

# The Silos of Waterford

## Verlinda Homes

### Application to Norfolk County

Official Plan Amendment

Zoning Amendment

Draft Plan of Subdivision

Project 21-061

March 6, 2023







# vallee

*Consulting Engineers,  
Architects & Planners*

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# vallee

*Consulting Engineers,  
Architects & Planners*

March 6, 2023

Norfolk County  
Clerks and By-Law  
50 Colborne Street South  
Simcoe, Ontario N3Y 4H3

Norfolk County  
Community Development Division  
185 Robinson Street  
Simcoe, Ontario N3Y 5L6

Sent by email only to: Teresa Olsen [Teresa.Olsen@norfolkcounty.ca](mailto:Teresa.Olsen@norfolkcounty.ca)  
NC Clerks [clerks@norfolkcounty.ca](mailto:clerks@norfolkcounty.ca)  
Mohammad Alam [Mohammad.Alam@norfolkcounty.ca](mailto:Mohammad.Alam@norfolkcounty.ca)

**Attention: Teresa Olsen, County Clerk  
Mohammad Alam, Principal Planner**

**Reference: The Silos of Waterford  
Application for Zoning and Official Plan Amendments and Draft Plan of Subdivision  
Waterford, Norfolk County  
Our File 21-061**

Please accept this package as our formal application for the following planning applications:

1. Zoning By-Law Amendment
2. Official Plan Amendment
3. Draft Plan of Subdivision

In response to Norfolk County's minutes issued in February of 2023 relating to the pre-consultation meeting of August 25, 2021, we include the following documents as our complete application package:

1. This cover letter.
2. Our client's cheque for Norfolk County's application fee calculated as follows:
  - a. \$9,652 for a combined zoning and official plan amendment (major)
  - b. \$11,258 for a draft plan of subdivision (\$10,058 + 16 lots @ \$75)
  - c. \$20,910 TOTAL PAYABLE TO NORFOLK COUNTY**
3. Summary notes from a meeting on February 28, 2023 with Norfolk County staff to confirm a complete application.
4. A copy of the Norfolk County minutes issued in February 2023 from the August 25, 2021 pre-consultation meeting, signed by Mr. John D. Vallee, P.Eng.

- a. An email from Mohammad Alam, Norfolk County Principal Planner, dated January 3, 2023 confirming that a record of site condition is not required at the OPA / ZBA / DPA stage, but rather will be a requirement to remove the anticipated holding provision on the amended zoning. This modifies the pre-consultation meeting requirements for a complete application.
5. Completed and executed Norfolk County Planning Department Development Application Form.
6. Draft plan of subdivision.
7. Conceptual site plan for the combined subdivision and condominium.
8. Planning Justification Report as prepared by G. Douglas Vallee Limited.
9. Urban Design Brief as prepared by G. Douglas Vallee Limited.
10. Phase 1 Environmental Site Assessment as prepared by G2S Consultants.
11. Parking assessment is contained within the Planning Justification Report.
12. Functional Servicing and Stormwater Management Report containing the anticipated flows and demands associated with the project as prepared by G. Douglas Vallee Limited.
13. General Plan of Services
14. January 24, 2022 request to Norfolk County to undertake water and sanitary modelling reports. At our meeting of February 28, 2023 with Norfolk Planning and Development Engineering staff, it was agreed that this would be sufficient in lieu of completed modeling reports for a complete planning application.
15. G. Douglas Vallee's November 2021 submission to Infrastructure Ontario requesting an easement over the Waterford Rail Trail to install a storm sewer for this development.
16. Email exchange with Rita Kelly, Infrastructure Ontario, Real Estate Transaction Manager in which she confirms the applicant's request for an easement over the Waterford Rail Trail "***has been successfully circulated to IO stakeholders without objection and IO will proceed to work with you to acquire an easement.***"
17. Traffic Impact Study as prepared by Paradigm traffic consultants.

**G. DOUGLAS VALLEE LIMITED**  
**Consulting Engineers, Architects & Planners**



This submission has been made electronically. You can download the submission supporting documents listed above directly from our website using the following process:

1. Go to the Vallee website: [www.gdvallee.ca](http://www.gdvallee.ca)
2. On the top menu, select "Clients."
3. Enter your email and password which have been set as follows:
  - a. E: [clerks@norfolkcounty.ca](mailto:clerks@norfolkcounty.ca) P: Clerks1234
  - b. E: [Mohammad.Alam@norfolkcounty.ca](mailto:Mohammad.Alam@norfolkcounty.ca) P: Mohammad1234
4. A blue box will appear. Click on "Click to Expand."
5. The file will become available and can be viewed by double clicking on it.

Based on a submission date of Monday March 6, we request that you process this application in accordance with the following schedule:

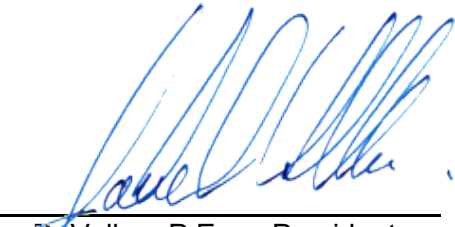
**April 5, 2023:** 30 days after submission, confirm that this application is complete.

**July 4, 2023:** 120 days after submission, decision for approval by Norfolk County Council.

Should you have any questions or comments, please contact me immediately so that we can address your items in a timely manner.

Thank you in advance for your support of this project.

Yours very truly,



John D. Vallee, P.Eng., President  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architect and Planners

c. Tom and Angie O'Hara, Verlinda Homes

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**G. DOUGLAS VALLEE LIMITED**  
**Consulting Engineers, Architects & Planners**



Authorized by the Association of Professional Engineers of Ontario  
to offer professional engineering services.





# vallee

*Consulting Engineers,  
Architects & Planners*

## Silos of Waterford

### Meeting to Confirm Complete Application

ZBA and OPA and Draft Plan of Subdivision Application

Based on February 2023 Norfolk County Minutes from the August 2021 Pre-Con Meeting

February 23, 2023 Meeting rescheduled to  
February 28, 2023

- Tricia Givens                      Norfolk Planning
- Mohammad Alam               Norfolk Planning
- Mike King                        Norfolk Development Engineering
- Tim Dickhout                   Norfolk Development Engineering
- Tom O'Hara                     Applicant
- John Vallee                      Development Prime Consultant

Required Document	Provided in Vallee Package	Comments
Meeting with Planner to confirm complete application	Today's meeting: February 28, 2023	
Pre-Con Minutes	February 2023 Minutes for August 25, 2021 meeting issued by Norfolk – Signed by Vallee	
Official Plan Application	Norfolk County application form	
Zoning By-Law Application	Norfolk County application form	
Draft Plan of Subdivision	Drawing by Vallee	
Proposed Site Plan	In PJR – is separate drawing required?	Separate drawing file
Planning Justification Report	Planning Justification Report - Vallee	
Urban Design Brief	Urban Design Brief - Vallee	
Record of Site Condition – reduced to Phase One ESA	Phase One Report (G2S)	Provide email from Mohammad that Phase 1 EAS is sufficient for a complete application. Remediation is underway. Phase 2 report will be provided once remediation. RSC will be required to remove the Holding provision.
Contaminated Site Study – confirm this is the Phase One ESA	Same as above	
Parking Assessment – Parking table on site plan and in PJR.	See PJR – page 10 Zoning drawing – Z101	

# Silos of Waterford

ZBA and OPA Application

Check List for Complete Application

Based on February 2023 Norfolk County Minutes from the August 2021 Pre-Con Meeting

Page 2

Traffic Impact Study	TIS – Paradigm – June 2022	
Concept Plan	Same as site plan above	
General Plan of Services	Drawing within FSR – Does this need to be separate?	Separate document from any reports.
Functional Servicing Report	FSR by Vallee	
Water modeling report	Requested Jan 24 2022 – 13 months ago. Repeated Jan 18, 2023	Agreed at Feb 28/23 meeting that the formal request for the modeling would be sufficient for a complete application.
Sanitary modeling report	Requested Jan 24 2022 – 13 months ago. Repeated Jan 18, 2023	Agreed at Feb 28/23 meeting that the formal request for the modeling would be sufficient for a complete application.
Stormwater Management Report	Part of FSR	
Confirm legal adequate outlet	Part of FSR	Re-submit email from Province of Ontario granting permission for use of rail trail for storm outlet to Waterford Ponds.
Anticipated flow to receiving systems	Part of FSR	
“In the opinion of Development Engineering, the use of cisterns in an urban area does not meet Norfolk County Zoning or Official Plan requirements.”		Givens asked Vallee to address NCOP Section 8.9.1 in PJR.
<b>Fees</b>		
Zoning & Official Plan Major	\$9,652	
Draft Plan of Subdivision	\$10,058 + 16 lots @ \$75 = \$11,258	
Other??	None	
<b>Total</b>	<b>\$20,910</b>	

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Consulting Engineers, Architects & Planners



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to offer professional engineering services







## Pre-Submission Consultation Meeting Notes

**Date:** August 25, 2021 These minutes issued Feb 15, 2023 in an email from Tricia Givens.

**Description of Proposal:** 16 dwelling unit subdivision with 2 condos (149 Units & 55 Units)

**Property Location:** 257 W CHURCH ST (intersection with McCool Street)

**Roll Number:** 33503002300

**Please read all the information contained in this document, as it pertains to the requirements for future development planning applications.** As a result of the information shared at the pre-consultation meeting dated August 25, 2021, the following applications and qualified professional documents / reports are required as part of a complete application. Failure to include all listed items with the application will deem the application incomplete. The County reserves the right to change, reduce or add requirements for a complete application, particularly if the submission does not match the proposal as reviewed during the pre-submission consultation meeting.

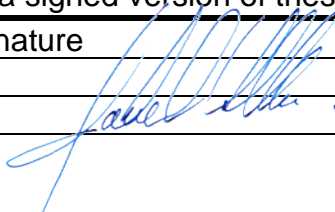
Please note that various fees are associated with each application and there are also costs for qualified professionals retained to complete various documents / reports. All requirements identified are minimum and determined as of the date of the pre-consultation meeting with the information available at that time. As the proposal proceeds and more information is made available, additional applications, studies, reports, etc. may be required.

The information contained in this document is applicable for a maximum of one (1) year from the date of meeting. If an application is not received within that time frame or any component of the proposal changes, a new pre-submission consultation meeting is required.

**All applications are required to include information outlined in the Pre-submission consultation meeting notes; failure to include all items with the application submission without prior approval will necessitate a notice of incomplete application response by the County.**

**Before you submit your application, please contact the assigned Planner to confirm submission requirements and the applicable fee.**

As part of a complete application, a signed version of these meeting notes is required.

Proponent / Agent Name	Signature	Date
John Vallee, P.Eng.		February 23, 2023

## Attendance List

Proponent	Tom O'Hara Angie O'Hara Melissa Stickl, Architect, G. Douglas Vallee Ltd. Scott Puillandre, Planner, G. Douglas Vallee Ltd. Eldon Darbyson, Director of Planning, G. Douglas Vallee Ltd. John Vallee, President, G. Douglas Vallee Ltd.
Community Development – Planning	Nicole Goodbrand, Senior Planner Mohammad Alam, Senior Planner  Annette Helmig, Agreement Coordinator
Community Development – Building and Zoning	Scott Northcott, Building Inspector III
Public Works – Development Engineering	Tim Dickhout, Project Manager Stephen Gradish, Development Technologist
Community Services – Fire	Katie Ballantyne, Community Safety Officer
Corporate Support Services – Realty Services	Lydia Harrison, Realty Services Coordinator
Long Point Regional Conservation Authority	Isabel Johnson, Resource Planner

## Privileged Information and Without Prejudice

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Norfolk County Zoning By-Law 1-Z-2014 <a href="https://www.norfolkcounty.ca/government/planning/new-zoning-by-law/">https://www.norfolkcounty.ca/government/planning/new-zoning-by-law/</a> .....	25



## **Privileged Information and Without Prejudice**

### **Proposal Summary**

The subject lands are located between Nichol Street and West Church Street, with frontage also on McCool Street to the east.

The applicant is proposing a multi-use development which is proposed to include a plan of subdivision of 15 street townhouses, two plan of condominium (an eight storey, approx. 129-unit condo building with service commercial uses, and 55 condos in a variety of designs).

**Privileged Information and Without Prejudice**

**List of Application Requirements\* and General Comments**

**Planning Department**

Planning application(s) required to proceed		Required
Official Plan Amendment Application (Major)		X
Zoning By-law Amendment Application (Major)		X
Site Plan Application (Major)		X**
Draft Plan of Subdivision Application		X**
Draft Plan of Condominium Application		X**
Part Lot Control Application		
Consent / Severance Application		
Minor Variance Application		
Removal of Holding Application		
Temporary Use By-Law Application		
Other - Click here to enter text.		
Planning requirements for a complete application The items below are to be submitted as part of the identified Planning Application(s). ** electronic/PDF copies of all plans, studies and reports are required**	Required at OPA/ Zoning Stage	Required at Site Plan Stage
Proposed Site Plan / Drawing	X	X
Planning Impact Analysis Report / Justification Report + Urban Design Brief	X	X UDB
Environmental Impact Study Choose an item.		
Neighbourhood Plan (TOR (Terms of Reference) must be approved by the County)		
Agricultural Impact Assessment Report		
Archaeological Assessment		
Heritage Impact Assessment		
Market Impact Analysis		
Dust, Noise and/or Vibration Study		
MOE D-Series Guidelines Analysis		
Landscaping Plan		X
Elevation Plan		
Photometrics (Lighting) Plan		X
Odour mitigation plan (in relation to Cannabis Production and Processing Facilities)		
Shadow Analysis Report		

Mohammad Alam email of January 3, 2023 confirmed a Record of Site Condition is NOT required for complete application. ESA Phase One will be sufficient.

Continued within PRJ

## Information and Without Prejudice

Record of Site Condition	X	
Contaminated Site Study	X	
Minimum Distance Separation Schedule		
Parking Assessment	X	
Hydrogeological Study		
Restricted Land Use Screening Form		
Topographical Survey Drawing		X
<b>Additional Planning requirements</b>		<b>Required</b>
Development Agreement		X
Parkland Dedication/Cash-in-lieu of Parkland		X

\*The list of Planning Department requirements is based on the information submitted and as presented for this specific pre-consultation meeting. Norfolk County reserves the right to adjust requirements including identifying additional requirements or reducing requirements. Any changes to a proposal may necessitate changes to Planning Department submission requirements. Furthermore, reports and studies are subject to peer review.

\*\*These applications should be submitted at applicable time. Site Plan will not be accepted prior to appropriate land use permissions being in place, including Official Plan and Zoning permissions, to ensure applicable timeframes can be met.

Community Development fees, applications, and helpful resources can be found by visiting <https://www.norfolkcounty.ca/government/planning/>

## Planning Comments

*All comments are general and nature and subject to change pending modifications to the proposal and full analysis at the application submission stage.*

The subject lands are designated Industrial in the Norfolk County Official Plan and zoned General Industrial in the Norfolk County Zoning By-law, 1-Z-2014. The site was previously the Norfolk Co-op. The Industrial Designation in the Official Plan applies to older industrial sites that are under-utilized and poorly situated to attract new industrial investment. The Official Plan identifies that “the conversion of lands designated as Industrial to other uses more compatible with the neighbourhood context in which the lands are situated is encouraged.” The redevelopment of these lands are subject to the policies outlined in 7.13.2, and are subject to an Official Plan Amendment. Applications for the conversion of lands designated Industrial to other land uses shall be subject to the consideration of the following policies:

- i) Conversion to a residential land use shall be subject to the policies set out in Section 7.7 (Urban Residential) of this Plan;
- ii) Conversion to a more sensitive land use shall be subject to the policies of Section 4.8 (Potentially Contaminated Sites) of this Plan;



## Privileged Information and Without Prejudice

- iii) The proposed use shall be compatible with the surrounding neighbourhood;
- iv) Appropriate buffers and landscaping shall be provided;
- v) Adequate parking for residents, employees and visitors shall be provided on-site;
- vi) A planning rationale report assessing the compatibility of the proposed use and potential impact on adjacent uses as well as addressing any other relevant matter outlined in Section 9.6.1 (Official Plan Amendments) of this Plan shall be provided;
- vii) A traffic impact study, in accordance with the requirements of the County and the Province, shall be provided; viii) An urban design study, including the preparation of appropriate development guidelines, as outlined in Section 5.4 (Community Design) of this Plan, shall be provided.

Accordingly, the proposed development will require an Official Plan Amendment which is accompanied by a Record of Site Condition, which is filed with the Brownfields Environmental Site Registry. A Planning Rationale or Planning Justification report will also be required, as will a Traffic Impact Study and Urban Design Study, including the preparation of appropriate development guidelines, as outlined in Section 5.4 of the Official Plan.

High density residential uses are permitted in the Urban Residential Designation and are evaluated through criteria outlined in Section 7.7.2 c) Further, in the Urban Residential designation, small scale neighbourhood convenience commercial and personal services uses to serve the daily shopping needs of a neighbourhood is permitted. Criteria regarding these types of uses are outlined in 7.7.2 d). Adequate parking for all the uses would be required.

Staff are excited about the interest in honouring the history of the site through the potential re-use or recognition through re-conceptualization of some of the grain silos. We are also excited to see green space included in the preliminary design. The site represents an exciting opportunity for redevelopment and accordingly policies outlined in Section 5.3.1 f).

In regard to the Zoning for the proposed development, a unique set of site specific zoning will likely be required to identify the various uses on the site. Staff expect some combination including Urban Residential Type 6 (R6) and Urban Residential Type 4 (R4) zones.

Endangered and threatened species and their habitat are protected under the provinces Endangered Species Act, 2007 (ESA), O. Reg. 242/08 & O. Reg. 830/21. The Act prohibits development or site alteration within areas of significant habitat for endangered or threatened species without demonstrating that no negative impacts will occur. The Ministry of Environment, Conservation and Parks provides the service of responding to species at risk information requests and project screenings. The proponent is

## Privileged Information and Without Prejudice

responsible for discussing the proposed activity and having their project screened with MECP (Ministry of Environment, Conservation and Parks).

Please be advised that it is the owner's responsibility to be aware of and comply with all relevant federal or provincial legislation, municipal by-laws, or other agency approvals.

### Assigned Planner:

Mohammad Alam  
Principal Planner  
Extension 1828  
[Mohammad.Alam@norfolkcounty.ca](mailto:Mohammad.Alam@norfolkcounty.ca)

### Development Engineering

<b>Development Engineering requirements to proceed</b> The below requirements are to be submitted as part of the Formal Development Planning application.	<b>Required at OPA/ Zoning Stage</b>	<b>Required at Site Plan Stage</b>	<b>Potentially Required (See Notes Section)</b>
<b>General Requirements</b>			
Concept Plan	X	X	
Area Rough Grading Plan			X <sup>48</sup>
Lot Grading Plan		X <sup>27</sup>	
Siltation and Erosion Control Plan		X <sup>27</sup>	
General Plan of Services	X <sup>11, 13, 16</sup>	X <sup>27</sup>	
Plan and Profile Drawings		X <sup>28</sup>	
Utility Plan		X <sup>29</sup>	
Geotechnical Report		X <sup>30</sup>	
Functional Servicing Report	X <sup>12</sup>	X	
Ministry of Environment, Conservation and Parks Permit		X <sup>25, 26, 31</sup>	
<b>Water Servicing Requirements– Section 10.0 Norfolk County Design Criteria and ISMP Section 4.0</b>			
Extension of Watermain		X <sup>32,33</sup>	
Water main Looping		X	
Disconnection of Water Service(s) to Property Line		X <sup>9</sup>	
Disconnection of Water Service(s) to Main		X	

## Privileged Information and Without Prejudice

What does this mean?  
See comment in text  
below.

Water Modelling (County Consultant)	X <sup>12, 14, 15</sup>	X	
Backflow Preventer (RPZ)		X <sup>35</sup>	
Water Allocation	X <sup>10</sup>	X	
<b>Sanitary Servicing Requirements – Section 9.0 Norfolk County Design Criteria and ISMP Section 4.0</b>			
Sanitary Drainage Plan		X <sup>36</sup>	
Sanitary Design Sheet		X <sup>36</sup>	
Extension of Sanitary Mainline		X <sup>37</sup>	
Disconnection of Sanitary Service(s) to Property Line		X <sup>9, 38</sup>	
Disconnection of Sanitary Service(s) to Main		X	
Sanitary Modelling (County Consultant)	X <sup>12</sup>	X	
Property Line Inspection Maintenance Hole		X <sup>39</sup>	
<b>Storm Water Servicing Requirements – Section 7.0 and Section 8 Norfolk County Design Criteria and ISMP Section 4.0</b>			
Storm Water Management Design Report (including calculations)	X <sup>17, 18</sup>	X	
Storm Water Drainage Plan		X <sup>41</sup>	
Storm Sewer Design Sheet		X <sup>41</sup>	
Establish/Confirm Legal and Adequate Outlet	X <sup>19</sup>	X <sup>42</sup>	
Anticipated Flow/Analysis to Receiving Collection System	X	X <sup>43</sup>	
Extension of Storm Water Mainline		X <sup>44</sup>	
Easement and/or Block Registration		X <sup>44</sup>	
Municipal Drainage			
Property Line Inspection Maintenance Hole		X	
<b>Transportation Requirements – Section 6.0 Norfolk County Design Criteria, ISMP Section 5.0, Section 6.0 and Appendix J</b>			
Traffic Impact Study	X <sup>20</sup>	X	
Street Signage/Traffic Control Plan			X <sup>49</sup>
Improvements to Existing Roads & Sidewalk (urbanization, pavement structure, widening sidewalk replacement, upgrades, extension and accessibility)		X <sup>45, 46, 47</sup>	

Multiple request have been made to Norfolk to complete this modelling. Not done.

Multiple request have been made to Norfolk to complete this modelling. Not done.



## Privileged Information and Without Prejudice

### General Notes:

1. Any required infrastructure to facilitate the development will be at the developer's expense;
2. Securities will be required in the form of a schedule. Any works completed within the Municipal Right-of-Way (R.O.W.) or any other location offsite, is to be shown as 100% security. Any works completed within private property of this development is to be shown as 10% security. This can be submitted at time of Site Plan.
3. All reports and plans are to be signed and stamped by a Professional Engineer (P.Eng.).
4. All reports are to be completed in reference to the Norfolk County Design Criteria (NCDC) and Integrated Sustainable Master Plan (ISMP).
5. Recommendations from all reports (FSR, SWM, TIS, Modelling, etc.) must be incorporated into the design and be constructed at the developer's expense.
6. All applicable permits and inspections to be issued by Public Works.
7. If Municipal Waste Collection Services are required, the development must adhere to Norfolk County's Technical Guidelines for Waste Collection Services for Condominium Corporations. These guidelines have been included as part of this information package. Application for waste collection can be made after the development is completed.
8. At the time of Pre-consultation there was no defined description of the ownership of the future units and lands provided. There were potential ownership options involving multiple condominiums. Norfolk County will need to investigate any final ownership strategy prior to the county being able to communicate the viability of the future servicing of this development. Consideration must be given that a Non-Municipal Water System is not created. As well, the county has policies concerning the servicing of developments through private lands.
9. The subject site currently has a Municipally owned 200mm Sanitary sewer and 150mm Watermain located in an easement through the middle of the property. As part of any future development of this site into a residential use Norfolk County will require the relocation of the Sanitary sewer into the current McCool Street ROW. The existing Sanitary will then be transferred to the ownership of the Developer for their use or removal. No external sewage will be permitted to flow through the future site. All external sewage will be rerouted to the new Sanitary sewer. A new watermain will also be required to be installed along McCool Street to replace the existing watermain on site. The current Watermain will then be transferred to the ownership of the Developer and must be disconnected from looping through the site. If the developer chooses to reuse the existing watermain as part of the future design, it must meet all Norfolk County standards and Bylaws.
10. Water / Wastewater allocation will not be issued as part of the Zoning By-law Amendment. At the time of Site Plan Agreement or registration of Site Plan

Chart above says  
water allocation  
required at OPA / ZBA  
stage. Contradiction?

## **Privileged Information and Without Prejudice**

agreement then approval for allocation will be provided for the development, if available. Please see attached Service Monitoring Report

### **Required at Draft Plan of Subdivision and Condominium Official Plan Amendment (OPA) / Zoning By-Law Amendment (ZBA) Stage:**

11. The following reports/studies will be required at time of Zoning Amendment Submission and the Draft Plan of Subdivision and/or Condominium:

- Concept Plan;
- Functional Servicing Report (as per Norfolk County Design Criteria);
- Water / Sanitary Modelling;
- Storm Water Management Report;
- Traffic Impact Study (as per ISMP Appendix J – TIS Guidelines);

Requested from Norfolk County  
but not provided by County

12. Sanitary and Water modelling will be required. This is to be completed by Norfolk County's third-party consultant. The cost to complete the modelling and any recommendations from reports are to be implemented into the design at the applicant's expense. The following information will be required to receive a quote and complete the modelling;

- a. General Plan of Services
- b. Functional Servicing Report (as per Norfolk County Design Criteria)
  - i. Total Domestic Water and Fire Flows as per Norfolk County Design Criteria Section 10.1.1
  - i. Total Wastewater Flows
  - ii. Sanitary Sewer Design Sheets;

The Functional Servicing Report must include water /sanitary servicing and fire flow calculations.

Once the quote has been received, approval from the applicant will be required before proceeding.

13. General Plan of Services. As mentioned at the Pre consultation meeting regarding the question proposed by GD Vallee:

"Will Norfolk County Staff support the servicing concepts as outlined in this package?"

Response: In consultation with Norfolk County's Environmental Services team and a review of the submitted proposal the first answer to the question is that

**Norfolk County would NOT be supporting the proposal.**

This is based on an  
old servicing  
approach that has  
been modified since  
the pre-con.

## Privileged Information and Without Prejudice

We are proposing one service per condominium. What is the concern?

This is primarily based on the current Condo requirements which Norfolk County follows and specifically – “As per Norfolk County By-Law 2013-65, only one domestic water service pipe shall be installed per condominium corp. (Section 3.4 Limitations on Number of Services)”.

We are proposing one service per condominium.

Further to the Norfolk County criteria Development Engineering was also advised the proposal may present challenges regarding the criteria of water and wastewater servicing from a viewpoint through the Safe Water Drinking Act.

How are we creating a Non-Municipal Year-Round Residential Drinking Water System?

There are concerns the proposal as submitted may create a “Non-Municipal Year-Round Residential Drinking water system”. While this is not permitted in Norfolk it is also of greater concern to any future ownership as this designation comes with several legal obligations for the owner with regards to testing and monitoring.

We are waiting for Norfolk to complete the modeling.

14. As part of the Water Modeling there will be an assessment of available Fire Flows in this area. Prior to the completion of a site specific Water model for this proposal, the developer should be aware that Norfolk County has had a few recent applications in this area where modeling has been completed. The results showed very low available fire flows in this area. As shown in the most recent report the available fire flows are estimated between 64L/sec to 71L/sec during MDD. Based on these preliminary results it appears upsizing of Watermains in the area OR installation of new Watermain loops will be required. Once a detailed FUS calculation has been completed for the site a detailed assessment can be completed.

What sections of the official plan or zoning by-law are not satisfied?

15. In discussions after the Pre consultation meeting the development was proposing the potential use of on-site Cisterns to provide additional available Fire Flow water. In the opinion of Development Engineering the use of cisterns in an urban area does not meet Norfolk County Zoning or Official Plan requirements.

Units on McCool Street are in a plan of subdivision, NOT in a plan of condo.

