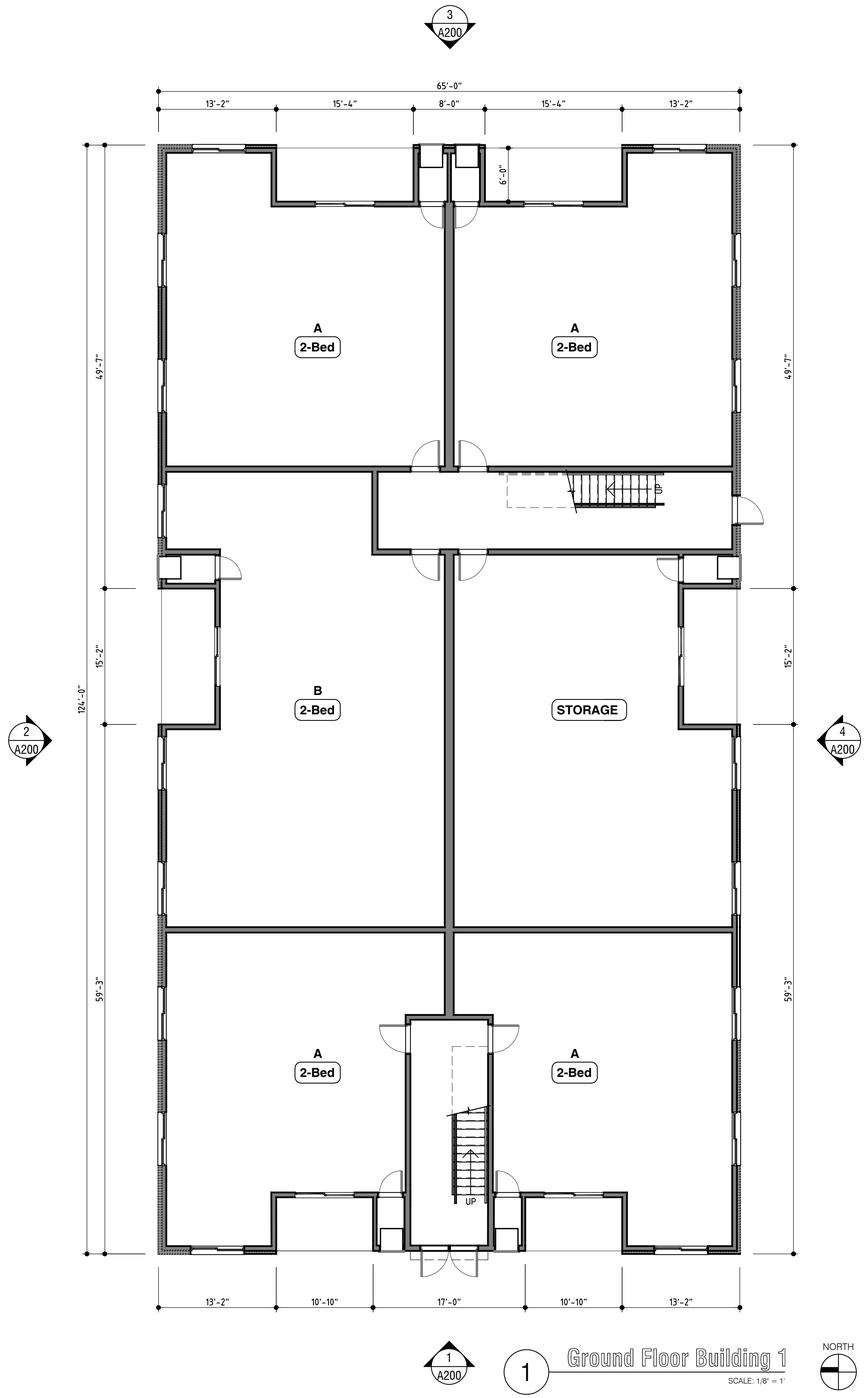
UNIT MATRIX

	A	B	C	TOTAL
GROUND FLOOR	4	2*	0	5
MIDDLE FLOOR	4	2	0	6
UPPER FLOOR	0	0	3	3
TOTAL	8	4	3	14

ALL UNITS 2 BEDROOMS

* One B-Type Unit replaced with Bike Storage in North Building





DESIGNHAUS ARCHITECTURE EST 1998

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PETER M. STUHLREYER ARCHITECT 44668

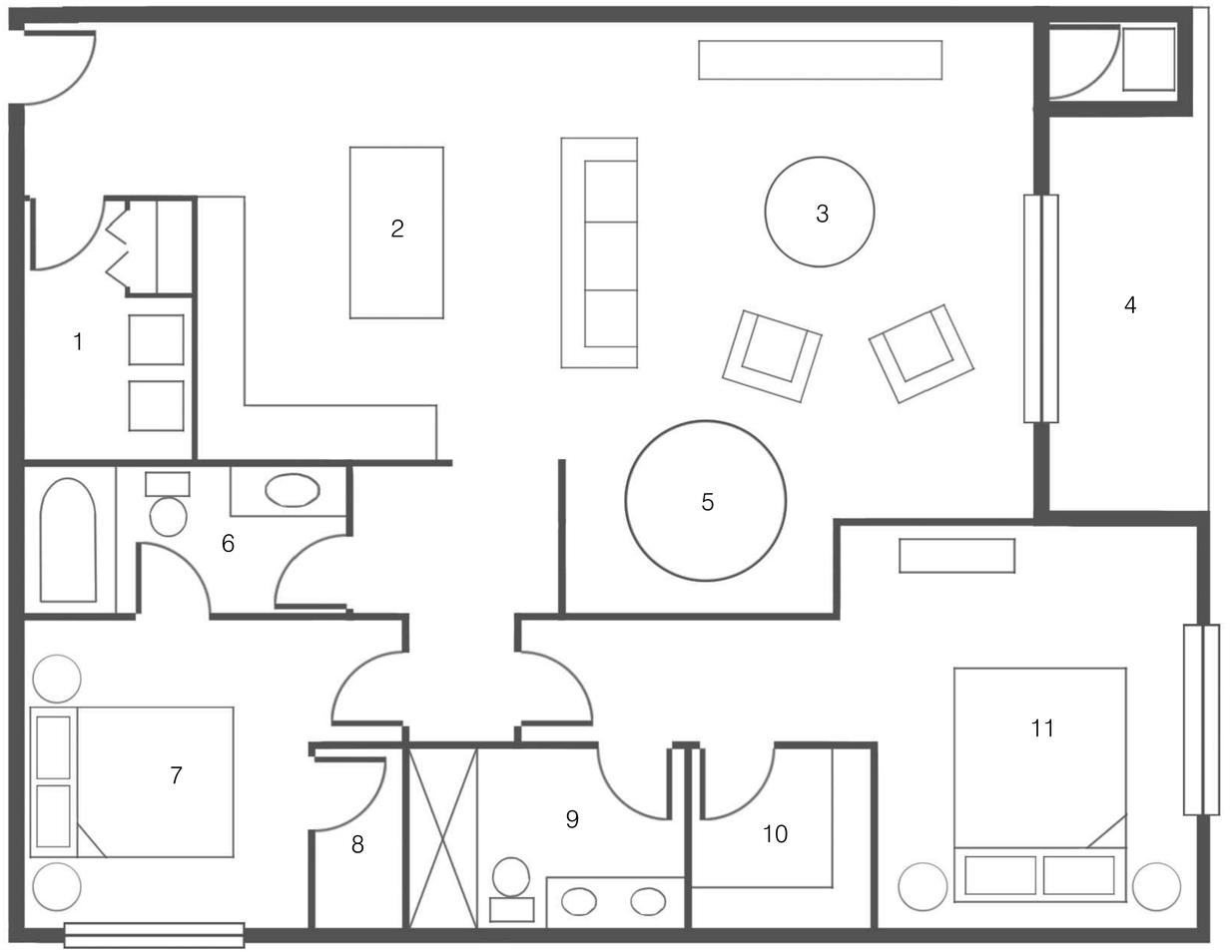
Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Building 1 & 2 Ground Floor Plans

021241

A102



1 Typical Unit Plan
SCALE: N.T.S

1. Laundry
2. Kitchen
3. Living Room
4. Balcony
5. Dining Room
6. Bathroom
7. Bedroom
8. Closet
9. Bathroom
10. Walk in Closet
11. Master Bedroom

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Hills West
3902 Crooks Rd.
Troy, MI 48098