16. As per Norfolk County By-Law 2013-65, only one domestic water service pipe shall be installed per lot. As a result, the units shown to front onto McCool Street will NOT be permitted to be part of the Condo. It is assumed each of the units labelled B will have individual Services from McCool St and therefore cannot be condo.

Complete and included in our formal application package.

17. Stormwater Management Report is to be completed as per Norfolk County Design Criteria Section 7.0.

Furthermore, as requested in your questions, “Will Norfolk County Staff support sizing the storm outlet to accommodate the 100yr storm, thereby eliminating the need to implement “Post to pre” stormwater management on site?”

Our proposed design includes on site detention to limit discharge to current conditions.

- As discussed at the Pre consultation meeting at this time Norfolk County is not in support of discharging storm water from this development un-attenuated to an offsite SWM facility. Norfolk County’s expectation is that the developer will control all flows on site to a pre development rate. It should be noted in Norfolk County’s opinion the pre development

Why can the current site condition not be considered as “pre-development?”

## Privileged Information and Without Prejudice

calculation would be from a grassed field and not the previous industrial use.

Our proposed design is to detain storm water on site and to release at condition rates.

outlet is along railway to Waterford Ponds.
On site as per our SWM Report
Underground chambers as per our SWM Report
Yes
Addressed at detailed design / site plan approval

- After further review of the submission and subsequent meeting, Norfolk County would certainly be looking for the developer to justify why the concept of discharging 100yr post development flows from the site would be an appropriate solution. Prior to any further determination Norfolk County will want to see some additional information:
  - Where is the Storm sewer planning to outlet?
  - Where will the developer do there SWM retention?
  - How will the development control the 100yr STM?
  - As per Section 7 of NCDC Norfolk County WILL require retention of the 100yr storm.
  - Norfolk would certainly be looking for an enhanced treatment due to the proximity of the Towns Drinking water source.

Is this comment from another project? We propose to construct a new storm sewer to the Waterford Ponds.

18. Storm water management report is to demonstrate that an offsite solution has the capacity to receive the storm water discharge from this development. If during the analysis and subsequent review the yet to be identified SWM pond is determined to not have the capacity, the County reserves the right to further refuse the concept of offsite SWM.

19. Establish and Confirm a Legal and Adequate outlet.

How is a storm sewer and discharge to the Waterford Ponds not a legal and adequate outlet?

Yes. Detailed design / Site Plan approval
Yes. Detailed design / site plan approval
Detailed design / site plan approval

- As identified in your submission the subject site does not have a legal or adequate stormwater outlet.

During discussions on any proposed outlet Norfolk County Drainage Department will be consulted to determine if the outlet is appropriate. If the outlet requires Drainage Act compliance, then this will be part of a future Hold placed on the lands.

While it has been assumed that any future legal outlet eventually travels to the Waterford ponds which is the drinking water source for the entire town. Norfolk County will also require consultation from LPRCA and ensure all their concerns are cleared prior to Norfolk County approval.

Please note that any new or reconstructed Stormwater outlet will require an ECA approval from the appropriate Ministry.

20. As per Norfolk County's Integrated Sustainable Master Plan (ISMP) – Appendix J: **Traffic Impact Study (TIS) Guidelines**, a traffic impact study will be required. These guidelines are available upon request.

**Required at Site Plan Submission Stage:**

NO APPLICATION FOR SITE PLAN AT THIS TIME.

21. Resubmission of all reports, studies and plans required for OPA and ZBA applications.

## **Privileged Information and Without Prejudice**

22. Recommendations from all reports must be incorporated into the design at the owner's expense.
23. The design and engineering drawings for the Condominium components are to adhere to Section 16 of the NCDC. A copy of this criteria is available upon request.
24. The components of the project within any of the surrounding Municipal ROW's will need to comply with all sections of the NCDC and ISMP.
25. Please note that for all Watermain and Sanitary sewer designed within the Municipal ROW, each will require approval through the CLI -ECA process with Norfolk County.
26. MOE approval will be required for SWM design if it is proposed off site.
27. Lot Grading Plan, Siltation and Erosion Control Plan, and General Plan of Services drawing can be shown on one engineering plan as long as it's legible for review.
28. Plan and Profile drawings will be required for site plan as per Section 16.4.03 of the Norfolk County design Criteria. All works within the Municipal R.O.W. to facilitate the development will require Plan and Profile drawings as per Section 4.4.03.
29. A Utility Plan as per Section 4.4.07 will be required for all proposed Utility work including any relocations required to facilitate the development.
30. A Geotechnical Report will be required as per Section 3.01 (e). In addition, the report must also identify existing and proposed conditions if infiltration galleries are proposed for the Stormwater Management design.
31. Development Engineering will require confirmation that a building permit can be issued for this site under the requirements of Ontario Regulation 153/04 and that the proposed use is consistent with the certificate issued by the Environmental Site Registry, if required.
32. As mentioned in the proposal new watermain along McCool Street will be required. The design and installation of watermain is to follow Section 10 of the Norfolk County Design Criteria. The same criteria will apply to any new or updated watermain work required on West Church Street and/or Nicole Street.
33. Watermain Looping will be required on McCool Street from West Church Street to Nicole Street. Watermain Looping is NOT permitted within Condo Developments and therefore the existing watermain located in the current easement must be disconnected at one end. No permanent dead end watermains will be permitted on Municipal Property.
34. As per Norfolk County By-Law 2013-65, only one domestic water service pipe shall be installed per lot. A copy of this By-law is available upon request.
35. For Condo developments a Backflow Preventer (RPZ) will be required. Approval from the Manager of Environmental Services must be obtained as per Norfolk County Design criteria.
36. Sanitary Drainage Plans and Design Sheets are required for all proposed Sanitary sewers in a Municipal ROW.
37. New proposed Sanitary sewer on McCool St is to go from Nicole Street to intersection of West Church St. Further extension of sanitary sewers may be



## **Privileged Information and Without Prejudice**

required to ensure no public Sanitary effluent travels through the future private condo site.

38. Disconnection of upstream sanitary on proposed Condo site may be required
39. An inspection manhole will be required on the property line where private sanitary sewer discharges from each Condo Site.
40. Norfolk County will be seeking to transfer ownership of the Sanitary and Water in the easement back to the developer.
41. Storm water Drainage Plans and Design Sheets will be required for all areas of the development including all external areas. Storm water Drainage Plans and Design Sheets are required for all proposed Storm sewers in a Municipal ROW.
42. Further to comments above Norfolk County will be looking for the establishment and confirmation of a legal and adequate Storm outlet for both the proposed condo development and any Storm infrastructure proposed in the Municipal ROW.
43. The anticipated Flow/Analysis to the receiving collection system must also be identified in all Storm designs.
44. As proposed it is suggested that an extension of Storm sewers will be required to a legal and adequate outlet. All external Storm sewers are to be designed to meet NCDC. The location of any storm sewer extension is to be in a ROW, Block or Easement to which the County has legal right to maintain and repair all infrastructure.
45. Improvements to Existing roads –As mentioned in the proposal, McCool Street will be reconstructed to full urban standards. Both Nicole Street and West Church Street will need to be urbanized. The extent of the urbanization is to be determined at the time of Zoning amendment.
46. Sidewalks are to be installed along all municipal roads as per the latest version of the Norfolk County Sidewalk Policy.
47. As per Norfolk County By-Law 2016-32, only one entrance is permitted per residential lot.

### **Potentially Required Notes:**

48. An Area Rough Grading plan will be required if earth cuts and fills are in excess of 0.5m, as per Norfolk County Design Criteria.
49. A Street signage plan may be required if the development proposes a private street name or proposes signage at the entrances.

### **Agreements**

I am excited to be working with you during the agreement stage of your subdivision and condominium development until the final release of your performance securities. To start your agreements please contact me so I can provide you with a checklist for further information and user fees.

## **Privileged Information and Without Prejudice**

The County does not provide construction, maintenance or delivery of services on private property. These are considered internal as the property is under private ownership and will be maintained by the condominium corporation. It is the owner's and/or condominium corporation's responsibility to engage competent and qualified professionals to construct, maintain and deliver such services. That being said, I have also attached the guidelines for the condominium waste collection services for your information. If the condominium meets the technical guidelines the condominium board may apply to through a separate application to have waste collection services performed by the County.

If any transfers of land to the County or transfer easements in favour of the County are required, the Owner agrees that it is their solicitor's responsibility to register these documents free and clear of any encumbrances.

The Owner will be required, at its expense, to obtain and keep in force, insurance coverage until the securities have been released at the completion of your project. Your surveyor, engineer and architect will also be required to provide insurance for professional liability.

Recommended conditions from staff and external agencies will be prepared as part of the planning report. These conditions will need to be satisfied prior to the registration of your agreement. If it is determined appropriate, a condition of the development of land, could be the requirement for a cash-in-lieu parkland payment. This payment is determined from a land appraisal (preconstruction) prepared for the Owner at its expense.

If there are any charges or mortgage holders on your property they will be required to postpone their interest on the property to the County's development agreement. All the best.

The additional requirements for a development agreement could include, but are not limited to the following:

- Engineering drawing review
- Engineer's schedule of costs for the works
- Clearance letter and supporting documentation to support condition clearance
- User fees and performance securities
- Current property identification number (PIN printout) (can be obtained by visiting <https://help.onland.ca/en/home/>)
- Owner's commercial general liability Insurance to be obtained and kept in force during the terms of the agreement
- Postponement of interest. If there are mortgages / charges on your property identifier, your legal representative will be required to obtain a postponement from your bank or financial institution to the terms outlined in your development agreement
- Transfers and / or transfer easements along with registered reference plan

## **Privileged Information and Without Prejudice**

Annette Helmig  
Agreement and Development Coordinator  
Extension 8053  
[Annette.Helmig@norfolkcounty.ca](mailto:Annette.Helmig@norfolkcounty.ca)

### **Building**

#### **Zoning Administrator:**

Proposal: 16 Unit Subdivision with Two Condos (149 units & 55 Units)  
Zoned: MG (Proposing R4 & R6)

#### **\*Front lot line considered along West Church Street\***

Setbacks for R6 zone proposed for entire site

#### Comments for 16 Unit Subdivision (NOT PART OF CONDO DEVELOPMENT):

1. R4 zoning proposed, street townhouses permitted
2. 3 meter exterior side yard proposed along McCool Street (6 meters required under R4 zoning), planning approval required
3. No visitor parking required for these units as they are not part of a condo development
4. Ensure 3.3 meter x 5.8 meter uninterrupted parking spaces provided in garage
5. Maximum building height not to exceed 11 meters
6. Ensure decks are shown on site plan with dimensions
  - Decks required to be 1.2 meters from mutual side lot line as per section 5.4.3 of the Zoning Bylaw
7. 50% of front yard to be maintained as landscaped area

#### Comments for 55 Unit Condominium:

1. R4 zoning proposed, street townhouses and stacked townhouses permitted
2. Some rear porches may encroach into required setbacks, setbacks to be provided on site plan
3. Ensure 3.3 meters x 5.8 meter uninterrupted parking spaces provided in garage and 3.0 meter by 5.8 meter parking space provided in driveway
4. Where will parking for dwelling units that are labelled "A" be? (16 required)
5. 19 Visitor parking spaces required as this is part of a condo development (1 space to be Type A accessible)
6. Ensure decks are shown on site plan with dimensions
  - Decks required to be 1.2 meters from mutual side lot line as per section 5.4.3 of the Zoning Bylaw

#### Comments for 149 Unit Condominium (with commercial component):

1. R6 zoning proposed, apartments permitted

## **Privileged Information and Without Prejudice**

2. Also proposing commercial component on first floor (i.e. coffee shop, retail etc.), planning approval required
3. Building to comply with section 5.6 of the Zoning Bylaw
4. Parking to comply with section 4.0 of the Zoning Bylaw

Zoning and parking table to be provided on site plan

Hayley Stobbe  
Zoning Administrator  
Extension 1853  
[hayley.stobbe@norfolkcounty.ca](mailto:hayley.stobbe@norfolkcounty.ca)

### **Building Inspector:**

Please refer to our website for current forms, and fees.  
<https://www.norfolkcounty.ca/business/building/>

The proposed residential dwelling up to 3 storey in building height construction is considered a House as defined by the Ontario Building Code (OBC). You will need to retain the services of a qualified individual with BCIN House/HVAC House, an Architect and/or a Professional Engineer to complete the design documentation for this application.

The proposed 8 storey building is considered a building of multiple major occupancy as defined by the Ontario Building Code (OBC). You will need to retain the services of an Architect and a Professional Engineer to complete the design documentation for this application.

### **Items for Site Plan**

**Site plan drawings need to have enough detail, to determine compliance with the code references listed.**

- Provided elevations and general cross section of proposed 8 storey building [Planning Act]
- Provide spatial separation calculation for proposed 8 storey building. [OBC 3.2.3]
- Indicate location of access route and access route design [OBC 3.2.5.4 to 3.2.5.6]
- Indicate location of existing and new fire department connections [OBC 3.2.5.16]
- Location and specifications of exterior lighting. Lighting to be included in SB-10 report – energy efficiency

## **Privileged Information and Without Prejudice**

- Indicate barrier free path of travel from parking area to building entrance. [OBC 3.8.1.3, & 3.8.3.2]

### **+ Demolition Permit**

A demolition permit is required anytime a building area is reduced or a building is demolished.

#### **What do I need for to apply?**

##### **Completed Forms**

- Building Permit Application Form
- Commitment to General Review if:
  - Building exceeds 3 storeys in building height or 600m.sq in building area,
  - Building Contains pre-tensions or post-tensioned members,
  - Demolition will be below the level of footing of an adjacent building,
  - Building to demolished with explosive or lasers.
- Property Owner Consent Form, if application is not completed by the property owner,
- Applicable Law Checklist and supporting documents.
- Demolition Checklist

##### **Required Documents**

- ☐ Plot Plan
  - Property lines and lot dimension,
  - Location of demolished building and all other structures on the lot,
  - Distance from demolished building to property lines,

##### **Fees**

- ☐ Demolition Permit fee

### **+ 8 Storey Building, multiple major occupancies**

##### **Completed Forms**

- Building Permit Application Form
- Signed Commitment to General Review
- Property Owner Consent Form, if application is not completed by the property owner,
- Applicable Law Checklist and supporting documents.
- Lot grading form.

##### **Required Documents**

- Site Plan Approved
- Drawings of the building.
  - Architectural



## **Privileged Information and Without Prejudice**

- Structural
- Electrical
- Mechanical
- Plumbing
- Sprinkler system [NFPA 96]
- Fire Alarm System [ULC S524]
- Building Code Matrix
- Completed SB-10 report (energy efficiency).

### **Fees**

- Building Permit fee
- Plumbing fee
- Occupancy fee
- Development charges

### **+ Single Family Dwelling**

#### **What do I need to apply?**

#### **Completed Forms**

- Building Permit Application Form
- Schedule 1: Designer Information
- Property Owner Consent Form, if application is not completed by the property owner,
- Applicable Law Checklist and supporting documents.
- Lot grading form or exemption request.
- Water, storm sewer, sanitary sewer connection permit (where required)
- Energy Efficiency Design Summary (EEDS form)
- Residential Mechanical Ventilation Design Summary form

#### **Required Documents**

- Plot Plan (approved site plan – condo lots)
  - Property lines and lot dimension,
  - Location of dwelling and all other structures on the lot,
  - Location of all steps and landing,
  - Distance from dwelling to property lines
  - Parking spots with dimensions
- Lot grading plan (approved site plan – condo lots)
- Drawings of the Single Family dwelling.
  - Floor plans,

## **Privileged Information and Without Prejudice**

- Elevations,
- Cross sections of exterior wall from footing to roof.
- Roof truss layout (where required)
- Engineered floor system layout (where required)
- Engineered beam details (i.e. Parallam, Micro-lam) (where required)
- Heat loss calculations
- Ventilation duct design
  - Heat Recovery Ventilator (HRV) duct sizing and layout,
  - Exhaust fan duct sizing and layout.
- Septic application (where required) This is a separate application, see septic

### **Fees**

- Building Permit fee
- Plumbing fee
- Occupancy fee
- Water/storm/sanitary connection fees (where applicable)
- Development changes

Currently, all permit can be applied for by email to [permits@norfolkcounty.ca](mailto:permits@norfolkcounty.ca). Our Permit Coordinators will review your application and provide in writing any item which may be missing from the application and a cost break down for the permit fees and payment options.

If you have any question on the building permit process or plans required, please contact the Building Inspector.

Jonathon Weir  
Building Inspector  
[Jonathon.weir@norfolkcounty.ca](mailto:Jonathon.weir@norfolkcounty.ca)

### **Accessibility for Ontarians with Disabilities Act**

Understanding that these proposals are very much preliminary in nature I will keep comments high level as the site plan layout may change with zoning and site requirements etc.

If the layout remains as is:

## **Privileged Information and Without Prejudice**

- Consider relocating accessible parking spaces on east side of site to the North visitor parking space area – closer to primary entrance and limits risk of crossing laneway wherever possible
- Consider providing more direct access to main entrance via dropped curb and painted pedestrian crossing at Northwest Corner of Parkland/outdoor activities/playground area towards main building

Will await further information on how the site plan is laid out based on pre-con discussions

Sam McFarlane  
Manager, Accessibility and Special Projects  
Extension 8099  
[sam.mcfarlane@norfolkcounty.ca](mailto:sam.mcfarlane@norfolkcounty.ca)

## **Parks, Facilities and Recreation**

We would like cash in lieu of parkland.

Todd Shoemaker  
Director, Parks and Recreation  
Extension 2202  
[Todd.Shoemaker@norfolkcounty.ca](mailto:Todd.Shoemaker@norfolkcounty.ca)

## **Fire Department**

Norfolk County Fire Department has the following comments for this proposal:

- Private hydrant on this property will need to be maintained or relocated to provide the 90m requirements as per OBC 3.2.5.5.
- All interior roadways to be designated as a fire access route and the proper signage provided
- Hydrant #30- looks as though it will be located in a driveway or dwelling- this will need to be addressed

Katie Ballantyne  
Community Safety Officer  
Extension 2423  
[Katie.Ballantyne@norfolkcounty.ca](mailto:Katie.Ballantyne@norfolkcounty.ca)

## **Paramedic Services**

It's unclear to me if the development will have separate or new roads or whether the development will be contained within one address. Please consider addressing and signage so it is clear how to access the homes.

## Privileged Information and Without Prejudice

Stuart Burnett  
Deputy Chief  
Extension 2429  
[Stuart.Burnett@norfolkcounty.ca](mailto:Stuart.Burnett@norfolkcounty.ca)

### Conservation Authority

#### Long Point Regional Conservation Authority

Conservation Authority requirements to proceed	May be Required	Required
Conservation Authority Permit	X	
Slope Stability Analysis / Erosion Analysis		
Coastal Engineers Report		
Environmental Impact Study		
Subwatershed Plan/Study		
Master Drainage Study		
Stormwater Management Report/Brief		X
Other		

#### Notes:

##### Provincial Policy Statement, 2020, Section 3.1 Natural Hazards

Conservation Authorities have been delegated responsibilities from the Minister of Natural Resources and Forestry to represent the provincial interests regarding natural hazards encompassed by Section 3.1 of the Provincial Policy Statement, 2020 (PPS). The overall intent of Section 3.0 - Protecting Public Health and Safety of the PPS is to reduce the potential public cost or risk to Ontario's residents from natural or human-made hazards. As such, "development shall be directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety or of property damage, and not create new or aggravate existing hazards."

Based on the location of the proposed building envelope, the development appears to be outside any area subject to Natural Hazards as defined in the Provincial Policy Statement, 2020. At this time LPRCA has no concerns as it relates to section 3.1 of the PPS, 2020.

##### Ontario Regulation 178/06

Is LPRCA allowed to comment under new legislation?

The subject lands are not regulated under Ontario Regulation 178/06. The proposed storm sewer is within the regulation limits; thus, a permit needs to be obtained prior to construction.

##### Stormwater Management

## Privileged Information and Without Prejudice

LPRCA will review the final stormwater management design using the 2003 MECP Stormwater Management Planning and Design Manual, MTO Drainage Manual, LID Stormwater Management Manual, and the Municipal SWM guidelines.

Based on the site and receiving watercourse, an enhanced level of treatment as per the 2003 MECP Stormwater Management Planning and Design Manual is required for the proposed development.

LPRCA requires the following be included and addressed in the design of the stormwater water facility:

Can LPRCA comment since the site is not in the regulated area?

- Minimize, or, where possible, prevent increases in contaminant loads.
- Minimize, erosion and changes in water balance, and prepare for the impacts of a changing climate through the effect management of stormwater, including the use of green infrastructure.
- Mitigate risks to human health, safety, property and the environment.
- Maximize the extent and function of vegetative and pervious surfaces.
- Implement stormwater management best practices, including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.
- Adequate and legal outlet for major, minor, and all flow conditions from the site be provided.

In addition to the above requirements, the following must be clearly shown of the submitted design drawings:

- Major flow systems exceeding are delineated on the drawing. Overland flow paths and depths from surcharged storm sewer systems and the stormwater treatment facility must not increase the flood risk to life, property and the environment.
- Minor overland flow systems and paths are to be delineated and shown on the drawings.
- Erosion and sedimentation control during construction.
- Adequate erosion control on inlets and outlets.

\*LPRCA fees, applications, and helpful resources can be found can be found by visiting <https://lprca.on.ca/planning-permits/planning-fees/>

Completed by:

Isabel Johnson,

Resource Planner

519-842-4242 or 1-888-231-5408 ext.229

[IJohnson@lprca.on.ca](mailto:IJohnson@lprca.on.ca)

## **Appendix A: Planning Reference Materials**

Following is a summary of some land use planning reference materials. It is the requirement of the applicant to ensure compliance with applicable legislation, policies and regulations.

### **Provincial Policy Statement, 2020**

<https://www.ontario.ca/page/provincial-policy-statement-2020>

### **Norfolk County Official Plan**

<https://www.norfolkcounty.ca/government/planning/official-plan/>

Section 9.6.1 outlines requirements in relation to requests to amend the Official Plan.

Section 9.6.2 outlines requirements in relation to requests to amend the Zoning By-law.

**It is the responsibility of the proponent to review and ensure relevant Official Plan policies are addressed in any future development application.**

### **Norfolk County Zoning By-Law 1-Z-2014**

<https://www.norfolkcounty.ca/government/planning/new-zoning-by-law/>

The provisions of the Norfolk County Zoning By-Law shall apply to all lands within the boundaries of Norfolk County. No land, building or structure shall be used, erected, or altered in whole or in part except in conformity with the provisions of this By-Law. No land, building or structure shall be used or occupied except for uses that are specifically identified in the By-Law as permitted uses by the relevant zoning category.

**It is the responsibility of the proponent to review and ensure relevant Zoning By-law provisions are addressed in any future development application**



## John Vallee

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**From:** Mohammad Alam <Mohammad.Alam@norfolkcounty.ca>  
**Sent:** Tuesday, January 3, 2023 10:14 AM  
**To:** John Vallee  
**Cc:** Tom O'Hara  
**Subject:** RE: Silos of Waterford - Record of Site Condition

Good morning John,

A Record of Site Condition can be a condition of a potential Holding on the subject land. However, we would require at least an ESA – phase 1 to understand what extent of further study/remediation (if any) may be required before a zoning can be changed. I believe, the 'contaminated Site Study' should be read as an 'ESA'. Hope this clarifies.

Sincerely,  
Mohammad

**Mohammad Alam, MPL, MUD, RPP, MCIP**  
Principal Planner  
Planning  
Community Development Division  
185 Robinson Street, Simcoe, Ontario, Canada, N3Y 5L6  
519-426-5870 x. 8060



Working together with our community

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**From:** John Vallee <Johnvallee@gdvallee.ca>  
**Sent:** Tuesday, January 3, 2023 9:38 AM  
**To:** Mohammad Alam <Mohammad.Alam@norfolkcounty.ca>  
**Cc:** Tom O'Hara <tom@teamohara.com>  
**Subject:** Silos of Waterford - Record of Site Condition

**CAUTION:** This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good Morning Mohammad.

I hope you enjoyed some much deserved time away from work over the holidays.

We held a pre-con meeting for this project on August 25, 2021.

I have attached a copy of your County's minutes for your quick reference.

We are finalizing documents, and hope to make a formal submission to you in January.

Please take note of the requirement for a **Record of Site Condition and Contaminated Site Study** on page 6 of the Pre-Con Notes.

The notes indicated that these items are required at the OPA / ZBA stage.

**Please confirm to us that this is in error, and that these items are not required at OPA / ZBA, but rather just prior to issuance of a building permit as per NCOP 4.8 b)**

Also, please advise what a “Contaminated Site Study” is.

I will appreciate your prompt response so that we can finalize our submission.

Thanks Mohammad.

*John D. Vallee, P.Eng., President*

**G. DOUGLAS VALLEE LIMITED**

Consulting Engineers, Architects and Planner

2 Talbot Street North Simcoe Ontario N3Y 3W4

519.426.6270

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## Planning Department Development Application Form

### Complete Application

A complete development application consists of the following:

1. A properly completed and signed application form (signature must be original in planners file);
2. Supporting information adequate to illustrate your proposal as indicated in **Section H** of this application form (plans are required in paper copy and digital PDF format);
3. Written authorization from the registered owner of the subject lands where the applicant is not the owner as per Section N; and,
4. Cash, debit or cheque payable to Norfolk County in the amount set out in the user fees By-Law.

The above information is required to ensure that your application is given full consideration. An incomplete or improperly prepared application will not be accepted and may result in delays during the processing of the application. This application must be typed or printed in ink and completed in full.

### Pre-Submission Consultation “Pre-consultation”:

A pre-consultation meeting with staff is required for all applications; however, minor applications may be exempted depending on the nature of the proposal, with approval from the Director of Planning or delegate. The purpose of a pre-consultation meeting is to provide the applicant with an opportunity to present the proposed application, discuss potential issues, and for the County and Agency staff to identify the required information and materials to be submitted with the application in order for it to be considered complete. The applicant has the opportunity to make revisions to the application prior to submission, without the additional costs of recirculation fees. It may be necessary to seek the assistance of independent professional help (for example, a planning consultant or engineer) for complex applications. If a pre-consultation meeting has been held to discuss your development, please **include a copy of the Pre-consultation minutes with your application** as part of the submission package. It should be noted that **pre-consultation minutes are valid for one year after the meeting date.**

### Development Application Process

Once an application has been deemed complete by a planner, it will be circulated to public agencies and County departments for review and comments. Notice of the application is also provided to adjacent land owners. The comments received assist the planner with the review and recommendation/approval of your application. The time involved in processing an application varies depending upon its complexity and its

acceptability to the other agencies and is subject to statutory *Planning Act* decision timeframes.

An additional fee will be required if a review by the Long Point Region Conservation Authority or by the Grand River Conservation Authority is deemed necessary by planning staff and/or by the Authority. A separate cheque payable to the Long Point Region Conservation Authority or the Grand River Conservation Authority is required in accordance with their fee schedule at the same time your application is submitted.

Additional studies required as part of the complete application shall be at the sole expense of the applicant. It should also be noted that in some instances peer reviews may be necessary to review particular studies and that the cost shall be at the expense of the applicant. The company to complete the peer review shall be selected by the County.

If the application is withdrawn prior to the circulation to commenting agencies, the entire original fee will be refunded. If withdrawn after the circulation to agencies, half the original fee will be refunded. If your drawings are required to be recirculated there will be an additional fee. Also, please note that if your engineering drawings require more than three reviews due to revisions by the owner or failure to revise your engineering drawings as requested, an additional fee will be charged. No refund is available after the public meeting and/or after approval of application.