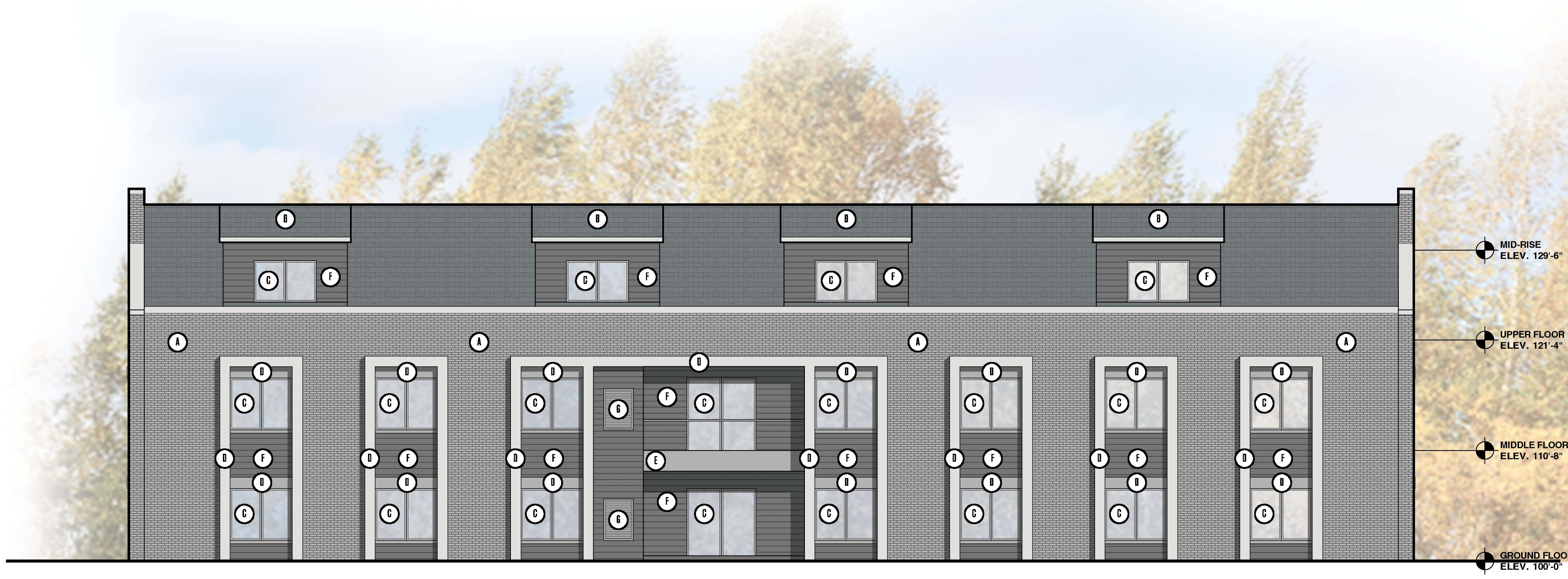
Typical Unit Plan

021241

A103

4 South Elevation
SCALE: 1/8" = 1'

3 East Elevation
SCALE: 1/8" = 1'



2 North Elevation
SCALE: 1/8" = 1'

1 West Elevation
SCALE: 1/8" = 1'

MATERIAL LEGEND

A	BRICK
B	ASPHALT SHINGLE ROOFING
C	VINYL WINDOW
D	LIMESTONE HEADER
E	METAL BALCONY
F	VINYL SIDING
G	MECHANICAL VENT
H	ENTRY DOOR
I	AWNING

DESIGNHAUS ARCHITECTURE
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STATE OF MICHIGAN
PETER M. STUHLREYER
ARCHITECT
No. 44666
LICENSED ARCHITECT
[illegible]

Revision/Issue	Date
SPA Resubmittal	22.02.24
SPA Resubmittal	21.10.28
SPA Review Set	21.10.06
SPA Review Set	21.09.02

Hills West
3902 Crooks Rd.
Troy, MI 48098

Elevations

021241

A200

A200 Elevations.dwg
2/23/2022
DHAROCCOM-020

memorandum

Date: March 10, 2022

To: Bill Huotari, PE

From: Genevieve Schneemann & Sara Merrill, PE, PTOE

Re: Hills West
Preliminary Site Plan Review

We have reviewed the preliminary site plans for Hills West, a residential development consisting of two new 2.5-story buildings, one proposing15-units and the other proposing 14-units. The site proposes one access point to Crooks Road, as well as a proposed cross-access to the adjacent easterly site (Westington Multi-Family). The development is located on the south side of Wattles Road, just east of Crooks Road. The plans were prepared by DesignHaus Architecture and PEA, Inc. and provided electronically on March 10th, 2022.