### **Notification Sign Requirements**

For the purpose of public notification and in order for staff to locate your lands for appropriate applications (zoning, subdivision, condominium or official plan) you will be given a sign to indicate the intent and purpose of your development application. It is your responsibility to:

1. Post one sign per frontage in a conspicuous location on the subject lands;
2. Ensure one sign is posted at the front of the subject lands at least three feet above ground level, not on a tree;
3. Notify the Planner when the sign is in place in order to avoid processing delays; and
4. Maintain the sign until the development application is finalized and thereafter removed.

### **Contact Us**

For additional information or assistance in completing this application, please contact a planner at 519-426-5870 or 519-875-4485 extension 1842 or [planning@norfolkcounty.ca](mailto:planning@norfolkcounty.ca). Please submit the completed application and fees to the attention of the Planning Department at 185 Robinson Street, Suite 200, Simcoe, ON N3Y 5L6.

**For Office Use Only:**

File Number	_____	Public Notice Sign	_____
Related File Number	_____	Application Fee	_____
Pre-consultation Meeting	_____	Conservation Authority Fee	_____
Application Submitted	_____	Well & Septic Info Provided	_____
Complete Application	_____	Planner	_____

---

**Check the type of planning application(s) you are submitting.**

- ☒ Official Plan Amendment
- ☒ Zoning By-Law Amendment
- ☐ Temporary Use By-law
- ☒ Draft Plan of Subdivision/Vacant Land Condominium
- ☐ Condominium Exemption
- ☐ Site Plan Application
- ☐ Extension of a Temporary Use By-law
- ☐ Part Lot Control
- ☐ Cash-in-Lieu of Parking
- ☐ Renewable Energy Project or Radio Communication Tower

Please summarize the desired end result of this application (for example: a special zoning provision on the subject lands to include additional use(s), changing the zone and/or official plan designation of the subject lands, creating a certain number of lots, or similar)

The purpose of these applications is to revitalize and redevelop the site with a vibrant multi-housing-form and functional residential development. The official plan designation is to be changed to "residential" and the zoning is to be changed to a variety of residential zones to accommodate the wide variety of housing forms.

The majority of the residential homes will be with a condominium, however, a draft plan of subdivision is also proposed to create single detached dwellings in a freehold environment through a plan of subdivision along McCool Street.

**Property Assessment Roll Number:** \_\_\_\_\_

## A. Applicant Information

**Name of Owner** \_\_\_\_\_

It is the responsibility of the owner or applicant to notify the planner of any changes in ownership within 30 days of such a change.

Address \_\_\_\_\_

Town and Postal Code \_\_\_\_\_

Phone Number \_\_\_\_\_

Cell Number \_\_\_\_\_

Email \_\_\_\_\_

**Name of Applicant** \_\_\_\_\_

Address \_\_\_\_\_

Town and Postal Code \_\_\_\_\_

Phone Number \_\_\_\_\_

Cell Number \_\_\_\_\_

Email \_\_\_\_\_

**Name of Agent** \_\_\_\_\_

Address \_\_\_\_\_

Town and Postal Code \_\_\_\_\_

Phone Number \_\_\_\_\_

Cell Number \_\_\_\_\_

Email \_\_\_\_\_

Please specify to whom all communications should be sent. Unless otherwise directed, all correspondence and notices in respect of this application will be forwarded to both owner and agent noted above.

☒ Owner ☒ Agent ☐ Applicant

Names and addresses of any holder of any mortgagees, charges or other encumbrances on the subject lands:

None



## B. Location, Legal Description and Property Information

1. Legal Description (include Geographic Township, Concession Number, Lot Number, Block Number and Urban Area or Hamlet):

Municipal Civic Address: \_\_\_\_\_

Present Official Plan Designation(s): \_\_\_\_\_

Present Zoning: \_\_\_\_\_

2. Is there a special provision or site specific zone on the subject lands?

☐ Yes ☐ No If yes, please specify corresponding number:

3. Present use of the subject lands:

4. Please describe **all existing** buildings or structures on the subject lands and whether they are to be retained, demolished or removed. If retaining the buildings or structures, please describe the type of buildings or structures, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

5. If an addition to an existing building is being proposed, please explain what it will be used for (for example: bedroom, kitchen, or bathroom). If new fixtures are proposed, please describe.

6. Please describe **all proposed** buildings or structures/additions on the subject lands. Describe the type of buildings or structures/additions, and illustrate the setback, in metric units, from front, rear and side lot lines, ground floor area, gross floor area, lot coverage, number of storeys, width, length, and height on your attached sketch which must be included with your application:

7. Are any existing buildings on the subject lands designated under the *Ontario Heritage Act* as being architecturally and/or historically significant? Yes ☐ No ☐

If yes, identify and provide details of the building:

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8. If known, the length of time the existing uses have continued on the subject lands:

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9. Existing use of abutting properties:

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10. Are there any easements or restrictive covenants affecting the subject lands?

☐ Yes ☐ No If yes, describe the easement or restrictive covenant and its effect:

An easement in favour of Norfolk County currently contains a watermain. That watermain will be relocated to McCool Street and the easement will be abandoned.

### C. Purpose of Development Application

**Note: Please complete all that apply.**

1. Please explain what you propose to do on the subject lands/premises which makes this development application necessary:

2. Please explain why it is not possible to comply with the provision(s) of the Zoning By-law/and or Official Plan:

3. Does the requested amendment alter all or any part of the boundary of an area of settlement in the municipality or implement a new area of settlement in the municipality? ☐ Yes ☐ No If yes, describe its effect:

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4. Does the requested amendment remove the subject land from an area of employment? ☐ Yes ☐ No If yes, describe its effect:

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5. Does the requested amendment alter, replace, or delete a policy of the Official Plan?  
☐ Yes ☐ No If yes, identify the policy, and also include a proposed text of the policy amendment (if additional space is required, please attach a separate sheet):

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6. Description of land intended to be severed in metric units:

Frontage: \_\_\_\_\_

Depth: \_\_\_\_\_

Width: \_\_\_\_\_

Lot Area: \_\_\_\_\_

Present Use: \_\_\_\_\_

Proposed Use: \_\_\_\_\_

Proposed final lot size (if boundary adjustment): \_\_\_\_\_

If a boundary adjustment, identify the assessment roll number and property owner of the lands to which the parcel will be added: \_\_\_\_\_

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Description of land intended to be retained in metric units:

Frontage: \_\_\_\_\_

Depth: \_\_\_\_\_

Width: \_\_\_\_\_

Lot Area: \_\_\_\_\_

Present Use: \_\_\_\_\_

Proposed Use: \_\_\_\_\_

Buildings on retained land: \_\_\_\_\_

7. Description of proposed right-of-way/easement:

Frontage: \_\_\_\_\_

Depth: \_\_\_\_\_

Width: \_\_\_\_\_

Area: \_\_\_\_\_

Proposed use: \_\_\_\_\_

8. Name of person(s), if known, to whom lands or interest in lands to be transferred, leased or charged (if known): [No lands or interest is to be transferred, leased or charged](#)

## 9. Site Information

## Zoning

## Proposed

Please indicate unit of measurement, for example: m, m<sup>2</sup> or %

Lot frontage

Lot depth

Lot width

Lot area

Lot coverage

Front yard

Rear yard

Left Interior side yard

Right Interior side yard

Exterior side yard (corner lot)

Landscaped open space

Entrance access width

Exit access width

Size of fencing or screening

Type of fencing

## 10. Building Size

Number of storeys

Building height

Total ground floor area

Total gross floor area

Total useable floor area

## 11. Off Street Parking and Loading Facilities

Condominium

Number of off street parking spaces \_\_\_\_\_

Number of visitor parking spaces \_\_\_\_\_

Number of accessible parking spaces \_\_\_\_\_

Number of off street loading facilities \_\_\_\_\_

See the  
concept site  
plan for all of  
this information  
and Zoning  
Drawing Z101.

12. Residential (if applicable)

Number of buildings existing: \_\_\_\_\_

Number of buildings proposed: \_\_\_\_\_

Is this a conversion or addition to an existing building? ☐ Yes ☐ No

If yes, describe: \_\_\_\_\_

Type	Number of Units	Floor Area per Unit in m2
Single Detached	_____	_____
Semi-Detached	_____	_____
Duplex	_____	_____
Triplex	_____	_____
Four-plex	_____	_____
Street Townhouse	_____	_____
Stacked Townhouse	_____	_____
Apartment - Bachelor	_____	_____
Apartment - One bedroom	_____	_____
Apartment - Two bedroom	_____	_____
Apartment - Three bedroom	_____	_____

Other facilities provided (for example: play facilities, underground parking, games room, or swimming pool):

13. Commercial/Industrial Uses (if applicable)

Number of buildings existing: \_\_\_\_\_

Number of buildings proposed: \_\_\_\_\_

Is this a conversion or addition to an existing building? ☐ Yes ☐ No

If yes, describe:

\_\_\_\_\_

Indicate the gross floor area by the type of use (for example: office, retail, or storage):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Seating Capacity (for assembly halls or similar): \_\_\_\_\_

Total number of fixed seats: \_\_\_\_\_

Describe the type of business(es) proposed: \_\_\_\_\_

Total number of staff proposed initially: \_\_\_\_\_

Total number of staff proposed in five years: \_\_\_\_\_

Maximum number of staff on the largest shift: \_\_\_\_\_

Is open storage required: ☐ Yes ☐ No

Is a residential use proposed as part of, or accessory to commercial/industrial use?

☐ Yes ☐ No If yes please describe:

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#### 14. Institutional (if applicable)

Describe the type of use proposed: \_\_\_\_\_

Seating capacity (if applicable): \_\_\_\_\_

Number of beds (if applicable): \_\_\_\_\_

Total number of staff proposed initially: \_\_\_\_\_

Total number of staff proposed in five years: \_\_\_\_\_

Maximum number of staff on the largest shift: \_\_\_\_\_

Indicate the gross floor area by the type of use (for example: office, retail, or storage):

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#### 15. Describe Recreational or Other Use(s) (if applicable)

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#### D. Previous Use of the Property

1. Has there been an industrial or commercial use on the subject lands or adjacent lands? ☐ Yes ☐ No ☐ Unknown

If yes, specify the uses (for example: gas station or petroleum storage):

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2. Is there reason to believe the subject lands may have been contaminated by former uses on the site or adjacent sites? ☐ Yes ☐ No ☐ Unknown

3. Provide the information you used to determine the answers to the above questions:

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4. If you answered yes to any of the above questions in Section D, a previous use inventory showing all known former uses of the subject lands, or if appropriate, the adjacent lands, is needed. Is the previous use inventory attached? ☐ Yes ☐ No

[See Phase 1 ESA report by G2S](#)

#### E. Provincial Policy

1. Is the requested amendment consistent with the provincial policy statements issued under subsection 3(1) of the *Planning Act*, R.S.O. 1990, c. P. 13? ☐ Yes ☐ No

If no, please explain:

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2. It is owner's responsibility to be aware of and comply with all relevant federal or provincial legislation, municipal by-laws or other agency approvals, including the Endangered Species Act, 2007. Have the subject lands been screened to ensure that development or site alteration will not have any impact on the habitat for endangered or threatened species further to the provincial policy statement subsection 2.1.7? ☐ Yes ☐ No

If no, please explain:

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3. Have the subject lands been screened to ensure that development or site alteration will not have any impact on source water protection? ☐ Yes ☐ No

The site is outside of the source water protection zones as illustrated on Norfolk's GIS mapping.

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Note: If in an area of source water Wellhead Protection Area (WHPA) A, B or C please attach relevant information and approved mitigation measures from the Risk Manager Official.

4. Are any of the following uses or features on the subject lands or within 500 metres of the subject lands, unless otherwise specified? Please check boxes, if applicable.

**Livestock facility or stockyard** (submit MDS Calculation with application)

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Wooded area**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Municipal Landfill**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Sewage treatment plant or waste stabilization plant**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Provincially significant wetland (class 1, 2 or 3) or other environmental feature**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Floodplain**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Rehabilitated mine site**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Non-operating mine site within one kilometre**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Active mine site within one kilometre**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Industrial or commercial use (specify the use(s))**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Active railway line**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Seasonal wetness of lands**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Erosion**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

**Abandoned gas wells**

☐ On the subject lands or ☐ within 500 meters – distance \_\_\_\_\_

## F. Servicing and Access

1. Indicate what services are available or proposed:

### Water Supply

- |  |   |
|--|---|
| <input type="checkbox"/> Municipal piped water | <input type="checkbox"/> Communal wells         |
| <input type="checkbox"/> Individual wells      | <input type="checkbox"/> Other (describe below) |
- 

### Sewage Treatment

- |   |   |
|---|---|
| <input type="checkbox"/> Municipal sewers                               | <input type="checkbox"/> Communal system        |
| <input type="checkbox"/> Septic tank and tile bed in good working order | <input type="checkbox"/> Other (describe below) |
- 

### Storm Drainage

- |   |                                       |
|---|---------------------------------------|
| <input type="checkbox"/> Storm sewers           | <input type="checkbox"/> Open ditches |
| <input type="checkbox"/> Other (describe below) |                                       |
- 

2. Existing or proposed access to subject lands:

- |   |   |
|---|---|
| <input type="checkbox"/> Municipal road | <input type="checkbox"/> Provincial highway     |
| <input type="checkbox"/> Unopened road  | <input type="checkbox"/> Other (describe below) |

Name of road/street: \_\_\_\_\_

## G. Other Information

1. Does the application involve a local business? ☐ Yes ☐ No

If yes, how many people are employed on the subject lands?

2. Is there any other information that you think may be useful in the review of this application? If so, explain below or attach on a separate page.

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## **H. Supporting Material to be submitted by Applicant**

In order for your application to be considered complete, **folded** hard copies (number of paper copies as directed by the planner) and an **electronic version (PDF) of the properly named site plan drawings, additional plans, studies and reports** will be required, including but not limited to the following details:

1. Concept/Layout Plan
2. All measurements in metric
3. Key map
4. Scale, legend and north arrow
5. Legal description and municipal address
6. Development name
7. Drawing title, number, original date and revision dates
8. Owner's name, address and telephone number
9. Engineer's name, address and telephone number
10. Professional engineer's stamp
11. Existing and proposed easements and right of ways
12. Zoning compliance table – required versus proposed
13. Parking space totals – required and proposed
14. All entrances to parking areas marked with directional arrows
15. Loading spaces, facilities and routes (for commercial developments)
16. All dimensions of the subject lands
17. Dimensions and setbacks of all buildings and structures
18. Location and setbacks of septic system and well from all existing and proposed lot lines, and all existing and proposed structures
19. Gross, ground and useable floor area
20. Lot coverage
21. Floor area ratio
22. Building entrances, building type, height, grades and extent of overhangs
23. Names, dimensions and location of adjacent streets including daylighting triangles
24. Driveways, curbs, drop curbs, pavement markings, widths, radii and traffic directional signs
25. All exterior stairways and ramps with dimensions and setbacks
26. Retaining walls including materials proposed
27. Fire access and routes
28. Location, dimensions and number of parking spaces (including visitor and accessible) and drive aisles
29. Location of mechanical room, and other building services (e.g. A/C, HRV)
30. Refuse disposal and storage areas including any related screening (if indoors, need notation on site plan)
31. Winter snow storage location

32. Landscape areas with dimensions
33. Natural features, watercourses and trees
34. Fire hydrants and utilities location
35. Fencing, screening and buffering – size, type and location
36. All hard surface materials
37. Light standards and wall mounted lights (plus a note on the site plan that all outdoor lighting is to be dark sky compliant)
38. Business signs (make sure they are not in sight lines)
39. Sidewalks and walkways with dimensions
40. Pedestrian access routes into site and around site
41. Bicycle parking
42. Architectural elevations of all building sides
43. All other requirements as per the pre-consultation meeting

In addition, the following additional plans, studies and reports, including but not limited to, **may** also be required as part of the complete application submission:

- ☐ Zoning Deficiency Form
- ☐ On-Site Sewage Disposal System Evaluation Form (to verify location and condition)
- ☐ Architectural Plan
- ☐ Buildings Elevation Plan
- ☐ Cut and Fill Plan
- ☐ Erosion and Sediment Control Plan
- ☐ Grading and Drainage Control Plan (around perimeter and within site) (existing and proposed)
- ☐ Landscape Plan
- ☐ Photometric (Lighting) Plan
- ☐ Plan and Profile Drawings
- ☐ Site Servicing Plan
- ☐ Storm water Management Plan
- ☐ Street Sign and Traffic Plan
- ☐ Street Tree Planting Plan
- ☐ Tree Preservation Plan
- ☐ Archaeological Assessment
- ☐ Environmental Impact Study

#### **J. Transfers, Easements and Postponement of Interest**

The owner acknowledges and agrees that if required it is their solicitor's responsibility on behalf of the owner for the registration of all transfer(s) of land to the County, and/or transfer(s) of easement in favour of the County and/or utilities. Also, the owner further acknowledges and agrees that it is their solicitor's responsibility on behalf of the owner for the registration of postponements of any charges in favour of the County.

#### **K. Permission to Enter Subject Lands**

Permission is hereby granted to Norfolk County officers, employees or agents, to enter the premises subject to this application for the purposes of making inspections associated with this application, during normal and reasonable working hours.

#### **L. Freedom of Information**

For the purposes of the *Municipal Freedom of Information and Protection of Privacy Act*, I authorize and consent to the use by or the disclosure to any person or public body any information that is collected under the authority of the *Planning Act, R.S.O. 1990, c. P. 13* for the purposes of processing this application.

  
\_\_\_\_\_  
Tom O'Hara, Verlinda Homes  
Owner/Applicant Signature

February 23, 2023

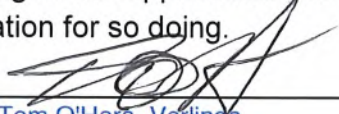
Date

#### **M. Owner's Authorization**

If the applicant/agent is not the registered owner of the lands that is the subject of this application, the owner(s) must complete the authorization set out below.

I/We Verlinda Homes am/are the registered owner(s) of the lands that is the subject of this application.

I/We authorize G. Douglas Vallee Limited to make this application on my/our behalf and to provide any of my/our personal information necessary for the processing of this application. Moreover, this shall be your good and sufficient authorization for so doing.

  
\_\_\_\_\_  
Tom O'Hara, Verlinda  
Owner

February 23, 2023

Date

**N. Declaration**

I, Tom O'Hara of Verlinda Homes (Waterford)

solemnly declare that:

all of the above statements and the statements contained in all of the exhibits transmitted herewith are true and I make this solemn declaration conscientiously believing it to be true and knowing that it is of the same force and effect as if made under oath and by virtue of *The Canada Evidence Act*.

Declared before me at:

Simcoe

  
\_\_\_\_\_  
Owner/Applicant Signature

In Norfolk County

This 28 day of February.

A.D., 2023

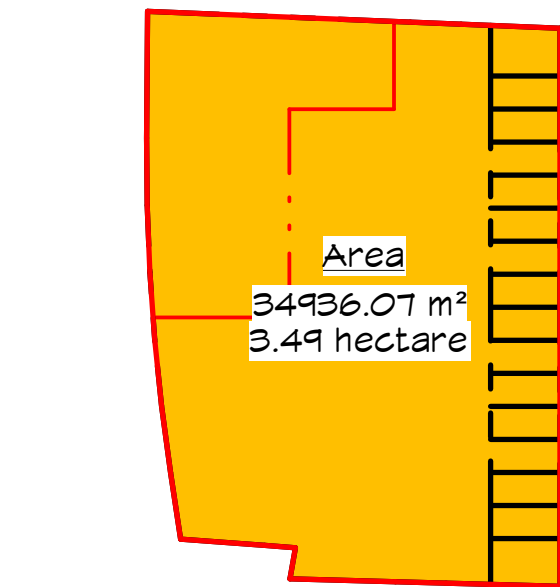
  
\_\_\_\_\_

A Commissioner, etc.

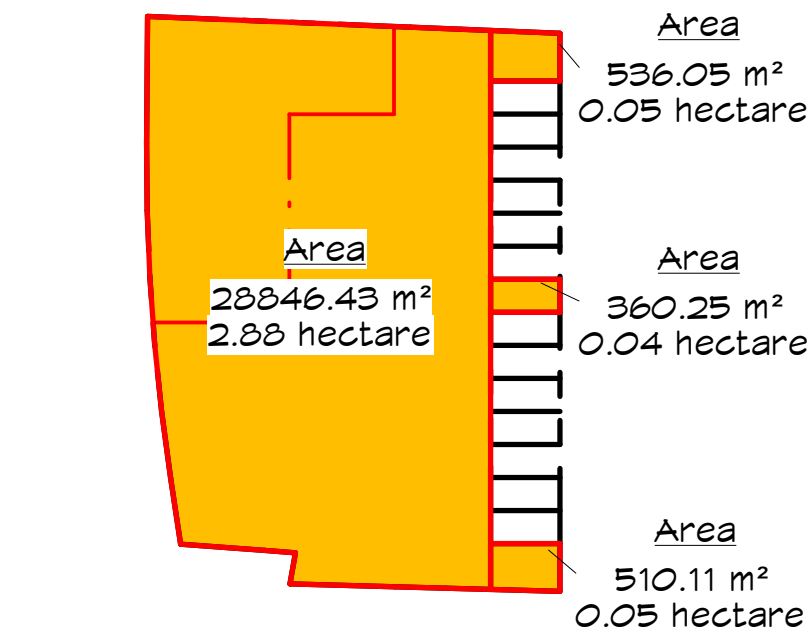
Brenda Joanne Bruley, a  
Commissioner, etc., Province of Ontario.  
for the Corporation of Norfolk County.  
Expires September 2, 2024.



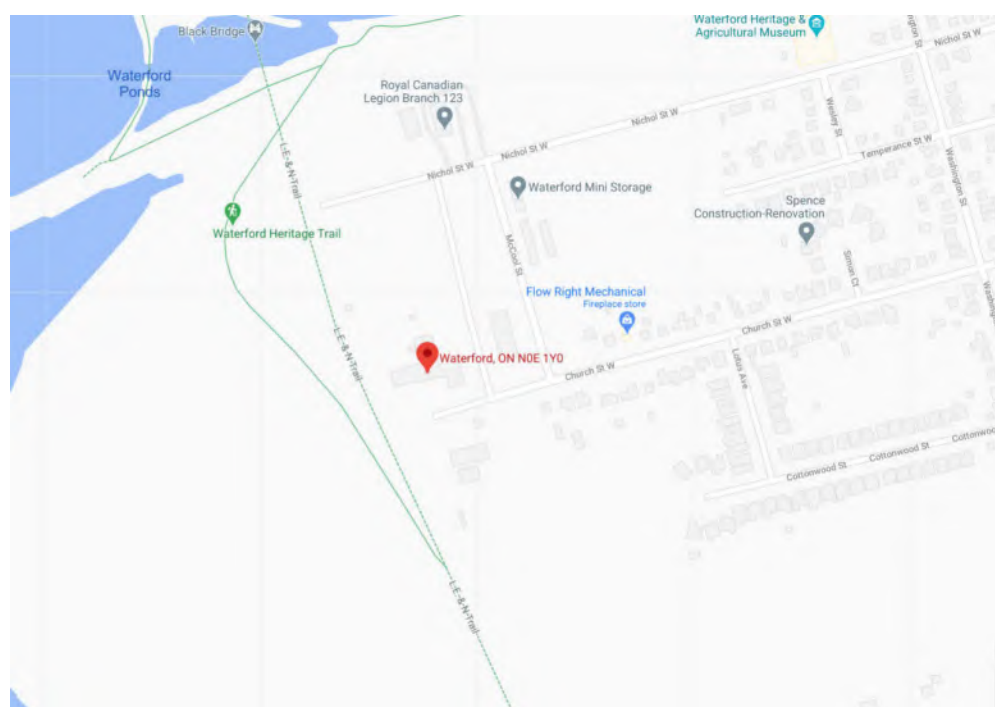
FILE PATH: H:\Projects\2023\12-061 Silos of Waterford Drawings\Arch\21-061 - SILOS OF WATERFORD - SITE.v4  
DATE PLOTTED 2023-01-13 12:18:12 PM PROJECT NUMBER & NAME: 21-061 SILOS OF WATERFORD



2 GROSS SITE - PLANNING  
SCALE 1:3000



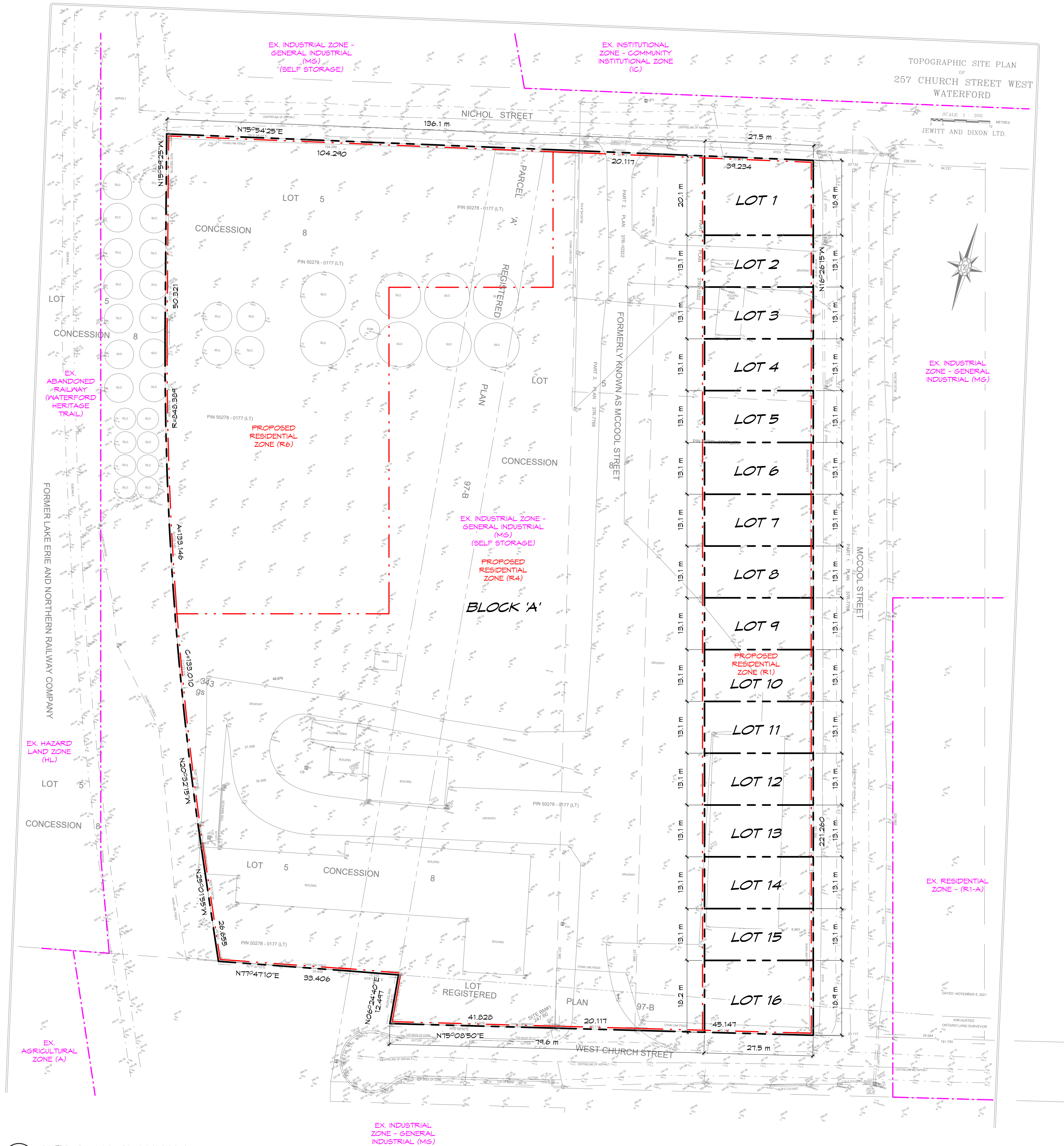
3 GROSS SITE ZONING - BLOCKS / LOTS - PLANNING  
SCALE 1:3000



KEY MAP  
SCALE 1:100



SITE MAP  
SCALE 1:100



1 SITE PLAN PLANNING  
SCALE 1:600

### SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATED: \_\_\_\_\_

SURVEYOR: \_\_\_\_\_  
KIM HUSTED

### OWNER'S CONSENT

I HEREBY CONSENT TO THE FILING OF THIS PLAN IN DRAFT FORM FOR APPROVAL.

DATED: \_\_\_\_\_

OWNER: \_\_\_\_\_  
TOM OHARA

### SITE ZONING

ZONING:  
CURRENT ZONING: INDUSTRIAL ZONE - GENERAL INDUSTRIAL (M6)  
(SELF STORAGE IN ACCORDANCE TO THE TOWN OF WATERFORD, ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY - JANUARY-2021-CONSOLIDATION)

### LAND USE SUMMARY

PROVISION	LOT(S) / BLOCK(S)	UNITS	AREA (m²)
SINGLE DETACHED DWELLINGS WITH OPTIONAL ACCESSORY DWELLING UNIT	LOTS 1 TO 16	16 UNITS	EXT. 536.05 INT. 360.25 EXT. 910.11 (6084.60m²) (0.81ha) TOTAL
CONDOMINIUM - GROUP TOWNHOUSE, MID-RISE	BLOCK 'A'	-	28,846.43 (2.88ha)

### SECTION 51 (17) PLANNING ACT, R.S.O. 1990

- (a) the boundaries of the land proposed to be subdivided, certified by an Ontario land surveyor;  
• THE BOUNDARIES OF THE LAND PROPOSED SHOWN
- (b) the locations, widths and names of the proposed highways within the proposed subdivision and of existing highways on which the proposed subdivision abuts;  
• LOCATIONS & NAMES OF EX. ROADWAYS ON WHICH THE PROPOSED SUBDIVISION ABUTS SHOWN
- (c) on a small key plan, on a scale of not less than one centimetre to 100 metres, all of the land adjacent to the proposed subdivision that is owned by the applicant or in which the applicant has an interest, every subdivision adjacent to the proposed subdivision and the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot or other original grant of which the land forms the whole or part;  
• SMALL KEY PLAN VV LAND ADJACENT TO THE PROPOSED SHOWN
- (d) the purpose for which the proposed lots are to be used;  
• PURPOSE OF PROPOSED LOTS ARE TO BE USED FOR RESIDENTIAL
- (e) the existing uses of all adjoining lands;  
• EX. USES OF ALL ADJOINING LANDS SHOWN
- (f) the approximate dimensions and layout of the proposed lots;  
• DIMENSIONS & LAYOUT OF PROPOSED LOTS SHOWN
- (f.1) if any affordable housing units are being proposed, the shape and dimensions of each proposed affordable housing unit and the approximate location of each proposed affordable housing unit in relation to other proposed residential units;  
• NO AFFORDABLE HOUSING UNITS ARE BEING PROPOSED
- (g) natural and artificial features such as buildings or other structures or installations, railways, highways, watercourses, drainage ditches, wetlands and wooded areas within or adjacent to the land proposed to be subdivided;  
• ALL EX. FEATURES SHOWN
- (h) the availability and nature of domestic water supplies;  
• MUNICIPAL WATER SUPPLY TO BE USED
- (i) the nature and porosity of the soil;  
• DOMINANTLY GRAVELLY SANDS OF FLUVIAL OR TILL DERIVATION, OR 40 TO 100cm OF SANDY SEDIMENTS OVER GRAVELLY SANDS. THE SITE IS UNDERLAIN BY CHERT Limestone OF THE MIDDLE DEVONIAN BOIS BLANC FORMATION - PHASE 1 ESA 257 WEST CHURCH ST., WATERFORD, ONTARIO, G2S2J3S4A
- (j) existing contours or elevations as may be required to determine the grade of the highways and the drainage of the land proposed to be subdivided;  
• EX. ELEVATIONS SHOWN
- (k) the municipal services available or to be available to the land proposed to be subdivided; and  
• MUNICIPAL SERVICES AVAILABLE ARE SANITARY, STORM & WATER
- (l) the nature and extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 1994, c.23, s.30; 1996, c.4, s.20 (3); 2016, c.25, Sched. 4, s.8 (1).  
• ALL EX. SURVEY / TOPO INFO. SHOWN  
• EX. EASEMENT ON PART 2, PLAN 3TR-1764

### PLANNING LEGEND

---	PROPERTY BOUNDARY LINE(S)
---	EX. ZONING BOUNDARY LINE(S)
---	PROPOSED ZONING BOUNDARY LINE(S)

NO.	DATE	ISSUANCE

NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:  
PART OF LOT 5, CONCESSION 8  
GEOGRAPHIC TOWNSHIP OF TOWNSEND  
AND PART OF LOT 1,  
AND ALL OF PARCEL 'A'  
BOTH IN REGISTERED PLAN 97-B

APPLICANT:  
VERLINDA  
TOM OHARA  
26 MAIN ST. S.  
WATERFORD, ONTARIO,  
N0E 1Y0  
1.705.205.3235

DO NOT SCALE DRAWINGS. CALL FOR ANY  
CLARIFICATIONS THAT ARE REQUIRED, FIELD  
VERIFY AT ALL BUILT CONDITIONS

ALL DWG.'S ARE TO BE READ IN COLOUR  
ORIGINAL PAGE SIZE ARCH 'D' - 24" x 36"

**VERLINDA** The Silos of Waterford

**vallee** Consulting Engineers, Architects & Planners

G. DOUGLAS VALLEE LIMITED  
2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 3W4  
(519) 426-6270

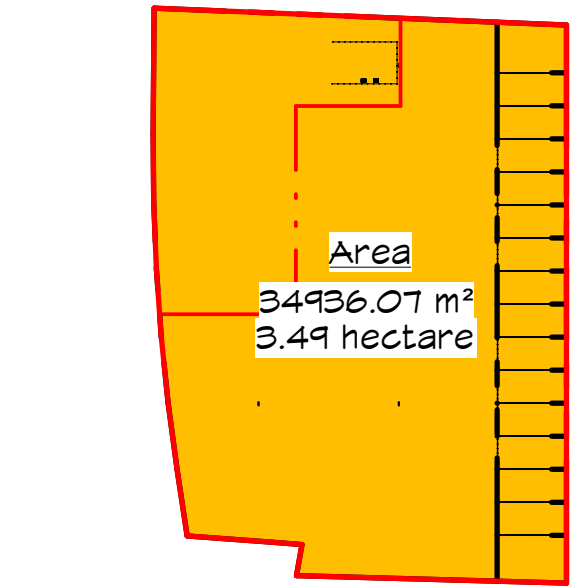
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SILOS OF WATERFORD  
257 CHURCH ST. W.  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

DRAWING TITLE:  
SILOS OF WATERFORD - DRAFT  
PLAN OF SUBDIVISION

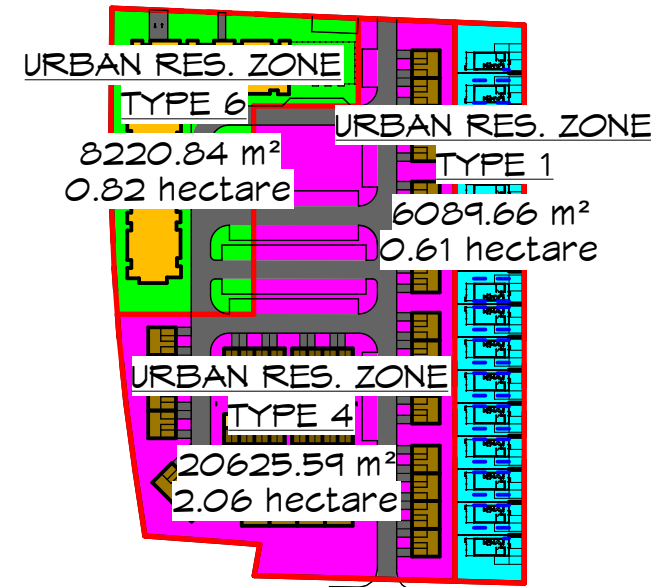
CHECKED BY: JV	DRAWN BY: JS
DRAWING SCALE: As indicated	DRAWING NO.: PROJECT NO.: 21-061

PL101

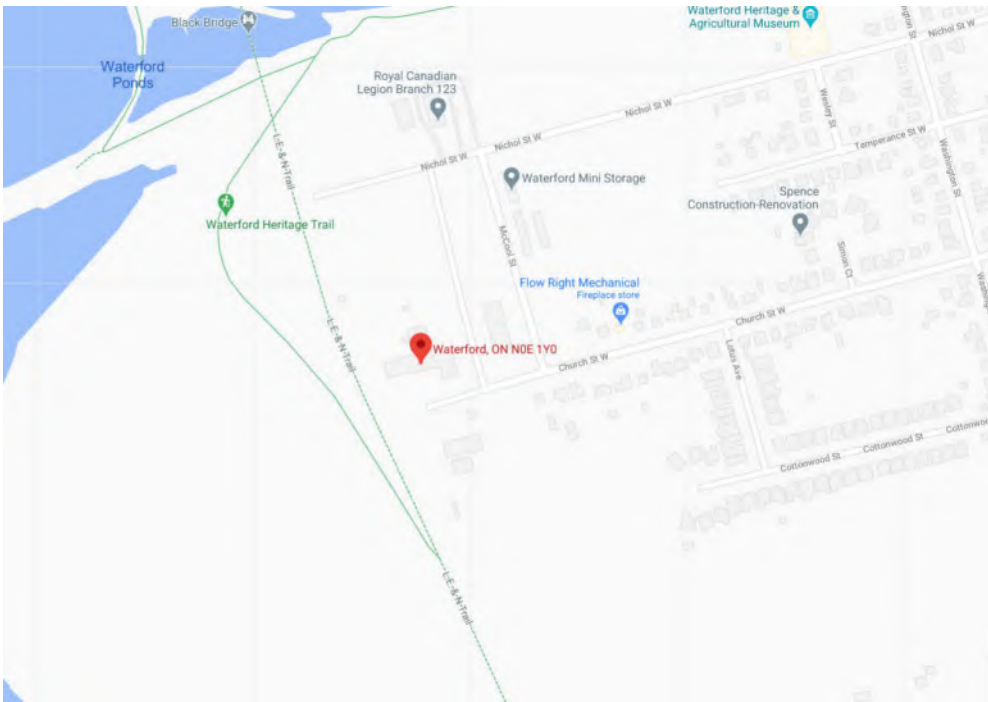




2  
Z100  
GROSS SITE - ZONING  
AMENDMENT  
SCALE 1:3000



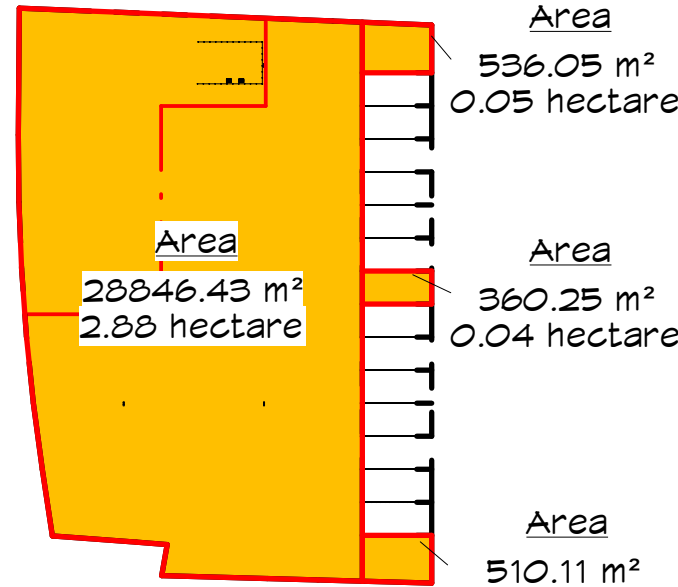
3  
Z100  
GROSS SITE ZONING -  
CLASSIFICATIONS - ZONING  
SCALE 1:3000



KEY MAP  
SCALE 1:100



SITE MAP  
SCALE 1:100



4  
Z100  
GROSS SITE ZONING -  
BLOCKS / LOTS - ZONING  
SCALE 1:3000



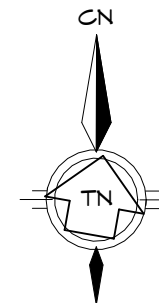
1  
Z100  
SITE PLAN ZONING AMENDMENT  
SCALE 1:600

### SITE PLAN LEGEND

- ▲ ENT. MAIN ENTRANCE / EXIT DOOR
- ▲ O/H. MAIN ENTRANCE / EXIT DOOR (OVERHEAD DOOR IV OPERATOR)
- PROPERTY LINE
- SETBACKS
- CE FIRE ROUTE (6m WIDE / 12m CENTER RADIUS)
- F COVERED ENTRANCE
- CP PATIO (ON GRADE)
- B COVERED PATIO (ON GRADE)
- CD BALCONY
- D COVERED DECK / UNENCLOSED PORCH
- PAINTED GRAPHICS ON ASPHALT / CONG. (COORD. IV. THE CITY / TOWN HAVING JURISDICTION GUIDELINES)
- WHEELCHAIR SIGN ON ASPHALT / CONG. (WHITE & BLUE COLOURS)
- V# VEHICULAR STALL MARKINGS (YELLOW COLOUR)
- VB# BARRIER FREE / ACCESSIBLE
- V# VISITOR
- R# RESTAURANT
- RS# RETAIL STORE
- DC# DAYCARE
- S# SPARE
- LETTER 1 - ONE REQ'D DWELLING PARKING
- LETTER 2 - TWO REQ'D DWELLING PARKING (LETTER REPRESENTS UNIT TYPE)
- DIAGONAL MARKINGS
- NEW CONIFEROUS TREE
- NEW DECIDUOUS TREE (~4500mm TREE RADIUS @ FULL GROWTH)
- VISIBILITY TRIANGLES TO BE MAINTAINED (REMAIN CLEAR) @ BOTH SIDES OF ALL LANEWAY / DRIVEWAYS & INTERSECTIONS. THE MAX. HEIGHT OF ANY OBJECT OR MATURE VEGETATION WITHIN THE VISIBILITY TRIANGLE IS NOT TO EXCEED REG'D HEIGHT ABOVE THE CENTRELINE OF THE CORRESPONDING ADJACENT STREET
- NORFOLK COUNTY 5m X 5m LANEWAY 9m X 9m INTERSECTION 1m HEIGHT N/A CBD ZONE NO PARKING ALLOWED

### HATCH IDENTIFICATION LEGEND

- CONG. SIDEWALK / PAD / CROSSWALK / SIDEWALK / LANEWAY / STAIRS / ETC.
- AREA OF ASPHALT
- AREA OF PARKING
- LANDSCAPING
- 8 UNITS A 1-STORY RESIDENTIAL DWELLING STACKED (VEHICULAR - X2 EXTERNAL)
- 16 UNITS B 2-STORY RESIDENTIAL DWELLING (VEHICULAR - X2 DRIVEWAY)
- 52 UNITS C 1-STORY RESIDENTIAL DWELLING STACKED (VEHICULAR - X1 GARAGE, X1 DRIVEWAY)
- 16 UNITS D 2-STORY RESIDENTIAL DWELLING STACKED (VEHICULAR - X1 GARAGE, X1 DRIVEWAY)
- 1 UNITS E 3-STORY RESIDENTIAL DWELLING STACKED (VEHICULAR - X1 GARAGE, X1 DRIVEWAY)
- 8-STORY RESIDENTIAL MID-RISE (UNDERGROUND PARKING)







G. DOUGLAS VALLEE LIMITED

2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 4W3  
(519) 426-6270

VERLINDA



The  
Silos  
of Waterford

Project Title  
SILOS OF WATERFORD  
257 CHURCH ST. W,  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

PRELIMINARY  
NOT FOR  
CONSTRUCTION

PROJECT No.  
21-061  
Drawing Title  
ZONING  
Drawing No.

Z101

PLAN OF SUBDIVISION - FREEHOLD (UNIT 'B')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R1

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE PROPOSED
5.0 5.1 5.1.1	<b>RESIDENTIAL ZONES</b> <b>URBAN RESIDENTIAL TYPE 1 ZONE (R1)</b> <i>Permitted Uses</i> In an R1 Zone, no land, building or structure shall be used except in accordance with the following uses: a) dwelling, single detached b) lot & breakfast, subject to Subsection 3.4 c) home occupation d) accessory residential dwelling unit, subject to Subsection 3.2.3.

PROVISION	SETBACKS (m - METERS):	R1-A	R1-B	PROVIDED (m)
5.1.2a)	MIN. LOT AREA: i) INTERIOR LOT ii) CORNER LOT	450m <sup>2</sup> 450m <sup>2</sup>	360m <sup>2</sup> 450m <sup>2</sup>	360.28m <sup>2</sup> 510.11m <sup>2</sup>
5.1.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT	15 18	12 15	19.1 18.9
5.1.2c)	MIN. FRONT YARD: i) DETACHED GARAGE WITH REAR LANE	6 9	6 9	7.5 N/A
5.1.2d)	MIN. EXTERIOR SIDE YARD:	6	6	10.1 / 11.0
5.1.2e)	MIN. INTERIOR SIDE YARD i) DETACHED GARAGE ii) DETACHED GARAGE WITH A REAR LANE, ATTACHED GARAGE	3.1 & 12 12 EACH SIDE	3.1 & 12 12 EACH SIDE	4.9 & 1.2
5.1.2f)	MIN. REAR YARD:	7.5	7.5	7.5
5.1.2g)	MAX. BLDG. HEIGHT	11	11	>11
5.1.3	Projection of an Attached Garage The wall of an attached garage facing the street in an R1-B Zone shall project no more than 3.5 metres from the main front wall of the dwelling. This projection shall be measured from the wall of the garage facing the front lot line to the nearest structural element of the front wall of the dwelling facing the front lot line, including any covered porch which extends along the entire front wall of the dwelling but excluding eaves, stairs or gutters. This provision shall not apply where: a) the front wall of the dwelling and the wall of the attached garage containing the opening for vehicular access do not face the same lot line or b) the width of the attached garage is less than 60 percent of the width of the dwelling.	3.5	3.5	N/A

GRAY HIGHLIGHTED APPLICABLE

PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOMES (8-Z-2017): 2 SPACES / DWELLING UNIT 2 SPACES x 16 DWELLING UNITS = 32	32 SPACE(S)	32 SPACE(S)
4.9a)	INT-B (2-STORY RESIDENTIAL DWELLING) 2 SPACES x 16 DWELLING UNITS = 32	(32 SPACES)	(32 SPACES) (2 LANEWAY)
4.9b)	ACCESSORY RESIDENTIAL DWELLING UNIT: 1 SPACES IN ADDITION TO THOSE REQ'D FOR THE PRIMARY RESIDENTIAL DWELLING UNIT USE	16 SPACE(S)	16 SPACE(S) (1 LANEWAY)

PARKING REQ'D VISITOR:			
PROVISION	VISITOR PARKING: N/A SUBDIVISION	N/A	N/A

PARKING REQ'D TOTAL:			
TOTAL	48 SPACE(S)	48 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING)			
4.3.3	BARRIER FREE PARKING REQ'D: N/A SUBDIVISION		

4.0 OFF STREET PARKING: PARKING SPACE DIMENSIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7

RESIDENTIAL PARKING AREA			
4.2.3	4.2.3 Residential Parking Area For Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) within a front yard or exterior side yard, motor vehicles shall only be parked on a driveway, in a parking space or parking garage (7-Z-2018); b) not more than one (1) required parking space may be located within the required front yard or required exterior side yard (7-Z-2018); c) vehicles shall not be parked within any landscape area (5-Z-2018);		

LANDSCAPED AREA			
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (5-Z-2018)		

4.2.5	4.2.5 Parking and Landscape Area (7-Z-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.		
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CONDOMINIUM - GROUP TOWNHOUSES (UNIT 'A', 'C' & 'D')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R4

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE EXISTING
5.4 5.4.1	<b>URBAN RESIDENTIAL TYPE 4 ZONE (R4)</b> <i>PERMITTED USES</i> In an R4 Zone, no land, building or structure shall be used except in accordance with the following uses: a) group townhouse b) stacked townhouse c) street townhouse d) semi-detached, duplex, tri-plex and four-plex dwellings provided they are located on the same lot with, and in accordance with the Zone provisions of, group townhouse e) home occupation f) accessory residential dwelling unit, subject to Subsection 3.2.3.(7-Z-2020)

PROVISION	SETBACKS (m - METERS):	REQUIRED (m) Street Frontage	REQUIRED (m) Street Frontage Backlot Townhouse	PROVIDED (m)
5.4.2a)	MIN. LOT AREA: i) ATTACHED GARAGE ii) CORNER LOT iii) DETACHED GARAGE	156m <sup>2</sup> 264m <sup>2</sup> 162m <sup>2</sup>	145m <sup>2</sup> 145m <sup>2</sup> 215m <sup>2</sup>	23.846.43m <sup>2</sup>
5.4.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT iii) CORNER LOT ACCESSED BY A REAR LANE	6.5 11 6.5	30 30 30	196.2 & 19.1
5.4.2c)	MIN. FRONT YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE OR REAR YARD PARKING	6 1.5	6 1.5	11.4 & 9.3
5.4.2d)	MIN. EXTERIOR SIDE YARD: i) IV A 6m FRONT YARD ii) IV A 15m FRONT YARD	6 1.5	6 1.5	N/A
5.4.2e)	MIN. INTERIOR SIDE YARD	1.2	3	6 & 16
5.4.2f)	MIN. REAR YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE ACCESSED VIA A REAR LANE INCLUDING HALF OF THE LANE	7.5 13	7.5 7.5	N/A
5.4.2g)	MIN. SEPARATION BETWEEN TOWNHOUSE DWELLINGS	2	2	>2
5.4.2h)	MAX. BLDG. HEIGHT	11 (8-Z-2017)	11 (8-Z-2017)	<11 (8-Z-2017)
5.4.3	MIN. MUTUAL SIDE LOT LINE	1.2	1.2	3
5.4.4	MAX. UNITS IN A TOWNHOUSE DWELLING	8 UNITS	8 UNITS	8 UNITS

GRAY HIGHLIGHTED APPLICABLE

PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOMES (8-Z-2017): 2 SPACES / DWELLING UNIT 2 SPACES x 16 DWELLING UNITS = 32	144 SPACE(S)	144 SPACE(S)
4.9a)	INT-A (1-STORY RESIDENTIAL DWELLING STACKED): ACCESSORY RESIDENTIAL DWELLING UNIT: 1 SPACE IN ADDITION TO THOSE REQ'D FOR THE PRIMARY RESIDENTIAL DWELLING UNIT USE 1 SPACES x DWELLING UNITS = 82 CONDOMINIUM	(82 SPACES)	(82 SPACES) (1 EXTERNAL)
4.9b)	INT-C (10-STORY RESIDENTIAL DWELLING STACKED): 2 SPACES x 82 DWELLING UNITS = 164 CONDOMINIUM	(104 SPACES)	(104 SPACES) (1 LANEWAY, 1 GARAGE)
4.9b)	INT-D (10-STORY RESIDENTIAL DWELLING STACKED): 2 SPACES x 16 DWELLING UNITS = 32 CONDOMINIUM	(32 SPACES)	(32 SPACES) (1 LANEWAY, 1 GARAGE)

PARKING REQ'D VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (16 / 3) = 25.3	26 SPACE(S)	26 SPACE(S)

PARKING REQ'D TOTAL:			
TOTAL	172 SPACE(S)	172 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING)			
4.3.3	BARRIER FREE PARKING REQ'D: 26-50 (VISITOR) PARKING SPACES = TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S) 1 SPACE(S)	1 SPACE(S) 1 SPACE(S)

PARKING AREA REGULATIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7

LANDSCAPED AREA			
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (5-Z-2018)		

4.2.5	4.2.5 Parking and Landscape Area (7-Z-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.		
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3.0 GENERAL PROVISIONS

3.6.	<b>Decks and Porches</b> No deck or unenclosed porch shall: a) be nearer than 1.2 metres from an interior side lot line. b) have a floor higher than the height, above finished grade, of the floor of the first storey of the main dwelling on the lot, if so, it is referred to as a balcony (27-Z-2020). c) be closer than 3 metres from the rear lot line (8-Z-2023). d) project more than 1.5 metres into the required front yard or required exterior side yard. e) on a sloping rear yard, be closer than 3 metres from an interior lot line and 6 metres from the rear lot line, at the point where the deck floor reaches a height of 2 metres above the finished surface of the ground.
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3.10.	<b>Exemptions from Yard Provisions.</b> Except as otherwise provided herein, every part of any required yard shall be open and unobstructed by any building, structure, fuel-storage tanks, heating or air conditioner units, and generators except: a) sills, belt courses, cornices, chimneys, bay windows, pilasters, hydro meters or gas meters may project into any required yard or setback area a distance of not more than 0.65 metres; b) eaves or gutters may project into any required yard or setback area a distance of not more than 0.65 metres; c) canopies or awnings may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres; d) balconies may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres provided they are no closer than 3 metres from an interior lot line and 6 metres from a rear lot line. e) barrier-free access ramps may project into any required rear yard, required front yard or required exterior side yard area a distance of 3 metres; f) steps may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres, and steps may project into any required interior side yard area a distance of 1 metre. g) Public utilities may project into any required rear yard, required front yard, required interior side yard area or required exterior side yard area (6-Z-2019). h) Air conditioner units, provided the encroachment is no closer than 0.6 metres to the side lot line. (27-Z-2020)
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4.0 OFF STREET PARKING  
4.2 LOCATION OF PARKING ON A LOT

4.2.4	<b>4.2.4 Other Provisions</b> a) For tri-plex dwellings, duplex dwellings, four-plex dwellings, street townhouses, stacked townhouses, and boarding or lodging houses, required parking spaces shall be prohibited within the required front yard or required exterior side yard; except where a dwelling unit has a private garage in which case the driveway leading to the private garage may be used as a parking space subject to the size requirements herein; b) For group townhouses and apartment dwellings, no parking lot shall be located closer than 3 metres from any dwelling on the lot or of any interior lot line abutting another residential Zone; c) For group townhouses and apartment dwellings, no parking lot or parking space shall be located between a dwelling and the street line, except for individual or tandem parking spaces leading directly to each townhouse dwelling unit; d) For commercial or industrial properties, no parking lot shall be located closer than 4.5 metres from any interior lot line abutting a residential Zone; e) For accessory residential dwelling units, notwithstanding the foregoing, one (1) parking space dedicated for the use of the accessory residential dwelling unit, may be permitted in the front yard provided a minimum of 50 percent of the required front yard shall be maintained as landscaped open space notwithstanding such dedicated parking space.
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GRAY HIGHLIGHTED APPLICABLE

CONDOMINIUM - APARTMENT BLDGS. (UNIT 'E')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R6

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE PROPOSED
5.6 5.6.1	<b>URBAN RESIDENTIAL TYPE 6 ZONE (R6)</b> <i>PERMITTED USES</i> In an R6 Zone, no land, building or structure shall be used except in accordance with the following uses: a) dwelling, apartment b) home occupation c) retirement home.