At this time, OHM recommends approval of the preliminary site plan, subject to the comments below being incorporated into the final engineering plans.

OHM's comments on the proposed site plan are noted below:

1. Revise plans to eliminate inconsistencies between the PEA and DesignHaus plans. For example, plan sheets with a C- prefix show proposed sidewalks along the Crooks Road frontage, sidewalk curb ramps, and curb islands and radii within the parking lot (resulting in 1 less parking space), whereas sheets with S-prefix appear to show less refined layouts, a shorter deceleration lane, and omit the sidewalk along Crooks Road. We presume the PEA plans reflect the most accurate site layout.

2. Add dimension labels for the right turn lane and taper, curb radii and driveway throat width.

3. The right turn lane geometry on Crooks Road must conform with RCOC requirements. It appears the entrance taper may be less than 75 feet in length.

4. A detail for bollards has been provided on Sheet S101. Proposed bollard locations should be clearly shown on the plans.

5. Sidewalks:

    a. At the site driveway, extend the concrete sidewalk (with sidewalk jointing) through the driveway approach, as shown in the City's Engineering Standards.

    b. On the site civil plans, the proposed sidewalk connection on this site does not match up with the sidewalk on the adjacent Westington site. Revise plans to provide a continuous and accessible pedestrian route between the two sites.

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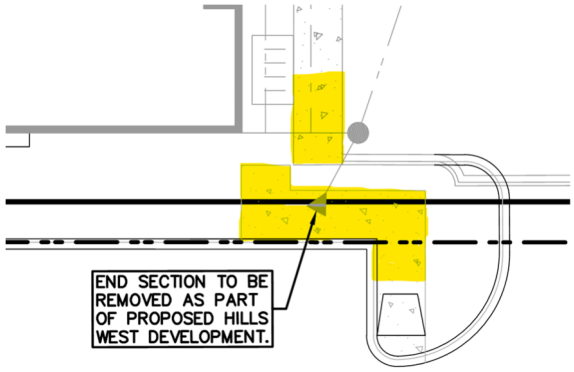
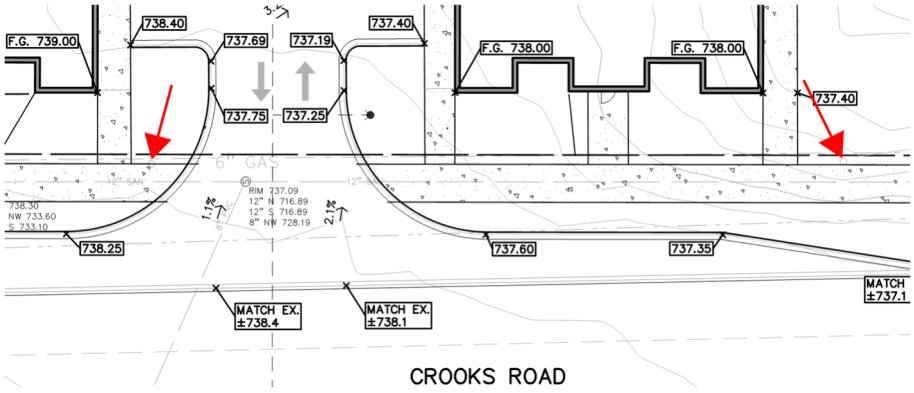


c. The proposed sidewalk along the Crooks Road right-of-way, just north of the site drive, appears to conflict with an existing electric pole. The utility pole near the southwest corner of Building 1 is located immediately adjacent to the public sidewalk. Utility poles should be located two (2) feet off the edge of walk. Plans should clearly indicate which poles are being relocated, as well as show proposed pole locations (if applicable).



d. At Barilane Drive, proposed sidewalk along the right-of-way must be aligned with the existing sidewalk on the south side of the street. Extend proposed sidewalk and reconfigure to provide a pedestrian crossing perpendicular to the road.