PROVISION	SETBACKS (m - METERS):	REQUIRED (m)	PROVIDED (m)
5.6.2a)	MIN. LOT FRONTAGE:	30	136.1 & 19.1
5.6.2b)	MIN. FRONT YARD:	3	9.9
5.6.2c)	MIN. EXTERIOR SIDE YARD:	3	N/A
5.6.2d)	MIN. INTERIOR SIDE YARD	5	>5 & 63.5
5.6.2e)	MIN. REAR YARD:	9	N/A
5.6.2f)	MAX. BLDG. HEIGHT	8 STOREYS	8 STOREYS
5.6.2g)	MAX. FLOOR AREA RATIO: (MID RISE ONLY) i) 4 STOREY BLDG. ii) 5 STOREY BLDG. iii) 6 STOREY BLDG. iv) 7 STOREY BLDG. v) 8 STOREY BLDG.	0.12 0.14 0.16 0.18 1	>1 (-.83)

5.6.3	<b>"FLOOR AREA RATIO"</b> shall mean the ratio of the usable floor area to the lot, determined by the calculation of: floor area ratio = usable floor area / lot area. <b>5.6.3 STEP BACK OF UPPER FLRS</b> The exterior wall of each floor of a building facing a street and located above four (4) storeys shall be stepped back 2 metres from the exterior wall of the 4th storey and each floor above six (6) storeys shall be setback an additional 2 metres from the exterior wall facing a street. <b>5.6.4 ANGULAR PLANE</b> Where an R6 Zone abuts an Urban Residential Zone (R1-A, R1-B or R2), no portion of an apartment dwelling shall exceed the height of a 45 degree angular plane originating at the lot line of the nearest R1-A, R1-B or R2 Zone.
-------	--

GRAY HIGHLIGHTED APPLICABLE

3.10.	<b>Exemptions from Yard Provisions</b> Except as otherwise provided herein, every part of any required yard shall be open and unobstructed by any building, structure, fuel-storage tanks, heating or air conditioner units, and generators except: a) balconies may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres provided they are no closer than 3 metres from an interior lot line and 6 metres from a rear lot line.
-------	---

PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	INT-E APARTMENT DWELLING (8-Z-2017): 15 SPACES / DWELLING UNIT 15 SPACES x 16 DWELLING UNITS = 246	246 SPACE(S)	236 SPACE(S) UNDERGROUND
4.9b)	MAKE-UP 14 STUDIO - 1 SPACE / DWELLING UNIT 21 1-BED - 1 SPACE / DWELLING UNIT 21 2-BED - 1.5 SPACE / DWELLING UNIT 22 2-BED + 1.5B - 1.5 SPACE / DWELLING UNIT 3 BENTHOUSE - 1.5 SPACE / DWELLING UNIT 84 TOTAL	21 SPACE(S) 40.5 SPACE(S) 130.5 SPACE(S) 42 SPACE(S) 12 SPACE(S)	14 SPACE(S) 27 SPACE(S) 131 SPACE(S) 42 SPACE(S) 12 SPACE(S)

PARKING REQ'D VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (164 / 3) = 54.7	55 SPACE(S)	55 SPACE(S)

2.110  
"USABLE FLOOR AREA" shall mean the total area of all floors of a building, outdoor patio or cafe, or dwelling unit including:  
a) a hallway, aisle, stairway and corridor within a suite or unit;  
b) an internal wall and partition within a suite or unit;  
c) a storage room and storage area within a suite or unit;  
d) a balcony in the case of a detached house;  
e) a habitable room or area in the basement of a dwelling.  
But excluding:  
a) an area occupied by a common area in a multi-tenant building including but not limited to a public stairwell, public or shared corridor and lobby;  
b) a mechanical shaft;  
c) an entry vestibule not within a dwelling unit;  
d) a garage attached to a building;  
e) an unfinished basement in a dwelling used for storage or laundry.

The usable floor area for a dwelling is measured from the outside face of exterior walls or to the centre-line of party or common walls.  
The usable floor area for all other buildings shall be measured from the inside face of exterior walls, interior common walls and firewalls.

PARKING REQ'D: NON-RESIDENTIAL			
4.9(1)	RESTAURANT, FAST FOOD WITHOUT DRIVE THROUGH 15 SPACE / 6m <sup>2</sup> 15 SPACE x (90 x 180 / 6m <sup>2</sup> ) = 115	18 SPACE(S)	18 SPACE(S)
4.9(2)	OTHER COMMERCIAL USE 15 SPACE / 35m <sup>2</sup> 15 SPACE x (94 / 35m <sup>2</sup> ) = 2.7	3 SPACE(S)	3 SPACE(S)
4.9(3)	OTHER NON-RESIDENTIAL USES (DAYCARE) 15 SPACE / 35m <sup>2</sup> 15 SPACE x (305 / 35m <sup>2</sup> ) = 11	11 SPACE(S)	11 SPACE(S)
TOTAL		32 SPACE(S)	32 SPACE(S)

PARKING REQ'D TOTAL:			
TOTAL	333 SPACE(S)	318 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING & COMMERCIAL)			
4.3.3 (95%+30%)	BARRIER FREE PARKING REQ'D: 76-102 (VISITOR & COMMERCIAL) PARKING SPACES = TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S) 2 SPACE(S)	2 SPACE(S) 2 SPACE(S)

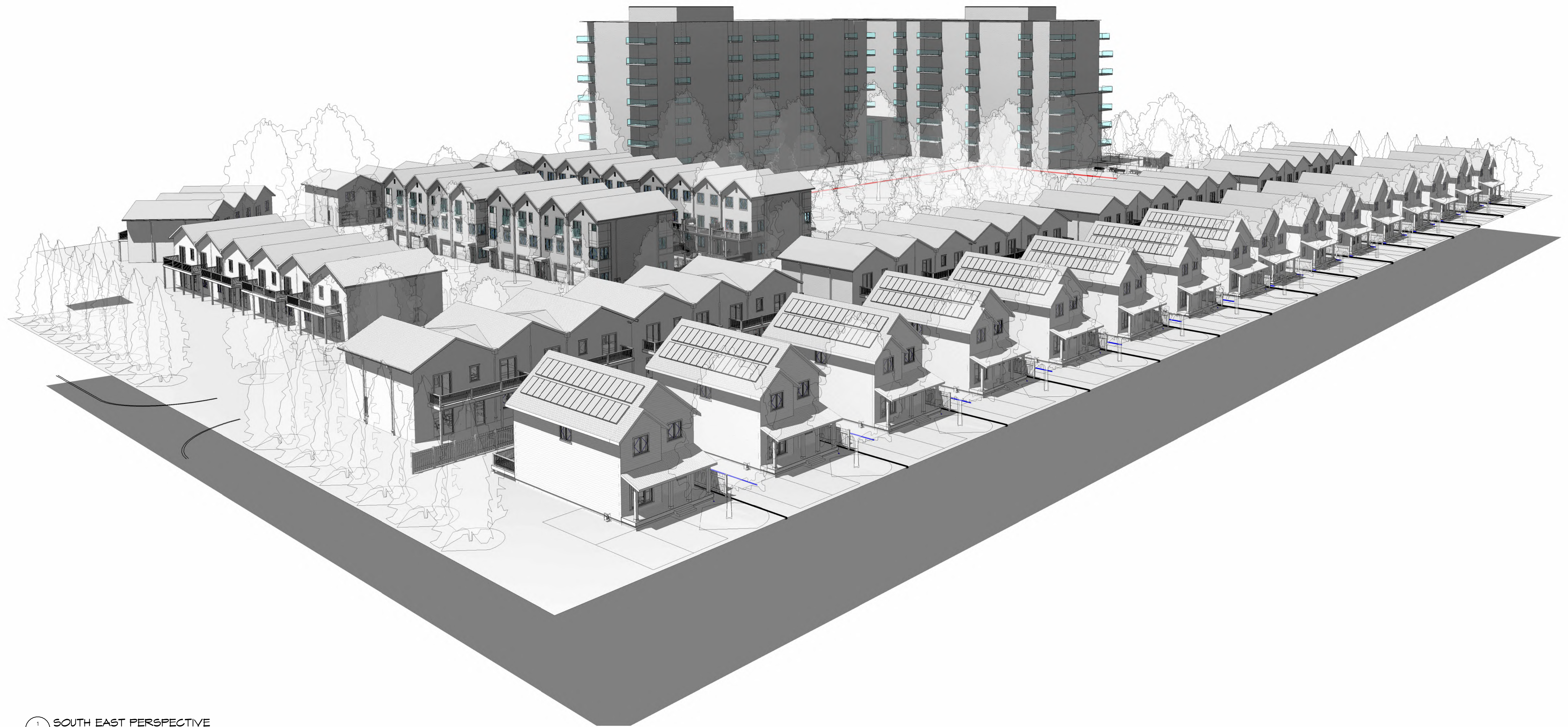
PARKING REQ'D - LOADING SPACES			
4.7	LOADING SPACES: 3m WIDTH x 10m DEPTH	N/A	1 SPACE(S)

PARKING AREA REGULATIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7
4.1.4	PARKING AISLE REQ'D: TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.



H:\Projects\2021\21-061 Silos of Waterford Drawings\Arch\21-061 - SILOS OF WATERFORD - SITE PLAN

DATE LAST PLOTTED 2025-01-13 12:18:04 PM



1 SOUTH EAST PERSPECTIVE  
2102 SCALE



G. DOUGLAS VALLEE LIMITED  
2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 4W3  
(519) 426-6270



Project Title  
**SILOS OF WATERFORD**  
257 CHURCH ST. W,  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

**PRELIMINARY  
NOT FOR  
CONSTRUCTION**

**SITE PLAN PERSPECTIVE**

PROJECT No.  
**21-061**

Drawing Title

Drawing No.  
**Z102**



# The Silos of Waterford

## Verlinda Homes

### Planning Justification Report

Application to Norfolk County

Official Plan Amendment

Zoning Amendment

Draft Plan of Subdivision

Project 21-061

February 1, 2022



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### Introduction

G. Douglas Vallee Limited has been retained by Verlinda Homes to make an application for an Official Plan and Zoning By-law Amendment and a draft plan of subdivision to permit development consisting of approximately 272 residential units on the former Norfolk Co-operative Company Limited, an agricultural supply depot. The property is located on the southwest corner of West Church Street and McCool Street.

The Norfolk County Official Plan designates this site “Industrial” and therefore describes the site as

*“under utilized and poorly situated to attract new industrial investment.”*

The official plan encourages the conversion of these lands to uses that are more compatible with the surrounding neighbourhood. This proposed re-development precisely implements that direction from the Norfolk County Official Plan.

The intent of the proposal is to redevelop a stagnant land parcel at the western edge of the urban boundary of Waterford and to create a new vibrant community within the existing neighbourhood. The development will be highly attractive to new homeowners, given the wide range of housing options that will be available; single detached dwellings within a plan of subdivision, various forms of condominium townhouses, and condominium apartment dwellings ranging from studio units to penthouse suites.

The introduction of commercial uses within the condominium plan will provide basic services to the residents of the community, such as daycare, coffee shops and service industry shops. This will provide convenience to the community and be an added benefit to the development.

The proposed mid-rise building will be similar in height and massing to the existing silos on the site (which the project is named after). The owners of the units within this mid-rise building will be provided with a commanding view of the Waterford Ponds and the associated nature complex. Views of the Waterford downtown area will also be enjoyed by the residents.

The site is immediately adjacent to the Waterford Rail Trail, providing an outstanding opportunity for residents to enjoy the best that Norfolk County has to offer - outdoor nature experiences. With this trail at the condominium’s doorstep, residents will have direct access to the trail network, leading them to adjacent communities and the Waterford Ponds conservation areas, camping and fishing opportunities.

It is proposed to change the Official Plan designation of the lands from **Industrial** to **Residential** to facilitate the re-zoning of the lands to **Residential Types R1-B, R-4 and R-6**. Appendix A provides a detailed site plan for the proposed development, which will feature eight (8) different housing forms providing the residents of Norfolk County with increased housing options. The development will consist of three primary components:

1. **Plan of Subdivision:** A plan of subdivision will create 16 single detached dwelling lots fronting on McCool Street. These lots will be geared to smaller two-storey homes with the option for accessory dwelling units to provide attainable housing for the community of Waterford.

2. **Condominiums Townhouses** will occupy the majority of the site and will contain an innovative mix of housing styles:
  - a. Two-storey stacked townhomes with one smaller and accessible unit on the ground floor and a larger second unit above the ground floor unit and the garages.
  - b. Three-storey stacked townhomes with a single floor at grade unit at the back of the building (being an accessory dwelling unit) with three-storey stacked units in front and over the top of the back unit.
3. **Condominium Apartments** will be located in the northwest corner of the site and offer the following unit styles:
  - a. Studio
  - b. One Bedroom
  - c. Two Bedroom
  - d. Two Bedroom + Den
  - e. Penthouse

Three planning applications are supported by this report:

1. An **Official Plan** amendment is required to change the designation from **Industrial** to **Residential**.
2. A **Zoning** amendment is required to change the zoning from **General Industrial (MG)** to **Residential Types R-1B, R-2 and R-6** with the special provisions noted in this document.
3. A **Draft Plan of Subdivision** is required to create the single detached lots fronting on McCool Street.





Figure 1 – Subject Lands

This application:

- Re-develops an under-utilized industrial site into a vibrant residential community;
- Is consistent with the Provincial Policy Statement;
- Implements the intent and purpose of the Norfolk County Official Plan;
- Proposes a density and mix of dwelling types compatible with the area's land uses;
- Ensures the protection of Natural Heritage Features;
- Can be appropriately serviced by municipal infrastructure, including water and sanitary services;
- Represents good planning.

### Site Description

The lands are 3.49 hectares in area with approximately 118 meters of frontage on West Church Street. They are rectangular in nature with a curved westerly property line and a 'jog' into the property from the Church Street Road allowance (See Figure 1). The lands are within the urban area and, more specifically, within the Norfolk County 'built-up' area. The Former Lake Erie and Northern Railway Company lands to the west are now used for a trail system.

The site was previously occupied by the former Norfolk Co-operative Company Limited, an agricultural supply depot. The structures on the lands have consisted of:

- 33 silos (13 on the site plus an additional 20 silos on the adjacent lands to the west).
- Various warehouses
- Various storage buildings; and
- A fueling station

The topography of the lands is relatively flat as the majority of the site is near elevation 246.5 m, with a drop in elevation in the northwest corner to 243.4 m.

### Surrounding Uses

The surrounding land uses consist of the following:

- To the north
  - Nichol Street
  - Vacant land, approximately 2 acres in size, zoned hazard land and general industrial,
  - Royal Canadian Legion is approximately 2.6 acres in size.
  - Proposed residential development for condominium townhouses, zoned R4(H)
- To the East
  - McCool Street
  - Mini storage building site zoned General Industrial (MG)
  - Single detached residential dwellings zoned Residential (R1-B)
- To the South
  - West Church Street
  - Proposed residential development for condominium townhouses, currently zoned General Industrial (MG)
  - Single detached residential home
  - Class 1 Industrial use zoned general industrial MG approximately 2.8 acres.
- To the West
  - Waterford Heritage Trail
  - Vacant lands zoned Agricultural and Hazard Land

### Community Meeting

In order to gather input and feedback from the community, the applicant held a community open house and information session on November 3, 2022. The applicant advertised this meeting by hand delivering notices to the homes in the area and by posting flyers / notices in key locations in the community, including at the Legion Hall. The meeting was held at the Royal Canadian Legion, across the street from the subject lands.

The applicant was represented by the following team members:

- Tom O'Hara – Applicant
- Angie O'Hara – Applicant
- John Vallee, P.Eng. – Development Consultant
- Melissa Stickl, OAA – Architect

This meeting was well attended by the Community, with nearly 100 people being present. There were two primary concerns expressed by members of the community; density / massing / height and traffic. Since that meeting, the applicant has adjusted the proposal as follows:

#### **Density / Massing / Height**

To address the concerns of the neighbourhood regarding density, massing, and height, the applicant has modified the proposal along the edge of the development adjacent to the existing neighbourhood. McCool Street separates the proposed development from the existing neighbourhood. The original plan, as presented at the public meeting, indicated street townhomes fronting on McCool Street.

In recognition of the fact that the existing neighbourhood is primarily single-detached and semi-detached dwellings, the proposed dwelling units along McCool have been changed from townhouses to small form single detached dwellings. This housing style is consistent with the neighbourhood. With this revised proposal, the transition from single and semi-detached homes to townhomes occurs within the development instead of at the edge of the proposal. This change will make the interface of the proposed development consistent with the neighbourhood.

The applicant's proposal also includes a tapered increase in height and massing with only two-story homes along the edges of the development, tapering up to increased height and density within the development. In this way, the higher-density forms of housing are not adjacent to the existing neighbourhood.

#### **Traffic**

Neighbours nearby to a proposed development are always concerned with increased traffic volumes. In order to ensure that the development will not overwhelm the neighbourhood's roads and streets, the applicant has retained Paradigm Transportation Solutions to complete a Traffic Impact Study. The study concludes that all study area intersections and site accesses are forecast to operate at Level of Service "A" at the far end of the study period, being the year 2036.

### Proposed Amendments

The purpose of this planning justification report is to provide planning support to Norfolk County and agencies when considering the applications for an Official Plan and Zoning By-law amendment and Draft Plan of Subdivision to permit a mix of residential and commercial uses on the subject lands.

**Table 1: Official Plan Amendment**

Official Plan Section	Existing	Proposed
<b>7.13</b>	Industrial Designation	Urban Residential Designation
<b>7.7.1</b>	<ul style="list-style-type: none"> <li>Urban Residential Permitted Uses.</li> <li>Residential.</li> <li>Small-scale neighbourhood convenience commercial and personal services use.</li> </ul>	Additional uses including <ul style="list-style-type: none"> <li>Restaurants all types</li> <li>Retail store</li> <li>Small-scale institutional (i.e., Daycare)</li> <li>Clinic or doctors' offices</li> <li>Pharmacy</li> <li>Financial institution</li> <li>Office, all types</li> <li>Place of assembly or entertainment, or sports and recreation, or worship</li> <li>Service shops, i.e., bike repair</li> <li>delicatessen and specialty food shops</li> <li>personal service shop</li> <li>merchandise service shop</li> </ul>
<b>7.7.2 d) i)</b>	<ul style="list-style-type: none"> <li>No more than one commercial structure or building shall be permitted on any site, and the gross floor area of the commercial use shall generally not exceed 300 square meters;</li> </ul>	<ul style="list-style-type: none"> <li>Multiple commercial uses may be contained within a single building, and the floor area of the commercial use shall not exceed 15% of the lot area.</li> </ul>



**Table 2: Zoning By-law Amendments (Comprehensive Zoning By-law 2140(97))**

Zone	Existing	Proposed
<b>Schedule A10</b>	General Industrial (MG) Zone	Urban Residential Type 1 Zone (R1-B) Urban Residential Type 4 Zone (R4) Urban Residential Type 6 Zone (R6)
<b>5.1 Urban Residential Type 1 Zone (R1-B)</b>		No amendments to zone provisions required
<b>5.4 Urban Residential Type 4 Zone (R4)</b>		No amendments to zone provisions required
<b>5.6.1 Urban Residential Type 6 Zone (R6)</b>	Permitted Uses a) dwelling, apartment b) home occupation c) retirement home.	Add permitted uses, including: <ul style="list-style-type: none"> <li>• Restaurants all types</li> <li>• Retail store</li> <li>• Small-scale institutional (i.e., Daycare)</li> <li>• Clinic or doctors' offices</li> <li>• Pharmacy</li> <li>• Financial institution</li> <li>• Office, all types</li> <li>• Place of assembly or entertainment, or sports and recreation, or worship</li> <li>• Service shops, i.e., bike repair</li> <li>• delicatessen and specialty food shops</li> <li>• personal service shop</li> <li>• merchandise service shop</li> </ul>
<b>4.9 Number of Parking Spaces</b>	a) singles, semis duplex, triplex, fourplex, townhouses, and vacation homes: <i>2 spaces per unit.</i>	No amendment required
	b) Apartment dwellings: <i>1.5 spaces per unit</i>	Studio and one-bedroom apartments shall require 1 space per dwelling unit.
	c) dwelling unit in a non-residential building; <i>1 parking space per unit.</i>	No amendment is required.
	e) Accessory dwelling unit: <i>1 space</i> in addition to those required for the primary residence.	No amendment required
	f) Visitor spaces for apartments, duplexes, triplex, and townhouses as part of a condominium <i>1 visitor space for every 3 dwellings</i>	No amendment required
	Non-residential: Varies with use.	1 parking space for every 35 square meters of usable floor area regardless of use.

<b>2.88</b>	<p>“LOT” shall mean a parcel of land which can be legally conveyed. Where two (2) adjoining lots are in common ownership, and a main building straddles the lots, the two (2) lots are deemed to be one (1) lot for the purposes of establishing interior side yards.</p>	<p>In lieu of Section 2.88, the definition of a LOT shall not apply to the individual condominium units. The LOT shall be defined as the parcel of land consisting of the entire condominium block.</p> <p>The Norfolk County Zoning By-law provisions regarding the definition of a LOT are unclear in their application to a condominium development.</p> <p>The inclusion of this provision will clearly define the LOT and corresponding yard provisions. It will enhance the ability to interpret and apply the zoning by-law at the Site Plan approvals stage.</p>
<b>3.11.2</b>	<p>For the purposes of this Subsection, a private condominium road servicing a condominium development shall be deemed to be an open, constructed and year-round improved street.</p>	<p>In lieu of Section 3.11.2, the private condominium road shall not be deemed an improved street.</p> <p>See Section 2.88 above.</p> <p>The inclusion of this provision will clearly define the required yard and corresponding setback provisions for the entire condominium block. This will enhance the ability to interpret and apply the appropriate zoning by-law provisions for individual condominium units, which will assist staff and residents when considering potential future additions such as decks.</p>

This proposal contains a number of studio and one-bedroom apartment dwellings within the mid-rise condominium building. These units are geared towards single-person occupancy and, therefore, single-vehicle ownership. Some of the occupants may not own a vehicle. On this basis, we believe that providing a single parking space (plus visitor spaces) for these units is sufficient and justified.

**Table 3: Parking Study**

Unit Description	# Of Units	Parking Req / Unit	Required Parking Spaces
<b>Plan of Subdivision</b>			
<b>Single Detached Dwellings (McCool St)</b>			
<b>Unit B</b>	16	2 / dwelling	32
Accessory Dwelling Unit	16	1 / dwelling	16
<b>Total Subdivision</b>	<b>32 Units</b>		<b>48 spaces</b>
<b>Condominium</b>			
<b>Townhouses Condos</b>			
<b>Unit A:</b> 1 Storey residential stacked under the D units: <i>Considered an Accessory Residential Dwelling Unit.</i>	8	1 / dwelling	8
<b>Unit C:</b> 2 Storey residential stacked over each other.	52	2 / dwelling	104
<b>Unit D:</b> 3 Storey residential stacked over the A units	16	2 / dwelling	32
<b>Total Dwelling Parking</b>	76 units		144 spaces
<b>Visitor Parking</b>	76	1 / 3 dwellings	26 spaces
<b>Total Townhouse Condo</b>	<b>76 units</b>		<b>170 spaces</b>
<b>Apartment Condos</b>			
Studios	14	1 / dwelling (var)	14
One-bedroom	27	1 / dwelling (var)	27
Two bedroom	87	1.5 / dwelling	131
Two bedroom + den	28	1.5 / dwelling	42
Penthouse	8	1.5 / dwelling	12
<b>Total Dwelling Parking</b>	164 units		226 spaces
<b>Visitor Parking</b>	164 units	1 / 3 dwellings	55 spaces
<b>Total Apartment Condo Parking</b>			<b>281 spaces</b>
<b>Commercial</b>	<b>Area</b>	<b>Parking Req</b>	<b>Total</b>
Misc Commercial Uses	700 m2	1 space / 35 m2	20 spaces
<b>Total Commercial Condo Parking</b>			<b>20 spaces</b>
<b>Total Condo</b>	<b>240 units</b>		<b>471 spaces</b>
<b>Grand Total Subdivision + Condo</b>	<b>272 units</b>		<b>519 spaces</b>

### Supporting Studies

Studies identified through the pre-consultation with Norfolk County have been completed and are submitted in support of the proposed development. These studies are summarized as follows:

1. This Planning Justification Report (prepared by G. Douglas Vallee Limited)
2. A site plan (prepared by G. Douglas Vallee Limited)
3. Urban Design Study (prepared by G. Douglas Vallee Limited)
4. Parking Assessment (see the previous section of this report)
5. Phase One Environmental Site Assessment Update – (prepared by G2S, December 2021)
6. Function Servicing Report (prepared by G. Douglas Vallee Limited, dated March 2, 2023)
7. Functional Transportation Impact Study (prepared Paradigm Transportation Solutions, June 2022)

Appendices to this report include the following:

- Appendix A – Concept Plan
- Appendix B – Provincial Policy Statement 2020 Policy Compliance
- Appendix C – Norfolk County Official Plan Policy Compliance
- Appendix D – Draft Plan of Subdivision

This application was submitted to include the information and material required under Section 22(4) 'Official Plan,' and Section 34 (10.1) 'Zoning' and Section 51(19) of the Planning Act as part of a complete application.



### Planning Review

#### Planning Act

Section 2	Lists matters of provincial interest to have regard to.
Section 3	Requires that, in exercising any authority that affects a planning matter, planning authorities “shall be consistent with the policy statements” issued under the Act and “shall conform with the provincial plans that are in effect on that date, or shall not conflict with them, as the case may be.”
Section 21(1)	Allows for amendments to the Official Plan.
Section 34	Allows amendments to the Zoning By-law.
Section 51	Allows for the creation of plans of subdivision.

#### Provincial Policy Statement 2020

The PPS provides policy direction for appropriate land use planning and development patterns to achieve healthy, livable, and resilient communities that will protect resources of provincial interest, public health and safety, and the quality of the natural and built environment and will facilitate economic growth.

The Provincial Policy Statement recognizes the diversity of Ontario, and that local context is important. Under the ‘Geographic Scale of Policies,’ the PPS states,

*“Policies are outcome-oriented, and some policies provide flexibility in their implementation provided that provincial interests are upheld.*

*While the Provincial Policy Statement is to be read as a whole, not all policies will be applicable to every site, feature or area. The Provincial Policy Statement applies at a range of geographic scales.*

*Some of the policies refer to specific areas or features and can only be applied where these features or areas exist. Other policies refer to planning objectives that need to be considered in the context of the municipality or planning area as a whole and are not necessarily applicable to a specific site or development proposal.”*

The subject lands are within a Settlement Area as defined by the Provincial Policy Statement, 2020 (PPS). The PPS provides policy direction for appropriate land use planning and development patterns to achieve healthy, livable, and resilient communities through efficient development that will protect resources of provincial interest, public health and safety, the quality of the natural and built environment and will facilitate economic growth. It is encouraged that planning authorities consider infilling, redevelopment and intensification in a compact form in areas that support active transportation and can take advantage of existing infrastructure.

A decision by Council to approve the Official Plan and Zoning By-law amendment will be consistent with PPS, 2020. Full details describing the applicable Provincial policies and how the application is consistent with the PPS are included in Appendix B.

### Norfolk County Official Plan (NCOP)

The NCOP designates the lands as “**Industrial**.” The first paragraph of the NCOP section on Industrial Land clearly states that lands in this designation are not suitable for industrial use and should be converted to another designation that is more compatible with the surrounding land use.

Section 7.13 Industrial Designation states:

*“The Industrial Designation applies to older industrial sites that are under-utilized and poorly situated to attract new industrial investment. Generally, areas designated as Industrial are located **near to residential areas** and their intensive use for industrial purpose may conflict with neighbouring sensitive uses. The **conversion of lands** designated as Industrial **to other uses more compatible** with the neighbourhood context in which the lands are situated **is encouraged**.”*

This application implements this section of the NCOP. This older industrial site that is under-utilized is proposed to be re-designated as Residential, being compatible with the existing and proposed residential land uses in the neighbourhood. The details of compliance with the Official Plan are demonstrated in Appendix C.

Several sections of the Official Plan apply when considering zoning by-law amendments and are discussed in detail under Appendix C. On a high level, details of the Official Plan policies are captured by the overarching Goals and Objectives. Section 2.2 of the Official Plan set out six “Goals and Objectives” to which the following five are applicable to the proposed residential development:

- Protecting and Enhancing the Natural Environment;
- Maintaining and Enhancing the Rural and Small-Town Character;
- Maintaining a High Quality of Life;
- Upgrading and Expanding Infrastructure; and
- A Well Governed, Well Planned and Sustainable County.

The proposed official plan and zoning by-law amendment achieves the ‘Goals and Objectives’ of the Official Plan as demonstrated in Appendix C.

The proposed development will provide a compact form of additional housing choices and compatible character to the existing mix of residential and commercial development in the area. This will result in the efficient use of land of high quality, providing a variety of housing forms and levels of affordability. The lands are subject to site plan control to ensure County development standards are achieved.

Norfolk County’s existing infrastructure will be reviewed by Norfolk County’s consultant (RV Anderson Associates) in consideration of the connections proposed to service this development and in light of a Functional Servicing Report prepared by G. Douglas Vallee Limited. Existing services will be extended to the site from the existing mains along West Church Street, Nichol and McCool Streets. The proposed

infrastructure will be designed and constructed in accordance with Norfolk County's requirements and will be subject to Norfolk County's approval through the site plan process.

The lands are near existing residential, commercial and institutional uses, including the Waterford District High School, several places of worship, parks and a retail center. Through the site plan process, appropriate landscaping and buffering will be considered to improve compatibility with the adjacent uses.

### **Conversion of Industrially Designated Lands**

Section 7.13.2 b) of the NCOP sets out the criteria for consideration in the conversion of Industrially designated lands to other land uses. The eight (8) criteria – and the expanded referenced policies – are set out in Schedule C of this report.

The proposal satisfies the requirement of the plan since:

1. A variety of housing forms are proposed.
2. The density is appropriate.
3. The height and mass at the edge of the development is similar to the adjacent residential properties.
4. There is direct access to a collector road.
5. The lands can be serviced.
6. The community is serviced by parks and schools.
7. Greenspace has been allocated within the development.
8. The design minimizes visual impacts.
9. The existing road network can support the anticipated traffic.
10. The project will be subject to site plan control.

### **Residential Intensification**

Section 5.3.1 of the NCOP discusses Residential Intensification. This section states that residential intensification includes:

*“Redevelopment which includes either the replacement of existing residential uses with compatible new residential developments at a high density or the **replacement of non-residential uses with compatible residential or mixed-use development** with a residential component.”*

The proposed development replaces a non-residential use with a compatible residential development. This is discussed further in the following section of this report titled “Land Use Compatibility.” Therefore, this proposal is consistent with this section of the NCOP.

Section 5.3.1 b) states that:

*“The County shall target that a minimum 25 percent of its annual residential growth be accommodated through infill, intensification and redevelopment within the existing built-up areas in the Urban Areas...”*

The proposed development would greatly assist Norfolk County in reaching this target of 25% since the vast majority – if not all - of the other development applications within Waterford would not classify as infill, intensification or redevelopment. Therefore, this development proposal assists the County in achieving its own goals as stated within the NCOP.

Section 5.3.1 f) states that:

*“The County shall consider applications for infill development, intensification and redevelopment of sites and building through intensification based on the following criteria:.”*

#	Policy	Compliance	
i	The development proposal is located within an Urban Area and is appropriately located in the context of the residential intensification study.	The proposal is within the urban area. Norfolk County has not completed an intensification study; as such, this cannot be referenced.	✓
ii	The existing water and sanitary sewer services can accommodate the additional development	This is confirmed by the Functional Servicing Report.	✓
iii	The road network can accommodate the traffic generated	This is confirmed by the Traffic Impact Study.	✓
iv	The proposed development is compatible with the existing development of any physical characteristics of the adjacent properties and surrounding neighbourhood	This residential development is compatible with the surrounding lands that are predominantly residential. Refer to Appendix C and the Urban Design Study for detailed discussion.	✓
v	The proposed development is consistent with the policies of the appropriate Land Use Designation associated with the land.	This report confirms that the development is consistent with the policies of the NCOP,	✓

### **Urban Design Study**

Section 5.4 of the NCOP speaks to the importance of Community Design. This section of the plan sets out no less than 22 key points to be considered in new development regarding community design. To this end, an Urban Design Study has been prepared by Vallee and is attached to this document in support of this application.

### **Water Servicing**

Section 8.9.1 of the Norfolk County Official Plan addresses servicing in urban areas, such as Waterford. Section 8.9.1 c) states:

*“All development in the Urban Areas shall be fully serviced by municipal piped water supply and wastewater treatment systems, save and except for circumstances outlined in Section 8.9.1 f)…”*

Through the pre-consultation process, Norfolk staff have questioned if this proposal meets this section of the Norfolk County Official Plan with respect to the provision of water for firefighting purposes. It is anticipated that the results of the watermain network modelling by Norfolk County's consultant will determine that the existing municipal watermain network cannot provide the fire flows required by Norfolk County's current standards.

Norfolk County Engineering staff have verbally advised that this standard is under review and that it is anticipated that this standard will be reduced at some time in the future. However, that change of standard has not occurred yet; therefore, this application must demonstrate compliance with Norfolk's current standards.

In order to achieve the required fire flows, it is proposed to construct a series of underground tanks or cisterns and to fill these cisterns with municipal piped water. In the event of a fire, the water in these cisterns will be available to supplement the water flow the municipal watermain network can produce. This could be configured in multiple ways:

Fire hydrants could be placed on the site and connected directly to the cisterns. The fire trucks could connect directly to these cistern hydrants and pump from the cistern to fight the fire. The fire trucks could also connect to the fire hydrants connected to the municipal system. These two systems could work in concert to provide the required fire flow.

The cistern system could be equipped with fire pumps. In the event of a fire, these pumps would activate and pressurize a series of hydrants throughout the development. The fire truck could then connect to these pressurized hydrants and the hydrants pressurized by the municipal watermain network to provide the required fire flow.

In either scenario, the servicing of the site meets the requirements of 8.9.1. c) being a municipal piped water supply.

This section refers to a “water supply.” The “water supply” must be municipal and piped. This section does NOT refer to restrictions on booster pumps or on-site water storage, but only on the water supply. There are two criteria for water supply: Municipal and Piped:

**Municipal:** A water supply can either be municipal or private. A private water supply would consist of private on-site water wells or another water source not part of the municipal system, such as a private distribution system. An example of a private distribution system exists in Norfolk County's Long Point,

and that system would not qualify as a municipal supply. It is important to note that for the proposed development, all of the water will be supplied by Norfolk County's municipal system. Therefore, the proposed water supply is "municipal," meeting the first criteria.

**Piped:** Water supply can be delivered to a site through the use of pipes (or watermains), trucked or somehow delivered to a site. This trucked arrangement is common in the rural areas of Norfolk County, where private wells cannot produce acceptable water quality or quantity, and therefore water is routinely trucked to the site. In the case of this application, all of the water for the development will be piped to the site using the municipal watermain network. Therefore, the proposed water supply is "piped," meeting the second criteria.

The clear intention of Section 8.9.1 c) is to prohibit other water supply sources such as private wells, trucks of water from other sources, or private water supply systems. In the case of the proposed development, all of the water that will be used on-site for both domestic and firefighting purposes will be supplied by the "municipal piped water system."

Therefore, it is our opinion that the proposed water supply system is consistent with the requirements of section 8.9.1 of the Norfolk County Official Plan.

### **Official Plan Amendments**

Section 9.6.1 of the NCOP sets out the process and requirements for amendments to the plan. The following criteria are to be considered.

#	Policy	Compliance	
a)	Applications to amend the plan shall include a planning rationale report including: <ul style="list-style-type: none"> <li>Proposed use</li> <li>Servicing</li> <li>Density</li> <li>Floor area</li> <li>Lot layout</li> <li>Site plan</li> <li>Items in 9.6.1 c)</li> </ul>	These items are all addressed in this report.	✓
b)	Any specific Official Plan amendment procedures outlined in the policies of this Plan shall apply.	The application process will follow the policies of the NCOP	✓
c)	9.6.1 c) as referenced in a) above	See above	✓
i)	The manner in which the proposed amendment conforms to the PPS	This is addressed in this report.	✓
ii)	The manner in which the proposed amendment conforms to the Strategic Plan prepared in support of this application.	Norfolk County does not currently have a strategic plan in place.	✓
iii)	The manner in which the proposed amendment conforms to the Goals, Objectives and policies of this plan.	This is addressed in Appendix C.	✓
iv)	The impacts of the proposed amendment on the provision of and demand for municipal services, infrastructure and facilities.	This is addressed by the Functional Servicing Report.	✓
v)	The adequacy of the proposed servicing solution with respect to the servicing policies of this plan.	This is addressed by the Functional Servicing Report.	✓
vi)	The impact of the proposed amendment on surrounding land use, the transportation system, municipal services and community amenities and services	This is addressed through the comments in this report on compatibility, the Traffic Impact Study and the Functional Servicing Report.	✓
vii)	The impact of the proposed amendment on the community structure and nature of the Urban Areas.	This is addressed in the Urban Design Report.	✓

	viii) The impact of the proposed amendment on cultural heritage resources and or Natural Heritage Features.	This is addressed in the Urban Design Report.	✓
	ix) The impact on agricultural uses and land	The site is not on agricultural land.	✓
	x) The impact of the proposed amendment on the financial sustainability of the County	The development will generate significant development charges and will increase the tax base for Norfolk County.	✓
	xi) Any other information determined by the County, in consultation with the appropriate agencies, to be relevant and applicable.	All items identified in the pre-consultation meeting have been addressed in this document.	✓

### **Summary of Official Plan review**

The proposed Official Plan and zoning by-law amendment meet the policies of the Official Plan. As shown in Appendix C, the proposed development meets the requirements of 7.7 through the implementation of appropriate and compatible forms of housing.

The development concept represents an appropriate land use considering the size of the property, proximity to existing residential and commercial uses, availability of servicing, and the provision of buffering and landscaping. Accordingly, the proposed applications meet the intent and purpose of the Official Plan and represent good planning.

A decision of the Council to approve the proposed Official Plan amendment from Industrial to Residential is considered appropriate.

### **Norfolk County Zoning By-law (Zoning By-law)**

The lands are currently zoned MG for General Industrial in the Norfolk County zoning bylaw. It is proposed to change the zoning to three (3) forms of residential zoning to facilitate the proposed development:

1. **Residential (R1-B)** for the single detached lots to be created along McCool Street through a plan of subdivision,
2. **Residential (R4)** for the group townhouses contained within the proposed plan of condominium,
3. **Residential (R6)** for the apartment building within the proposed plan of condominium.

Generally, the existing provisions in the standards zones will facilitate the anticipated development; however, some special provisions are required and are all set out in the previous “Proposed Amendments” section of this report. These special provisions are not repeated here.



### Land Use Compatibility

The subject property is located in an area of transition. The Norfolk County Official Plan encourages the re-development of this site from its historical industrial use to a more compatible use with the surrounding neighbourhood. Similar residential development applications are active in the neighbourhood, which would also result in residential development in this area of Waterford. The existing land use to the east is predominantly residential.

The Norfolk County Official Plan encourages the re-development of this site, which will lead to the transition of this area of Waterford. This application is the first step in implementing this transition that is encouraged by the Official Plan. Eliminating the historical industrial use on this site and redeveloping the site with a wide variety of residential uses will improve the quality of the neighbourhood and the community. The approval of these applications will start the transition encouraged by both the Official Plan and the Province of Ontario's Bill 23.

The design of the proposed development strategically tapers density across the site. At the interface with other residential development on the east edge of the property (McCool Street), the development consists of low rise – low-density single-detached dwellings. As the development moves westerly, the density and building height increase to two and three-storey townhomes and then increase again to an eight-storey apartment building on the furthest west side of the site - thereby maximizing the separation distance from the apartment building to the existing residential homes.

The apartment building has also been located in the same general place as the existing silo buildings, and the apartment building will be the same height (approximately 32 m) as the existing silo buildings. Therefore, the height and massing of the apartment building will not significantly change the neighbourhood.

The compatibility of the development is discussed further in Appendix C, under sections 7.7.2 c) and 7.13.2 b) iii).

It is important to note that compatible is defined as two things that can exist together without conflict, although they may not be the same. It is our opinion that although the proposed residential use is somewhat different from the existing residential use in the area, they are, in fact, compatible with the reasons set out in this report.

### D6 Guidelines

The Ministry produced the D series guidelines to address compatibility between industrial and sensitive land uses such as residential development. There are industrial lands to the north and south. The northern parcel is vacant and small in size and, therefore, could only accommodate a Class 1 industry. The parcel to the south is a Class 1 industry. The D6 Guidelines call for a 20 m separation between a Class 1 industry and a sensitive land use such as residential. The roadways between these industrial lands and this development proposal provide that 20 m separation.

### Servicing

The servicing approach is addressed in the Functional Servicing Report (FSR) attached to this report. That FSR demonstrates that the site can be serviced with sanitary sewers, watermains, storm sewers and stormwater management.

### Conclusion

The proposed Official Plan and Zoning By-law Amendments are consistent with the policies of the PPS and the Norfolk County Official Plan. The proposed development will provide a compact form of development while maintaining compatibility with the surrounding residential land uses. Through re-development and infilling, this development will provide much-needed housing options for the residents of Norfolk County.

The site is physically separated from small Class 1 industrial sites by existing municipal road allowances, providing the required setback. Through the site plan control process, appropriate buffering and other mitigation measures can be put in place to help ensure compatibility with the neighbouring lands.

The **Functional Servicing Report** confirms that the site can be fully serviced with sanitary sewers, watermains and stormwater management. On-site cisterns are proposed to enhance the firefighting protection of the system. Underground storage is to be provided for stormwater management with an outlet along the railway trail to the Waterford Ponds. As is required for all developments in Norfolk County, sanitary and watermain network modelling is required to confirm system capacities.

The **Urban Design Report** confirms that the proposed development is compatible and appropriate within the existing neighbourhood and that the proposal implements the intent of Section 7.13 of the Norfolk County Official Plan, which states, “*The conversion of lands designated as Industrial to other uses more compatible with the neighbourhood context in which the lands are situated is encouraged.*”

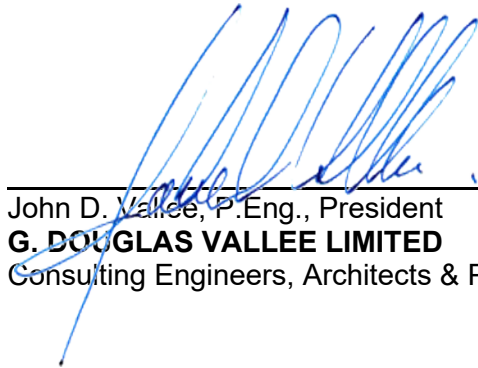
The **Traffic Impact Study** confirms that the existing road network can support the anticipated traffic from this proposed development. It is important to note that the development has direct access to West Church Street, being designated as a collector road in the Norfolk County Official Plan.

The analysis of this application is supportive. The proposed application is consistent with Provincial and County planning policies. Accordingly, it is our opinion that the applications:

- model good planning;
- facilitate a development with the most appropriate land use; and
- ensures efficiency and compatibility with the surrounding land uses.

As such, it is requested that Norfolk County approve the applications to amend the Official Plan and Zoning By-law and to grant the Draft Plan of Subdivision to permit the development as presented.

Report prepared by:



John D. Vallee, P.Eng., President  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects & Planners

Report reviewed and approved by:



Eldon Darbyson, BES, MCIP, RPP  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects & Planners

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# **Appendix A**

## **Concept Plan**









G. DOUGLAS VALLEE LIMITED

2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 4W3  
(519) 426-6270

VERLINDA



The  
Silos  
of Waterford

Project Title  
SILOS OF WATERFORD  
257 CHURCH ST. W,  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

PRELIMINARY  
NOT FOR  
CONSTRUCTION

PROJECT No.  
21-061  
Drawing Title  
ZONING  
Drawing No.

Z101

PLAN OF SUBDIVISION - FREEHOLD (UNIT 'B')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R1

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	

ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE PROPOSED
5.0 5.1 5.1.1	<b>RESIDENTIAL ZONES</b> <b>URBAN RESIDENTIAL TYPE 1 ZONE (R1)</b> <i>Permitted Uses</i> In an R1 Zone, no land, building or structure shall be used except in accordance with the following uses: a) dwelling, single detached b) lot & breakfast, subject to Subsection 3.4 c) home occupation d) accessory residential dwelling unit, subject to Subsection 3.2.3.

PROVISION	SETBACKS (m - METERS):	R1-A	R1-B	PROVIDED (m)
5.1.2a)	MIN. LOT AREA: i) INTERIOR LOT ii) CORNER LOT	450m <sup>2</sup> 450m <sup>2</sup>	360m <sup>2</sup> 450m <sup>2</sup>	360.28m <sup>2</sup> 510.11m <sup>2</sup>
5.1.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT	15 18	12 15	19.1 18.9
5.1.2c)	MIN. FRONT YARD: i) DETACHED GARAGE WITH REAR LANE	6 9	6 9	7.5 N/A
5.1.2d)	MIN. EXTERIOR SIDE YARD:	6	6	10.1 / 11.0
5.1.2e)	MIN. INTERIOR SIDE YARD i) DETACHED GARAGE ii) DETACHED GARAGE WITH A REAR LANE, ATTACHED GARAGE	3.1 & 12 12 EACH SIDE	3.1 & 12 12 EACH SIDE	4.9 & 1.2
5.1.2f)	MIN. REAR YARD:	7.5	7.5	7.5
5.1.2g)	MAX. BLDG. HEIGHT	11	11	>11
5.1.3	Projection of an Attached Garage The wall of an attached garage facing the street in an R1-B Zone shall project no more than 3.5 metres from the main front wall of the dwelling. This projection shall be measured from the wall of the garage facing the front lot line to the nearest structural element of the front wall of the dwelling facing the front lot line, including any covered porch which extends along the entire front wall of the dwelling but excluding eaves, stairs or gutters. This provision shall not apply where: a) the front wall of the dwelling and the wall of the attached garage containing the opening for vehicular access do not face the same lot line or b) the width of the attached garage is less than 60 percent of the width of the dwelling.	3.5	3.5	N/A

GRAY HIGHLIGHTED APPLICABLE

PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOMES (8-Z-2017): 2 SPACES / DWELLING UNIT 2 SPACES x 16 DWELLING UNITS = 32	32 SPACE(S)	32 SPACE(S)
4.9a)	INT.B (2-STORY RESIDENTIAL DWELLING) 2 SPACES x 16 DWELLING UNITS = 32	(32 SPACES)	(32 SPACES) (2 LANEWAY)
4.9b)	ACCESSORY RESIDENTIAL DWELLING UNIT: 1 SPACES IN ADDITION TO THOSE REQ'D FOR THE PRIMARY RESIDENTIAL DWELLING UNIT USE	16 SPACE(S)	16 SPACE(S) (1 LANEWAY)

PARKING REQ'D VISITOR:			
PROVISION	VISITOR PARKING: N/A SUBDIVISION	N/A	N/A

PARKING REQ'D TOTAL:			
TOTAL	48 SPACE(S)	48 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING)			
4.3.3	BARRIER FREE PARKING REQ'D: N/A SUBDIVISION		

4.0 OFF STREET PARKING: PARKING SPACE DIMENSIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7

RESIDENTIAL PARKING AREA			
4.2.3	4.2.3 Residential Parking Area For Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) within a front yard or exterior side yard, motor vehicles shall only be parked on a driveway, in a parking space or parking garage (7-Z-2018); b) not more than one (1) required parking space may be located within the required front yard or required exterior side yard (7-Z-2018); c) vehicles shall not be parked within any landscape area (5-Z-2018);		

LANDSCAPED AREA			
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (5-Z-2018)		

4.2.5	4.2.5 Parking and Landscape Area (7-Z-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.		
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CONDOMINIUM - GROUP TOWNHOUSES (UNIT 'A', 'C' & 'D')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R4

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	

ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE EXISTING
5.4 5.4.1	<b>URBAN RESIDENTIAL TYPE 4 ZONE (R4)</b> <i>PERMITTED USES</i> In an R4 Zone, no land, building or structure shall be used except in accordance with the following uses: a) group townhouse b) stacked townhouse c) street townhouse d) semi-detached, duplex, tri-plex and four-plex dwellings provided they are located on the same lot with, and in accordance with the Zone provisions of, group townhouse e) home occupation f) accessory residential dwelling unit, subject to Subsection 3.2.3.(7-Z-2020)

PROVISION	SETBACKS (m - METERS):	REQUIRED (m) Street Frontage	REQUIRED (m) Rear Frontage	PROVIDED (m)
5.4.2a)	MIN. LOT AREA: i) ATTACHED GARAGE ii) CORNER LOT iii) DETACHED GARAGE	156m <sup>2</sup> 264m <sup>2</sup> 162m <sup>2</sup>	195m <sup>2</sup> 195m <sup>2</sup> 215m <sup>2</sup>	23.846.43m <sup>2</sup>
5.4.2b)	MIN. LOT FRONTAGE: i) INTERIOR LOT ii) CORNER LOT iii) CORNER LOT ACCESSED BY A REAR LANE	6.5 11 6.5	30 30 30	196.2 & 19.1
5.4.2c)	MIN. FRONT YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE OR REAR YARD PARKING	6 1.5	6 1.5	11.4 & 9.3
5.4.2d)	MIN. EXTERIOR SIDE YARD: i) 1/4 A 6m FRONT YARD ii) 1/4 A 15m FRONT YARD	6 1.5	6 1.5	N/A
5.4.2e)	MIN. INTERIOR SIDE YARD	1.2	3	6 & 16
5.4.2f)	MIN. REAR YARD: i) ATTACHED GARAGE ii) DETACHED GARAGE ACCESSED VIA A REAR LANE INCLUDING HALF OF THE LANE	7.5 13	7.5 7.5	N/A
5.4.2g)	MIN. SEPARATION BETWEEN TOWNHOUSE DWELLINGS	2	2	>2
5.4.2h)	MAX. BLDG. HEIGHT	11 (8-Z-2017)	11 (8-Z-2017)	<11 (8-Z-2017)
5.4.3	MIN. MUTUAL SIDE LOT LINE	1.2	1.2	3
5.4.4	MAX. UNITS IN A TOWNHOUSE DWELLING	8 UNITS	8 UNITS	8 UNITS

GRAY HIGHLIGHTED APPLICABLE

PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9a)	SINGLE DETACHED, SEMI-DETACHED, DUPLEX, TRI-PLEX, FOUR-PLEX, TOWNHOUSE DWELLINGS & VACATION HOMES (8-Z-2017): 2 SPACES / DWELLING UNIT 2 SPACES x 16 DWELLING UNITS = 32	144 SPACE(S)	144 SPACE(S)
4.9a)	INT.A (1-STORY RESIDENTIAL DWELLING STACKED): ACCESSORY RESIDENTIAL DWELLING UNIT: 1 SPACE IN ADDITION TO THOSE REQ'D FOR THE PRIMARY RESIDENTIAL DWELLING UNIT USE 1 SPACES x DWELLING UNITS = 82 CONDOMINIUM	(82 SPACES)	(82 SPACES) (1 EXTERNAL)
4.9b)	INT.C (10-STORY RESIDENTIAL DWELLING STACKED): 2 SPACES x 82 DWELLING UNITS = 164 CONDOMINIUM	(164 SPACES)	(164 SPACES) (1 LANEWAY, 1 GARAGE)
4.9b)	INT.D (10-STORY RESIDENTIAL DWELLING STACKED): 2 SPACES x 16 DWELLING UNITS = 32 CONDOMINIUM	(32 SPACES)	(32 SPACES) (1 LANEWAY, 1 GARAGE)

PARKING REQ'D VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (16 / 3) = 25.3	26 SPACE(S)	26 SPACE(S)

PARKING REQ'D TOTAL:			
TOTAL	170 SPACE(S)	170 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING)			
4.3.3	BARRIER FREE PARKING REQ'D: 26-50 (VISITOR) PARKING SPACES = TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	1 SPACE(S) 1 SPACE(S)	1 SPACE(S) 1 SPACE(S)

PARKING AREA REGULATIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7

LANDSCAPED AREA			
2.81	"LANDSCAPE AREA" shall mean an area of land comprised of trees, shrubs, flowers, grass or other horticultural elements. Landscaping may include pervious paths, patios, walkways, or elements designed to enhance the visual amenity of a property but does not include open storage display areas, parking or loading areas, or areas covered by driveways. (5-Z-2018)		

4.2.5	4.2.5 Parking and Landscape Area (7-Z-2018) Within Urban Residential Type 1 to 4 Zones (R1 to R4), the following shall apply: a) A minimum of 50 percent of the front yard shall be maintained as landscape area. b) In the case of a corner lot, a minimum of 50 percent of each of the front yard and exterior side yard shall be maintained as landscape area.		
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3.0 GENERAL PROVISIONS

3.6.	<b>Decks and Porches</b> No deck or unenclosed porch shall: a) be nearer than 1.2 metres from an interior side lot line. b) have a floor higher than the height, above finished grade, of the floor of the first storey of the main dwelling on the lot, if so, it is referred to as a balcony (7-Z-2020). c) be closer than 3 metres from the rear lot line (8-Z-2023). d) project more than 1.5 metres into the required front yard or required exterior side yard. e) on a sloping rear yard, be closer than 3 metres from an interior lot line and 6 metres from the rear lot line, at the point where the deck floor reaches a height of 2 metres above the finished surface of the ground.
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3.10.	<b>Exemptions from Yard Provisions.</b> Except as otherwise provided herein, every part of any required yard shall be open and unobstructed by any building, structure, fuel-storage tanks, heating or air conditioner units, and generators except: a) sills, belt courses, cornices, chimneys, bay windows, pilasters, hydro meters or gas meters may project into any required yard or setback area a distance of not more than 0.65 metres; b) eaves or gutters may project into any required yard or setback area a distance of not more than 0.65 metres; c) canopies or awnings may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres; d) balconies may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres provided they are no closer than 3 metres from an interior lot line and 6 metres from a rear lot line. e) barrier-free access ramps may project into any required rear yard, required front yard or required exterior side yard area a distance of 3 metres; f) steps may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres, and steps may project into any required interior side yard area a distance of 1 metre. g) Public utilities may project into any required rear yard, required front yard, required interior side yard area or required exterior side yard area (6-Z-2019). h) Air conditioner units, provided the encroachment is no closer than 0.6 metres to the side lot line. (7-Z-2020)
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4.0 OFF STREET PARKING  
4.2 LOCATION OF PARKING ON A LOT

4.2.4	<b>4.2.4 Other Provisions</b> a) For tri-plex dwellings, duplex dwellings, four-plex dwellings, street townhouses, stacked townhouses, and boarding or lodging houses, required parking spaces shall be prohibited within the required front yard or required exterior side yard; except where a dwelling unit has a private garage in which case the driveway leading to the private garage may be used as a parking space subject to the size requirements herein; b) For group townhouses and apartment dwellings, no parking lot shall be located closer than 3 metres from any dwelling on the lot or of any interior lot line abutting another residential Zone; c) For group townhouses and apartment dwellings, no parking lot or parking space shall be located between a dwelling and the street line, except for individual or tandem parking spaces leading directly to each townhouse dwelling unit; d) For commercial or industrial properties, no parking lot shall be located closer than 4.5 metres from any interior lot line abutting a residential Zone; e) For accessory residential dwelling units, notwithstanding the foregoing, one (1) parking space dedicated for the use of the accessory residential dwelling unit, may be permitted in the front yard provided a minimum of 50 percent of the required front yard shall be maintained as landscaped open space notwithstanding such dedicated parking space.
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GRAY HIGHLIGHTED APPLICABLE

CONDOMINIUM - APARTMENT BLDGS. (UNIT 'E')  
Z1 - ZONING AMENDMENTS (RED TEXT)

SITE STATISTIC & ZONING REQ.'S - R6

PROPERTY LEGAL DESCRIPTION:	
PLAN 31R-T164, PART 2, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	
PLAN 31R- PART 3 & 4, LOT 5, CONCESSION VIII IN THE GEOGRAPHIC TOWNSHIP OF TOWNSEND AND PART OF LOT 1 REGISTERED PLAN 41-B AND ALL OF PARCEL 'A' REGISTERED PLAN 41-B IN THE TOWN OF WATERFORD IN THE COUNTY OF NORFOLK NOW IN THE CITY OF NANTICOKE IN THE REGIONAL MUNICIPALITY OF HALDIMAND - NORFOLK	

ZONING:	
IN ACCORDANCE W/ ZONING BY-LAW 1-Z-2014NORFOLK COUNTY, CONSOLIDATED JANUARY 1, 2021	

PROVISION	LAND USE EX.
7.1	EX. GENERAL INDUSTRIAL ZONE (M6)

PROVISION	LAND USE PROPOSED
5.6 5.6.1	<b>URBAN RESIDENTIAL TYPE 6 ZONE (R6)</b> <i>PERMITTED USES</i> In an R6 Zone, no land, building or structure shall be used except in accordance with the following uses: a) dwelling, apartment b) home occupation c) retirement home.

PROVISION	SETBACKS (m - METERS):	REQUIRED (m)	PROVIDED (m)
5.6.2a)	MIN. LOT FRONTAGE:	30	136.1 & 19.1
5.6.2b)	MIN. FRONT YARD:	3	9.9
5.6.2c)	MIN. EXTERIOR SIDE YARD:	3	N/A
5.6.2d)	MIN. INTERIOR SIDE YARD	5	>5 & 63.5
5.6.2e)	MIN. REAR YARD:	9	N/A
5.6.2f)	MAX. BLDG. HEIGHT	8 STOREYS	8 STOREYS
5.6.2g)	MAX. FLOOR AREA RATIO: (MID RISE ONLY) i) 4 STOREY BLDG. ii) 5 STOREY BLDG. iii) 6 STOREY BLDG. iv) 7 STOREY BLDG. v) 8 STOREY BLDG.	0.12 0.14 0.16 0.18 1	>1 (-.83)

5.6.3	<b>"FLOOR AREA RATIO"</b> shall mean the ratio of the usable floor area to the lot, determined by the calculation of: floor area ratio = usable floor area / lot area.  5.6.3 STEP BACK OF UPPER FLRS: The exterior wall of each floor of a building facing a street and located above four (4) storeys shall be stepped back 2 metres from the exterior wall of the 4th storey and each floor above six (6) storeys shall be setback an additional 2 metres from the exterior wall facing a street.  5.6.4 ANGULAR PLANE Where an R6 Zone abuts an Urban Residential Zone (R1-A, R1-B or R2), no portion of an apartment dwelling shall exceed the height of a 45 degree angular plane originating at the lot line of the nearest R1-A, R1-B or R2 Zone.
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GRAY HIGHLIGHTED APPLICABLE

3.10.	<b>Exemptions from Yard Provisions</b> Except as otherwise provided herein, every part of any required yard shall be open and unobstructed by any building, structure, fuel-storage tanks, heating or air conditioner units, and generators except: a) balconies may project into any required rear yard, required front yard or required exterior side yard area a distance of not more than 1.5 metres provided they are no closer than 3 metres from an interior lot line and 6 metres from a rear lot line.
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PARKING REQ'D: RESIDENTIAL			
PROVISION	NUMBER OF PARKING SPACES	REQUIRED	PROVIDED
4.9b)	INT.E APARTMENT DWELLING (8-Z-2017): 15 SPACES / DWELLING UNIT 15 SPACES x 16 DWELLING UNITS = 246	246 SPACE(S)	236 SPACE(S) UNDERGROUND
4.9b)	MAKE-UP 14 STUDIO - 1 SPACE / DWELLING UNIT 21 1-BED - 1 SPACE / DWELLING UNIT 21 2-BED - 1.5 SPACE / DWELLING UNIT 22 2-BED + 1.5B - 1.5 SPACE / DWELLING UNIT 3 BENTHOUSE - 1.5 SPACE / DWELLING UNIT 84 TOTAL	21 SPACE(S) 40.5 SPACE(S) 130.5 SPACE(S) 42 SPACE(S) 12 SPACE(S)	14 SPACE(S) 27 SPACE(S) 131 SPACE(S) 42 SPACE(S) 12 SPACE(S)

PARKING REQ'D VISITOR:			
4.9f)	VISITOR PARKING: 1 SPACE / 3 DWELLING UNITS 1 SPACE x (164 / 3) = 54.7	55 SPACE(S)	55 SPACE(S)

2.110  
"USABLE FLOOR AREA" shall mean the total area of all floors of a building, outdoor patio or cafe, or dwelling unit including:  
a) a hallway, aisle, stairway and corridor within a suite or unit;  
b) an internal wall and partition within a suite or unit;  
c) a storage room and storage area within a suite or unit;  
d) a balcony in the case of a detached house;  
e) a habitable room or area in the basement of a dwelling.  
But excluding:  
a) an area occupied by a common area in a multi-tenant building including but not limited to a public stairwell, public or shared corridor and lobby;  
b) a mechanical shaft;  
c) an entry vestibule not within a dwelling unit;  
d) a garage attached to a building;  
e) an unfinished basement in a dwelling used for storage or laundry.

The usable floor area for a dwelling is measured from the outside face of exterior walls or to the centre-line of party or common walls.  
The usable floor area for all other buildings shall be measured from the inside face of exterior walls, interior common walls and firewalls.

PARKING REQ'D: NON-RESIDENTIAL			
4.9(1)	RESTAURANT, FAST FOOD WITHOUT DRIVE THROUGH 15 SPACE / 6m <sup>2</sup> 15 SPACE x (90 x 180 / 6m <sup>2</sup> ) = 115	18 SPACE(S)	18 SPACE(S)
4.9(2)	OTHER COMMERCIAL USE 15 SPACE / 35m <sup>2</sup> 15 SPACE x (94 / 35m <sup>2</sup> ) = 2.7	3 SPACE(S)	3 SPACE(S)
4.9(3)	OTHER NON-RESIDENTIAL USES (DAYCARE) 15 SPACE / 35m <sup>2</sup> 15 SPACE x (305 / 35m <sup>2</sup> ) = 11	11 SPACE(S)	11 SPACE(S)
	TOTAL	32 SPACE(S)	32 SPACE(S)

PARKING REQ'D TOTAL:			
TOTAL	333 SPACE(S)	318 SPACE(S)	

PARKING REQ'D - BARRIER FREE (PART OF REQ'D VISITOR PARKING & COMMERCIAL)			
4.3.3 (95%+30%)	BARRIER FREE PARKING REQ'D: 76-102 (VISITOR & COMMERCIAL) PARKING SPACES = TYPE 'A' (3.4m WIDE) PLUS 1.5m AISLE TYPE 'B' (2.4m WIDE) PLUS 1.5m AISLE	2 SPACE(S) 2 SPACE(S)	2 SPACE(S) 2 SPACE(S)

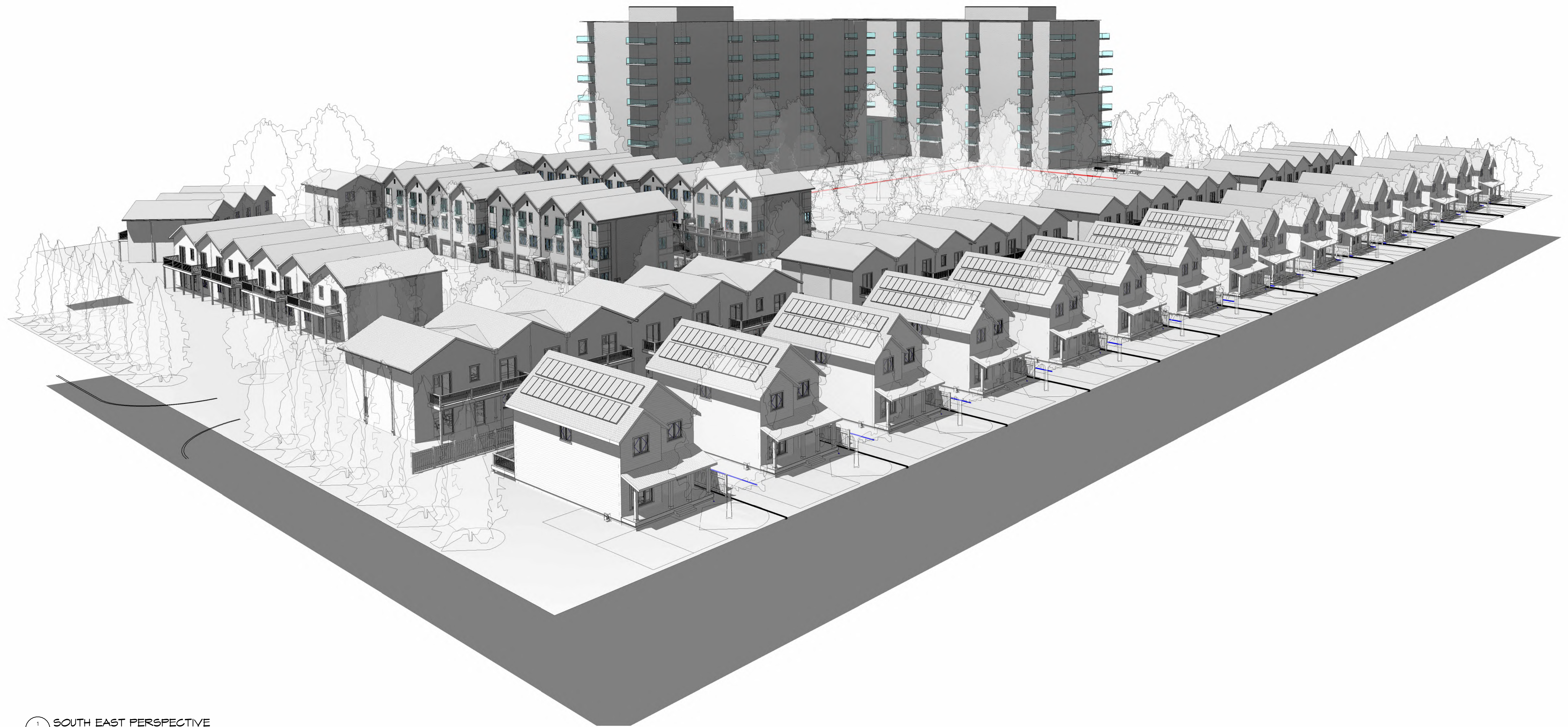
PARKING REQ'D - LOADING SPACES			
4.7	LOADING SPACES: 3m WIDTH x 10m DEPTH	N/A	1 SPACE(S)

PARKING AREA REGULATIONS			
4.1	PARKING SPACE DIMENSIONS		
4.1.3a)	WIDTH OF PARKING SPACE: FOR VEHICLES PARKED SIDE BY SIDE FOR VEHICLES PARKED WITH WALL OR FENCE ADJ.	3 MIN. 3.3 MIN.	3 3.3
4.1.3b)	DEPTH OF PARKING SPACE: FOR 90 DEGREE PARKING FOR PARALLEL PARKING	5.8 MIN. 7 MIN.	6 7
4.1.4	PARKING AISLE REQ'D: TWO-WAY TRAFFIC	7.3 MIN.	7.3 MIN.



H:\Projects\2021\21-061 Silos of Waterford Drawings\Arch\21-061 - SILOS OF WATERFORD - SITE PLAN

DATE LAST PLOTTED 2025-01-13 12:18:04 PM



1 SOUTH EAST PERSPECTIVE  
2102 SCALE



G. DOUGLAS VALLEE LIMITED  
2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 4W3  
(519) 426-6270



Project Title  
**SILOS OF WATERFORD**  
257 CHURCH ST. W,  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

**PRELIMINARY  
NOT FOR  
CONSTRUCTION**

**SITE PLAN PERSPECTIVE**

PROJECT No.  
**21-061**  
Drawing Title

Drawing No.  
**Z102**



## **Appendix B**

### **PPS Compliance**



## Appendix B – Provincial Policy Statement 2020 Policy Compliance

This appendix demonstrates that the proposed application is consistent with the policies of the Provincial Policy Statement 2020.

Section	Policy	Comments	
1.1	<p>Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns</p> <p>Policy 1.1.1 outlines that healthy, liveable, and safe communities are sustained by:</p> <p>a) promoting efficient development and land use patterns which sustain the financial well-being of the Province and municipalities over the long term;</p>	<p>a) The subject lands are appropriate for residential and commercial development.</p>	✓
	<p>b) accommodating an appropriate affordable and market-based range and mix of residential types (including single-detached, additional residential units, multi-unit housing, affordable housing and housing for older persons), employment (including industrial and commercial), institutional (including places of worship, cemeteries and long-term care homes), recreation, park and open space, and other uses to meet long-term needs;</p>	<p>b) This development adds a compact form of residential development to cater to various incomes and mix of housing types in the area.</p>	✓
	<p>c) avoiding development and land use patterns which may cause environmental or public health and safety concerns;</p>	<p>c) No anticipated negative impacts will be generated</p>	✓
	<p>d) avoiding development and land use patterns that would prevent the efficient expansion of settlement areas in those areas which are adjacent or close to settlement areas;</p> <p>e) promoting the integration of land use planning, growth management, transit-supportive development, intensification and infrastructure planning to achieve cost-effective development patterns, optimization of transit investments, and standards to minimize land consumption and servicing costs;</p> <p>f) improving accessibility for persons with disabilities and older persons by</p>	<p>d) N/A</p> <p>e) The proposed development is infill intensification and re-development making use of existing infrastructure and minimizing land consumption and servicing costs.</p> <p>f) The site is located in close proximity to the downtown core and is walkable.</p>	✓

	<p>addressing land use barriers which restrict their full participation in society;</p> <p>g) ensuring that necessary infrastructure and public service facilities are or will be available to meet current and projected needs;</p> <p>h) promoting development and land use patterns that conserve biodiversity; and;</p>	<p>g) Infrastructure and various services exist in the area. Capacity does exist within these services to support the development.</p> <p>h) N/A</p>	
<b>1.1.3.1</b>	States that settlement areas shall be the focus of growth and development.	The subject lands are within the urban boundary of Waterford.	✓
<b>1.1.3.2</b>	<p>States that land use patterns within settlement areas shall be based on densities and a mix of land uses which:</p> <p>a) efficiently use land and resources;</p> <p>b) are appropriate for, and efficiently use, the infrastructure and public service facilities which are planned or available, and avoid the need for their unjustified and/or uneconomical expansion;</p> <p>c) minimize negative impacts to air quality and climate change, and promote energy efficiency;</p> <p>d) prepare for the impacts of a changing climate;</p> <p>e) support active transportation;</p> <p>f) are transit-supportive, where transit is planned, exists or may be developed; and</p> <p>g) are freight-supportive.</p>	<p>a) Compact form of development through infilling re-development.</p> <p>b) Municipal services are available to this development with no requirement for extension</p> <p>c) No impacts to air quality and climate change are expected.</p> <p>d) N/A</p> <p>e) The location of the development provides walkability to a number of nearby services. The site is directly adjacent to West Church Street being a designated collector road.</p> <p>f) The site is directly adjacent to West Church Street being a designated collector road.</p> <p>g) N/A</p>	<p>✓</p> <p>✓</p>
	Land use patterns within settlement areas shall also be based on a range of uses and opportunities for intensification and redevelopment in accordance with the criteria	This development creates 8 forms of housing on an infilling site through re-development and intensification.	✓

	in policy 1.1.3.3, where this can be accommodated.		
<b>1.1.3.3</b>	Planning authorities shall identify appropriate locations and promote opportunities for transit-supportive development, accommodating a significant supply and range of housing options through intensification and redevelopment where this can be accommodated taking into account existing building stock or areas, including brownfield sites, and the availability of suitable existing or planned infrastructure and public service facilities required to accommodate projected needs.	This policy encourages the proposed development which represents intensification through redevelopment and the provision of a range of housing options that can be serviced with existing infrastructure.	✓
<b>1.1.3.4</b>	Appropriate development standards should be promoted which facilitate intensification, redevelopment and compact form, while avoiding or mitigating risks to public health and safety.	The development intensifies the area in a compact form and is not located in a flood plain.	✓
<b>1.1.3.5</b>	Planning authorities shall establish and implement minimum targets for intensification and redevelopment within built-up areas, based on local conditions. However, where provincial targets are established through provincial plans, the provincial target shall represent the minimum target for affected areas.	The County Official Plan indicates that the County shall target that a minimum 25 percent of its annual residential growth be accommodated through infill, intensification and redevelopment within the existing built-up areas in the Urban Areas with full municipal services.	✓
<b>1.2.6</b>	<p><b>Land Use Compatibility</b></p> <p>Major facilities and sensitive land uses shall be planned and developed to avoid, or if avoidance is not possible, minimize and mitigate any potential adverse effects from odour, noise and other contaminants, minimize risk to public health and safety, and to ensure the long-term operational and economic viability of major facilities in accordance with provincial guidelines, standards and procedures.</p> <p>A sensitive land use means buildings, amenity areas, or outdoor spaces where routine or normal activities occurring at reasonably expected times would experience one or more adverse effects from</p>	<p>The neighbourhood is in transition from Industrial land uses to Residential land use. This is as encouraged by the Norfolk County Official Plan. There are multiple adjacent applications for new residential development in this neighbourhood.</p> <p>Remaining commercial or industrial uses are sufficiently separated from the proposed residential development by the existing municipal road allowances.</p>	✓

	<p>contaminant discharges generated by a nearby major facility. Sensitive land uses may be a part of the natural or built environment. Examples may include, but are not limited to: residences, day care centres, and educational and health facilities.</p> <p>A major facility means facilities which may require separation from sensitive land uses, including but not limited to airports, manufacturing uses, transportation infrastructure and corridors, rail facilities, marine facilities, sewage treatment facilities, waste management systems, oil and gas pipelines, industries, energy generation facilities and transmission systems, and resource extraction activities.</p>		
<b>1.4</b>	<p>Housing</p> <p>Planning authorities to provide for an appropriate range and mix of housing types and densities.</p>	This development adds to the range and mix of housing types and densities in the area.	✓
<b>1.4.3</b>	<p>Planning authorities to provide for an appropriate range and mix of housing options and densities to meet projected market-based and affordable housing needs of current and future residents of the regional market area by:</p> <p>b) permitting and facilitating:</p> <ol style="list-style-type: none"> <li>1. all housing options required to meet the social, health, economic and well-being requirements of current and future residents, including special needs requirements and needs arising from demographic changes and employment opportunities; and</li> <li>2. all types of residential intensification, including additional residential units, and redevelopment in accordance with policy 1.1.3.3;</li> </ol> <p>c) directing the development of new housing towards locations where appropriate levels of infrastructure and public service facilities are or will be available to support current and projected needs;</p>	<p>b) The development adds to the range of housing options and is located in an area near employment opportunities. Single storey at grade housing forms are available within the condominium for physical special needs residents. Small form accessory dwelling units are available within the condominium, and in the single detached dwellings in the plan of subdivision.</p> <p>c) This development represents residential intensification where public facilities are already available.</p>	✓

	<p>d) promoting densities for new housing which efficiently use land, resources, infrastructure and public service facilities, and support the use of active transportation and transit in areas where it exists or is to be developed;</p> <p>e) requiring transit-supportive development and prioritizing intensification, including potential air rights development, in proximity to transit, including corridors and stations; and</p> <p>f) establishing development standards for residential intensification, redevelopment and new residential development which minimize the cost of housing and facilitate compact form, while maintaining appropriate levels of public health and safety.</p>	<p>d) The proposed development will achieve 73 uph to ensure efficient use of the land. The urban area of Waterford contains existing infrastructure public services facilities.</p> <p>e) N/A</p> <p>f) The development is an appropriate density for the size of the lands near sidewalks, public transit and existing and future trails.</p>	
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## Summary

The proposed development will facilitate the construction of 272 dwellings through re-development of an under-utilized Industrial land parcel within the County's Settlement Area. The proposed official plan and zoning amendments will help add to the range of housing in the area. The form of development contributes the County's existing residential building supply, improves the mix of land uses in the area, adds to the diversity unit configurations available, and will appeal to individuals with different needs and financial abilities. The lands have access to existing municipal infrastructure and will not cause any environmental or public health and safety concerns as the necessary studies have been completed to implement mitigation from adjacent industrial land uses. Municipal servicing is available on the existing adjacent municipal streets which can be extended to the subject property at the developers cost and will be confirmed through the site plan application.

### 1.5 Public Spaces, Recreation, Parks, Trails and Open Space

Section 1.5 addresses healthy communities and the provision of public spaces, recreation, parks, trails and open space. The lands are too small to provide viable parkland. Therefore, at the direction of Norfolk County through the pre-consultation meeting process, 5% of the value of the lands will be paid to the County in lieu of parkland dedication in accordance with County policies. It will facilitate active transportation and community connectivity due to the proximity of local businesses and services and fosters social interaction through existing recreation in the area. More specifically, the development is near public parks and open spaces, restaurants, pharmaceutical stores and immediately adjacent to the Waterford Heritage Trail.

### 1.6 Infrastructure and Public Service Facilities

Policy 1.6 discusses the efficient use of infrastructure, utilities and green infrastructure.

The subject lands will take advantage of existing infrastructure and coordinate the installation of utilities. Green infrastructure in the form of street trees as required by the County. The lands will contain



permeable surfaces in the form of sodded boulevards open space areas unoccupied by buildings, structures and driveways.

### 1.8 Energy Conservation, Air Quality and Climate Change

Policy 1.8.1 states that planning authorities shall support energy conservation and efficiency, improved air quality, reduced greenhouse gas emissions, and preparing for the impacts of a changing climate through land use and development patterns which:

- b) promote the use of active transportation and transit in and between residential, employment (including commercial and industrial) and institutional uses and other areas;
- e) encourage transit-supportive development and intensification to improve the mix of employment and housing uses to shorten commute journeys and decrease transportation congestion;

The proposed development is in a location that encourages active transportation to nearby residential and employment and institutional uses. The lands are in close proximity to various commercial and institutional uses which provide employment opportunities to the future residents of the development.

### 3.0 Protecting Public Health and Safety

Policy 3.0 discusses natural and human-made hazardous lands, where development is prohibited or permitted subject to conditions addressing flooding and erosion.

There are no existing facilities (industrial or commercial) that are expected to adversely impact the proposed development with noise, dust or odour emissions.

Appendix Figure 1 – Norfolk Trails Mapping



## **Appendix C**




### **Official Plan Compliance**

### Norfolk County Official Plan – Policy Compliance Table

This appendix demonstrates how the proposed application is consistent with those applicable policies of the Norfolk County Official Plan.

Section	Policy	Comments	
<b>Section 2.2 Goals &amp; Objectives</b>			
<b>2.2</b>	Goals and Objectives  This section of the Official Plan sets out six “Goals and Objectives” to which the following five are applicable to the proposed residential development:		
<b>2.2.1</b>	Strong and Diversified Economy	The proposed development contributes to a strong and diversified economy by revitalizing an underutilized former land use, and bringing additional housing and commercial uses to the urban area of Waterford.	✓
<b>2.2.2</b>	Protecting and Enhancing the Natural Environment	The lands are not subject to environmental constraints, rather the design of the proposed development, with focus on an eight-storey residential condominium apartment takes advantage of the scenic natural environment to the west.	✓
<b>2.2.3</b>	Maintaining and Enhancing the Rural and Small Town Character	The design of the proposed development considers future land uses and ‘steps back’ upper storeys to address community design zoning provisions. The property has not been identified as having any archaeological significance. The project revitalizes an underutilized property, will be subject to achieving a record of site condition and ensuring identified contamination is removed from the property, thus ensuring the safety of future residents of the development.	✓



2.2.4	Maintaining a High Quality of Life	<p>The development provides for a variety of housing forms and affordability. The lands are adjacent to the Waterford Heritage Trail and Shadow Lake Trail, as well as providing internal recreational areas for the future inhabitants and families of the development.</p> <p>The property is designed to ensure a safe, aesthetic and stimulating environment. Further details of the function of the property will be managed through the site plan application process.</p> <p>Waterford contains local shopping and access to healthy food options. Accessibility standards will be incorporated into the design of the facilities where required.</p>	
2.2.5	Upgrading and Expanding Infrastructure	<p>The lands are adjacent to and provides access to the Waterford Heritage Trail system and Shadow Lake Trail. Water and waste water services are to be provided in accordance with County requirements.</p> <p>Access to the local road network and running routes are available to the development.</p> <p>The public transit system can be accessed within 1 kilometer</p>	
2.2.6	A Well Governed, Well Planned and Sustainable County	<p>The County will hold a public meeting to engage the local area residents</p> <p>The project will benefit the community by revitalizing an underutilized property in the urban area, makes efficient use of lands, increases the municipal tax base and provides a variety housing forms to the growing community.</p> <p>The design of the property uses techniques to improve compatibility with the streetscape and adjacent land uses including landscaping, physical design of upper floors and natural buffering to the west where no development can occur.</p>	

Section 5.3 Housing			
5.3	<p>Housing</p> <p>The provision of housing is an essential part of planning in Norfolk County. The County shall ensure that a full range of housing types are provided to meet the anticipated demand and demographic change.</p> <p>5.3 e) Under this section the County shall encourage innovative and appropriate housing development that exhibits design and adaptability characteristics, and may represent non-traditional additions to the County's housing stock.</p> <p>5.3 g) Further the County shall encourage that housing be considered when opportunities for redevelopment become available. This includes the redevelopment of existing single-use and underutilized areas with full municipal services, such as shopping plazas, business and employment sites and older commercial and residential areas, especially where the land is in close proximity to human services. Special attention shall be given to the design of buildings, the landscaping treatment and features of the site to ensure that the proposed redevelopment is physically compatible with the adjacent uses.</p>	<p>The proposed application is consistent with the policies of this section of the official plan. This residential development will provide a unique and much needed form of housing. The proposed application provides a number of different housing forms, including: single detached homes, a variety of configurations of townhomes, and apartment units. The stacked townhouses will also include a smaller single storey townhouse, which will provide a much-needed lower cost housing option in Norfolk.</p> <p>e) This section of the Official Plan requires the County to consider innovative and appropriate housing options. As shown on the concept site plan, the design of this development will provide forms of housing not readily available in Norfolk County.</p> <p>g) Currently this vacant parcel of land remains underutilized, zoned and designated industrial. The policies in section 7.13 of the official plan (discussed in detail in other sections of this report) clearly encourage the conversion of these lands to a residential use that is more compatible with the existing surrounding land use.</p> <p>The development will be provided with access to municipal water and sewer services. As part of the application the necessary studies have been completed to show capacity exists within these systems along with a traffic impact study. Appropriate Landscaping will be approved through the Site Plan process.</p>	<p>✓</p> <p>✓</p> <p>✓</p>

	5.3.1 f) The County shall consider applications for infill development, intensification and redevelopment of sites and buildings through intensification based on the following criteria:		
	i. the development proposal is within an Urban Area, and is appropriately located in the context of the residential intensification study;	The development proposal is within the urban area of Waterford. Norfolk County staff has confirmed by email to John Vallee on January 3, 2023 that Norfolk County has not undertaken a residential intensification study. The location of the site is appropriate as outlined in numerous other sections of this analysis.	✓
	ii. the existing water and sanitary sewer services can accommodate the additional development;	The Functional Servicing Report for this project confirms that the site can be adequately serviced.	✓
	iii. the road network can accommodate the traffic generated;	The Traffic Report confirms that the existing roads can support this development.	✓
	iv. the proposed development is compatible with the existing development and physical character of the adjacent properties and surrounding neighbourhood; and	The residential use is compatible with the surround land use. See the appropriate section in this report.	✓
	v. the proposed development is consistent with the policies of the appropriate Land Use Designation associated with the land.	It is proposed to change the designation of this property to Residential. The development is consistent with all of the policies for residential development.	✓
Section 5.4 Community Design			
5.4	Community Design The following shall be the policy of the County:  a) Through implementation of this Plan, the County shall seek to maintain and improve the physical design characteristics of the Urban Areas in the context of new and existing development and stress a generally high quality of settlement design throughout the County.	a) This development will be subject to the site plan control process which will ensure high quality design.	✓

	<p>b) Through the review of development applications, including plans of subdivision, site plans and other development proposals, the County:</p> <ul style="list-style-type: none"> <li>i. shall ensure that new development is designed in keeping with the traditional character of the Urban Areas, in a manner that both preserves the traditional image of the Urban Areas and enhances the sense of place within the County while maintaining the community image of existing settlement areas;</li> <li>ii. shall promote efficient and cost-effective development design patterns that minimize land consumption;</li> <li>iii. shall promote the improvement of the physical character, appearance and safety of streetscapes, civic spaces, and parks;</li> <li>iv. shall encourage tree retention and tree replacement;</li> <li>v. shall ensure that design is sympathetic to the heritage character of an area, including the area's cultural heritage resources;</li> </ul>	<ul style="list-style-type: none"> <li>i. The proposed development will provide low-density single detached homes at the boundary of the development (fronting McCool Street) to recognize the traditional character of the neighbourhood. Urban design components are discussed in the Urban Design Report attached to this report.</li> <li>ii. The proposed development will also include higher density townhouse and apartment dwellings to ensure efficient use of the lands. As an infill / redevelopment project, this development makes excellent use of lands within the urban area, and eliminates pressure for urban boundary expansion.</li> <li>iii. This develop will greatly improve the streetscape in the neighbourhood, given that this is a former industrial site. Landscaping plans will be provided to the County as part of the site plan approval process.</li> <li>iv. A tree planting plan can be provided during the site plan approval process.</li> <li>v. The existing heritage character of the area is addressed in the Urban Design Report attached to this report.</li> </ul>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
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	<p>vi. shall strongly encourage design that considers and, wherever possible, continues existing and traditional street patterns and neighbourhood structure; and</p> <p>vii. may require, at the County's sole discretion, that proponents submit design guidelines with development applications, establishing how the policies of this Section have been considered and addressed. Such guidelines may also be required to address related issues of residential streetscaping, landscaping, setbacks, sidewalks, signage, garage placement, and architectural treatment</p> <p>c) Adequate measures shall be taken to ensure that the permitted uses have no adverse effects on adjacent land uses. Adequate buffering shall be provided between any uses where land use conflicts might be expected, and such buffering may include provisions for grass strips and appropriate planting of trees and shrubs, berms or fence screening, and other means as appropriate. Modifications to building orientation may also be appropriate buffering measures, but not in replacement of appropriate plantings.</p>	<p>vi. This proposal will not impact or modify street patterns. No new municipal streets are proposed.</p> <p>vii. This requirement will be met during the site plan application process.</p> <p>c) These requirements will be met during the site plan approval process. This residential development is not anticipated to create adverse impacts on the adjacent land uses.</p>	<p>✓</p> <p>✓</p> <p>✓</p>
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	d) Development design that establishes reverse lotting on Provincial Highways and County Roads will not be permitted. Development design that requires features such as noise attenuation or privacy fencing will be discouraged. Wherever possible, new development will be oriented toward streets or parks.	d) As shown on the site plan, the residential units on this plan generally front onto the adjacent streets. There is a small group of townhouses (8 units) that could be considered to “reverse front” onto West Church Street, however, the setback from the street is very large (approx. 20 m) and therefore the extraordinarily large rear yard more than compensates for this dwelling orientation.	✓
<b>Section 6.4 Urban Areas</b>			
6.4	Urban Areas This section of the Official Plan identifies the six Urban Areas of Norfolk County – Delhi, Courtland, Port Dove, Port Rowan, Simcoe, and Waterford – as the focal points for growth and development activity.	The proposed application is within the urban boundary of Waterford and will help Norfolk County meet its growth targets.	✓
<b>Section 6.5.4 Waterford Urban Area</b>			
6.5.4	The County will support and promote the continued development of Waterford as an important urban community and agricultural support centre in the County. The following shall be the policy of the County: a) Waterford is the closest Urban Area to Highway No. 403. The County shall encourage employment growth and development in the Urban Area. b) Many of the historic residences in the Waterford Urban Area are of cultural heritage value or interest. The County will encourage	a) This proposal is for residential growth in Waterford, and is consistent with this policy.  b) This development is not in close proximity to the historic heritage residences in Waterford.	✓



	<p>the maintenance, rehabilitation, and adaptive reuse of the historic residences.</p> <p>c) Trail linkage opportunities exist in the Waterford Urban Area due to the presence of abandoned rail corridors and other linear open space features. The County will encourage the development of trails integrating Waterford with other areas of the County.</p>	<p>c) The development is immediately adjacent to the Waterford Trail and will provide an ideal opportunity for the residents of the community to access the trail.</p>	<p>✓</p> <p>✓</p>
Section 7.13.2 Industrial Designation Land Use Policies			
<p>7.13.2 b i) Conversion to a residential land use shall be subject to the policies in Section 7.7 (Urban Residential) of this plan.</p>			
		<p>Section 7.7 encourages a variety of residential forms. This proposal provides numerous housing forms to the Waterford market.</p> <p><b>Type A</b> units are small single storey at grade dwellings suitable for those with special physical, social, or economic needs.</p> <p><b>Type B</b> units are small single-detached dwellings, geared as attainable housing.</p> <p><b>Type C</b> units provide smaller ground floor units geared to those with special physical needs and a larger upper floor unit for those that require additional space.</p> <p><b>Type D</b> units are 3 storey stacked dwellings, being a form of housing not found in Waterford today.</p>	<p>✓</p>


		<p><b>Type E</b> units are located in the apartment building and consist of a large range of</p> <ul style="list-style-type: none"> <li>• Studio units,</li> <li>• 1-bedroom units,</li> <li>• 2-bedroom units,</li> <li>• 2-bedroom plus den units, and</li> <li>• Penthouse units</li> </ul> <p>Section 7.7.1 a), b) and c) permit low profile, medium density and high-density residential units as proposed in this plan subject to section 7.7.2 a), b), and c).</p> <p>Section 7.7.1 l) permits small scale convenience commercial and personal services uses to the daily shopping needs of a neighbourhood shall be permitted subject to section 7.7.2 d)</p>	<p>✓</p> <p>✓</p>
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Section 7.7.2 a) sets the criteria for single detached housing forms.			
	Average net density of 15 uph.	<p>The residential units along McCool Street will be single detached residential in a plan of subdivision. This development form is the same as the existing residential development in the area providing a natural transition from the existing form to the proposed development. Considering the area of McCool Street itself, and the area of the plan of subdivision, the density of this portion of the development is approximately 16 uph.</p>	<p>✓</p>

Section 7.7.2 b) sets the criteria for group townhouses			
	Average net density of 15 to 30 uph.	The area of the development to be zoned R4 contains 76 dwelling units within an area of roughly 2 ha for a density of 38 uph.	✓
	i) Density, height and character of the developer shall have regard to adjacent uses.	The development proposes a gradual transition in height and character from the existing residential area to the higher form in the development. The existing neighbourhood consists of single detached dwelling with active proposals for multi-family development. To match the existing condition, single detached dwellings are proposed along McCool Street. Moving westerly within the development, two storey stacked townhouses are proposed (building type C) and further to the west and across a driveway, three storey stacked townhouses (building type D) are proposed. This very gradual transition in building mass, height and form has been proposed in consideration of the form of the existing neighbourhood.	✓
	ii) The height and massing of the building at the edge of the medium density residential development shall have regard to the height and massing of the buildings in any adjacent low density residential area....	This interface between medium and low-density development occurs within the boundary of the development as described above.	✓
	iii) Encouraged to have direct access to an arterial or collector road, where possible and appropriate.	West Church Street which is the southern border of this development is classified as a collector road according to the NCOP Schedule E-5.	✓
	iv) Watermains and sanitary sewers shall be capable of accommodating the development or the proponent shall commit to	The Functional Servicing Report prepared for this development confirms that the site can be serviced.	✓

Appendix C to Planning Justification Report – Official Plan Compliance  
The Silos of Waterford

	extending services at no cost to the County.		
	v) The development is adequately serviced by parks and schools.	The Waterford District High School is approximately 1 km from the development site. The community museum is approximately 400 m from the site.	✓
	vi) In developments incorporating ...block townhouse dwellings... on site recreation facilities....may be required.	Greenspace has been allocated within the condominium plan for parkland, outdoor activities and playground for the residents of the condominium.	✓
	vii) The development shall be designed and landscaped and buffering shall be provided to ensure that the visual impact of the development on adjacent uses is minimized.	This will be addressed through the site plan approval process. The design of the layout provides transition in building massing and height as previously discussed.	✓
	viii) A report on the adequacy of the road network to accommodate the expected traffic flows and the adequacy of water and sewer services may be required.	The traffic report for this project confirms that the road network can accommodate this development. The functional servicing report confirms servicing adequacy.	✓
	ix) Developments may be subject to site plan control.	This development will be subject to site plan control.	✓

Section 7.7.2 c) sets the criteria for high density uses, including apartment buildings as follows:			
	<p>i) The density, height and character of the development shall be compatible with adjacent uses.</p>	<p>The high-density area of the development is located in the far north west corner of the site. This area is currently occupied by the existing silos for the former co-operative business. These existing silos are 32m (105') tall and are therefore very similar in size and mass to the proposed apartment building. The proposed apartment building will be approximately 32 m tall to the top of the roof. A mechanical equipment penthouse will be on top of the roof and will add an additional 3 m to the total height of the building.</p> <p>This apartment building will be approximately 200 m from the nearest existing residential dwelling (single detached home) on West Church Street and will be buffered from that house by the following components of the proposed development:</p> <ul style="list-style-type: none"> <li>• McCool Street</li> <li>• A row of single detached dwellings,</li> <li>• A row of 2 storey townhomes,</li> <li>• A condo roadway</li> <li>• A row of 3 storey townhomes, and</li> <li>• A parking area and green space</li> </ul> <p>The development's gradual transition of height and density (low height and density on the east of the development near the existing neighbourhood) increasing towards the north west, provides the spatial separation as required to ensure compatibility with the adjacent uses.</p>	

		The mix of residential uses – single detached, two and three storey stacked townhouses, and apartment building are all uses supported by the proposed Residential designation in the official plan.	
	ii) The ability of the site to accommodate necessary facilities and amenities such as garbage storage, parking and landscaping.	The conceptual site plan illustrates that these facilities can all be accommodated on the site.	✓
	iii) The height, form and density of the proposed development is such that no undue adverse impact in terms of overshadowing, increased traffic, or loss of amenity area are created for surrounding residential uses.	The height and massing of the apartment building is similar to the existing silos. For this reason, it is not anticipated that there will be any change in shadowing impact on neighbouring properties. There may be minor shadowing impacts within the proposed development. No significant shadowing will be experienced by any existing residential dwelling given the spatial separation between the existing homes and the apartment building. The traffic study confirms that the existing roadways can accommodate the anticipated traffic. The development does not have any impact on amenity area for the neighbourhood.	✓
	iv) The relationship of the site to nearby lower density residential uses, in view of the desire to provide gradual transition in height and density wherever possible.	Gradual transition in height is provided within the development as discussed in section i) above.	✓
	v) The degree to which the site has access to significant open space amenities such as valleylands or major parks.	The site is directly adjacent to the Waterford Heritage Trail which provides excellent linkage to outdoor amenities including the Waterford Ponds and the LPRCA's Waterford North Conservation Area – Pickel Lake, Bass Lake and Willow Pond. The Waterford High School and its	✓



Appendix C to Planning Justification Report – Official Plan Compliance  
The Silos of Waterford

		large sports field is approximately 1 km from the site.	
	vi) Municipal watermains and sanitary sewers shall be required and shall be capable of accommodating the development, or the proponent shall commit to extending services at no cost to the County.	The functional servicing report confirm that the site can be serviced with municipal sewer and water.	✓
	vii) The proximity of the site to arterial or collector roads, and /or pedestrian accessibility to a Downtown Area or....	The site's southern border is West Church Street which is designated as a Collector Road according to Schedule E-5 of the NCOP. Nichol Street also provides direct pedestrian access to the Waterford Downtown area.	✓
	viii) The adequacy of local services including school and other community services.	Waterford's museum, high school, public school, catholic school, catholic church and united church are all within 1.5 km of this site.	✓

Section 7.7.2 d) sets the criteria for <b>commercial uses</b> in the Urban Residential Designation as follows:			
	i) No more than one <b>commercial building</b> on any site and maximum commercial use of 300 m2	Commercial use is only proposed on the ground floor of the apartment building. Therefore, only one building will have commercial use. A daycare (approx. 385 m2) and other commercial uses (approx. 240 m2) are proposed for a total of 625 m2. Given that the entire site is 3.5 ha in size, the proposed commercial footprint is less than 2% of the site area. It is considered appropriate that 5% of the area could be developed as commercial and meet the intent of the Official Plan.	✓
	ii) <b>Building height</b> where commercial is in a residential building is subject to the surround residential density provisions.	The commercial uses are proposed on the ground floor of a residential apartment building. That building will comply the appropriate height provisions of the R6 zone.	✓
	iii) <b>Landscaping</b> , fencing, berms and other forms of visual screening, as may be necessary, shall be provided adjacent to residential land use.	The commercial uses are proposed to be inside the residential apartment building, therefore visual screening will be addressed through the site plan approval process.	✓
	iv) All required <b>parking</b> shall be provided on the site.	Parking in accordance with the zoning by-law has been indicated on the conceptual site plan. This will be controlled through site plan approval.	✓
	v) <b>Driveway</b> access shall be approved by the County	This will be controlled through site plan approval.	✓
	vi) The facility shall be located at or in <b>proximity</b> to the intersection of arterial or collector roads, and shall not be located mid-block within a residential area.	This requirement is based on the assumption that the commercial use will be in a stand-alone commercial building. The commercial uses will be contained within the residential apartment building which is located adjacent to Nichol Street and McCool Street. The intent of this requirement is to ensure sufficient vehicular access to the commercial uses for the public. These commercial uses are generally intended for the residents of this development community	✓

		and therefore access is simple and natural. This is controlled through site plan approval.	
	vii) The use shall be subject to <b>site plan control</b> .	This development will be subject to site plan approval.	✓
<b>7.13.2 b) ii)</b> <b>Conversion to a more sensitive land use</b> shall be subject to the policies of Section 4.8 (Potentially Contaminated Sites) of this plan.			
	Section 4.8 (Potentially Contaminated sites) of the Norfolk County Official Plan sets out the following 5 criteria for conversion of land use to a more sensitive land use.		
	a) County encourages <b>identification</b> of contaminated sites.	The applicant has retained an G2S an environmental consulting firm and the site has been evaluated for chemical contamination. The ESA Phase 1 report is attached to this document and that report recommend that a Phase 2 study be completed based on the historical use of the lands.	✓
	a) A <b>Record of site condition</b> is required to be filed on the registry prior to issuance of a building permit.	The developer understands that the Record of Site Condition will be required prior to issuance of a building permit.	✓
	b) <b>Decommissioning and remediation</b> are to be completed in an environmentally responsible manner	Decommissioning will be performed under the direction of a qualified environmental firm to ensure appropriate compliance.	✓
	c) <b>Remediation</b> shall be carried out to achieve potable ground water site condition standards as per MOECC.	The developer's environmental consultant is aware of this requirement.	✓
	d) The County may prepare <b>community improvement plans</b> and may consider a variety of <b>incentives</b> to encourage the remediation and redevelopment of these sites.	The developer is exploring opportunities for development charges credits or other incentives that Norfolk County may offer for environmental remediation	✓

7.13.2 b) iii) The proposed use shall be <b>compatible</b> with the surrounding neighbourhood			
		<p>This site is bordered by transportation links on all four sides, providing buffers to any adjacent land use. The following comments are provided for the existing adjacent land uses:</p> <p><b>Lands to the North:</b> Nichol Street borders the site to the north. On the north side of the road is a vacant land parcel currently zoned MG, the Legion property currently zoned Community Institutional Zone (IC), and a residential block zoned R4.</p> <p>The vacant Industrial site is small in size and could only accommodate a Class 1 industry with a D6 Guideline recommended separation of 20 m. The road allowance itself and any required zoning setback easily provide this separation for the subject lands. Therefore, this is considered compatible with the proposed use.</p> <p>The Legion is a community use building and is considered to be compatible with the proposed residential use. Again, Nichol Street provides a buffer between the Legion and the proposed residential uses.</p> <p>The residential block is currently zoned R4(H). It is understood that this block is planned for group townhouses in a condominium format. This is very similar to the style of development on the subject lands, and therefore this is considered to be compatible.</p> <p><b>Lands to the East:</b> McCool Street borders the site to the east. On the other side of McCool is a mini storage site and residentially zoned lands.</p> <p>The mini storage site does not produce any significant noise, odour or other nuisance.</p>	<p>✓</p> <p>✓</p>

	<p>That site is classified as a Class 1 industry and therefore the D6 Guidelines recommend a 20 setback. This separation distance is provided by the road allowance, and therefore these land uses are considered compatible.</p> <p>The residential lands are zoned R1-A and used for single detached dwellings. The development proposed along McCool Street is also proposed to be single detached dwellings in the R1 zone, and therefore these land uses are the same and compatible.</p> <p><b>Lands to the South:</b> West Church Street borders the site to the south. On the other side of the street are lands currently designated as Industrial and zoned and General Industrial.</p> <p>We are aware of current applications before Norfolk County to amend the designation on most of this property to Residential and to rezone the same lands to Residential Type 4 to permit condominium group townhouses, being similar to the proposed development. Therefore, the proposed use on the subject lands and the proposed use on the adjacent lands are both similar and both implement the intent of the official plan by change the designation from Industrial to another more appropriate designation.</p> <p>There is an existing Industrial use on the south side of West Church Street. We understand that this is a Class 1 Industry and therefore West Church Street provided the recommended 20 m separation distance in accordance with the D6 Guidelines.</p> <p><b>Lands to the West:</b> The west limit of this site is the limit of the urban boundary of Waterford. This is also the edge of the former railway which is now part of the Norfolk tail system.</p>	<p>✓</p> <p>✓</p>
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		<p>The lands to the west are currently zoned Agricultural and Hazard Land and therefore no development is anticipated in this area.</p> <p>It is noted that a Provincially Significant Wetland is located to the west of the subject lands. Given that this wetland is generally more than 200 m from the subject lands, and given that there is a former railway and walking trail between the PSW and the subject lands, impacts on the PSW are not considered to warrant further consideration.</p> <p>On this basis, the proposed development is considered to be compatible with the surrounding land use.</p>	
	7.13.2.b) iv) Appropriate <b>buffers</b> and landscaping shall be provided	Nichol Street, McCool Street, and West Church Street already provide buffers between the proposed development and the existing neighbourhood. Any additional buffering that may be required will be addressed through the site plan approval process.	✓

7.13.2 b) v) Adequate <b>parking</b> shall be provided	The conceptual site plan illustrates that adequate parking will be provided in accordance with the requirements of the zoning by-law.	✓
7.13.2 b) vi) A <b>planning rationale</b> report assessing the compatibility of the proposed use and potential impact on adjacent uses as well as addressing any other matter outlined in section 9.6.1 of this plan shall be provided.	This report provides the required planning rationale.	✓
7.13.2 b) vii) A <b>traffic</b> study shall be provided	A traffic study by Paradigm Transportation Solutions Limited is attached to this report and confirms that the existing road network has the ability to accommodate the anticipated traffic from this development.	✓
7.13.2 b) viii) An <b>urban design</b> study including development guidelines as outlined in section 5.4 (Community Design) of this plan shall be provided	An Urban Design Study by Vallee is attached.	✓

Section 9.6 Development Control			
9.6.1	<p>9.6.1 c) The County shall consider the following criteria when reviewing applications to amend this Plan:</p> <ul style="list-style-type: none"> <li>i) the manner in which the proposed amendment conforms to prevailing Provincial policy and regulations;</li> <li>ii) the manner in which the proposed amendment conforms to the Strategic Plan prepared in support on this Plan;</li> <li>iii) the manner in which the proposed amendment conforms to the Goals and Objectives, and policies of this Plan;</li> <li>iv) the impacts of the proposed amendment on the provision of and demand for municipal services, infrastructure and facilities;</li> </ul>	<p>The proposed application is for an Official Plan and Zoning Bylaw amendment in order to facilitate a low density single detached lot subdivision along McCool Street, a medium density multi-unit townhouse style condominium with innovative forms of housing, and a high-density condominium apartment building.</p> <p>The development will be located within the Urban Settlement area of Waterford and will have access to adequate municipal water and sanitary services. The necessary studies and modeling have been completed to ensure there are no adverse impacts on surrounding</p>	✓



	<ul style="list-style-type: none"> <li>v) the adequacy of the proposed servicing solution with respect to the servicing policies of this Plan;</li> <li>vi) the impact of the proposed amendment on surrounding land uses, the transportation system, municipal services and community amenities and services;</li> <li>vii) the impact of the proposed amendment on the community structure and nature of the Urban Areas and/or Hamlet Areas;</li> <li>viii) the impact of the proposed amendment on cultural heritage resources and/or Natural Heritage Features;</li> <li>ix) the impact on agricultural uses and land;</li> <li>x) the impact of the proposed amendment on the financial sustainability of the County; and</li> <li>xi) any other information determined by the County, in consultation with the appropriate, agencies, to be relevant and applicable.</li> </ul>	<p>land uses. The necessary capacity exists within the municipal services to accommodate this development.</p> <p>This type of development will provide the citizens of Norfolk with increased housing options and is supported and encouraged by provincial and county land use planning policies.</p>	✓
<b>Section 9.10.5 Parkland Dedication</b>			
9.10.5	<p><b>Parkland Dedication</b></p> <p>The County shall secure the maximum benefit of the Planning Act with respect to land dedication for park development and shall strive to meet the policies of Section 7.5.1 (Parks) of this Plan relating to park development.</p> <p>g) The County may accept cash-in-lieu of the land dedication to be paid into a special account and used as specified in the Planning Act. Council will consider cash-in-lieu of parkland dedication under the following circumstances:</p> <ul style="list-style-type: none"> <li>a. where the required land dedication fails to provide an area of suitable shape, size or location for development as public parkland;</li> <li>b. where the required dedication of land would render the remainder of the</li> </ul>	<p>At the pre-consultation meeting of August 25, 2021, Norfolk County indicated that cash-in-lieu of parkland was preferred.</p> <p>Therefore, parkland is not to be provided as part of this development.</p>	✓

	<p>site unsuitable or impractical for development; and/or</p> <p>c. where it is preferable to have consolidated parkland of a substantial size servicing a wide area</p> <p>d. The County may establish a flat rate for cash-in-lieu payments for parkland dedications from new residential, commercial and industrial lots created by consent.</p>		
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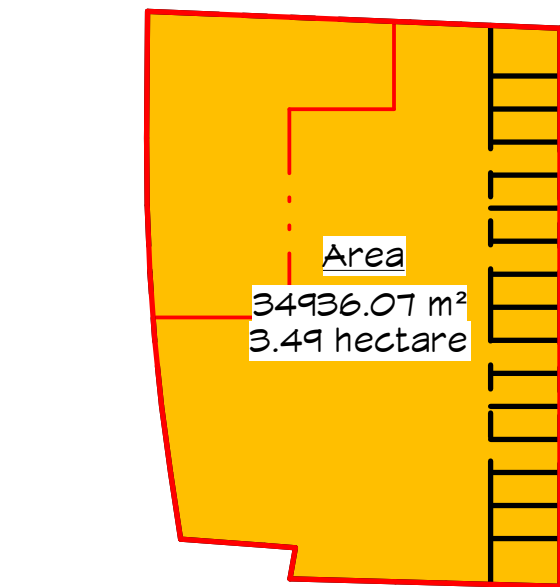
## **Appendix D**

### **Draft Plan of Subdivision**

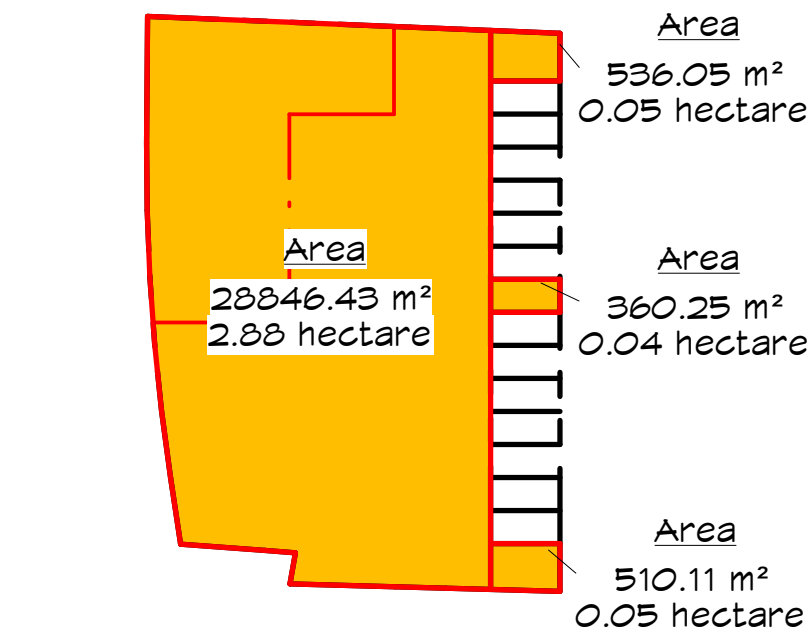


FILE PATH: H:\Projects\2023\12-061 Silos of Waterford Drawings\Arch\21-061 - SILOS OF WATERFORD - SITE.v4

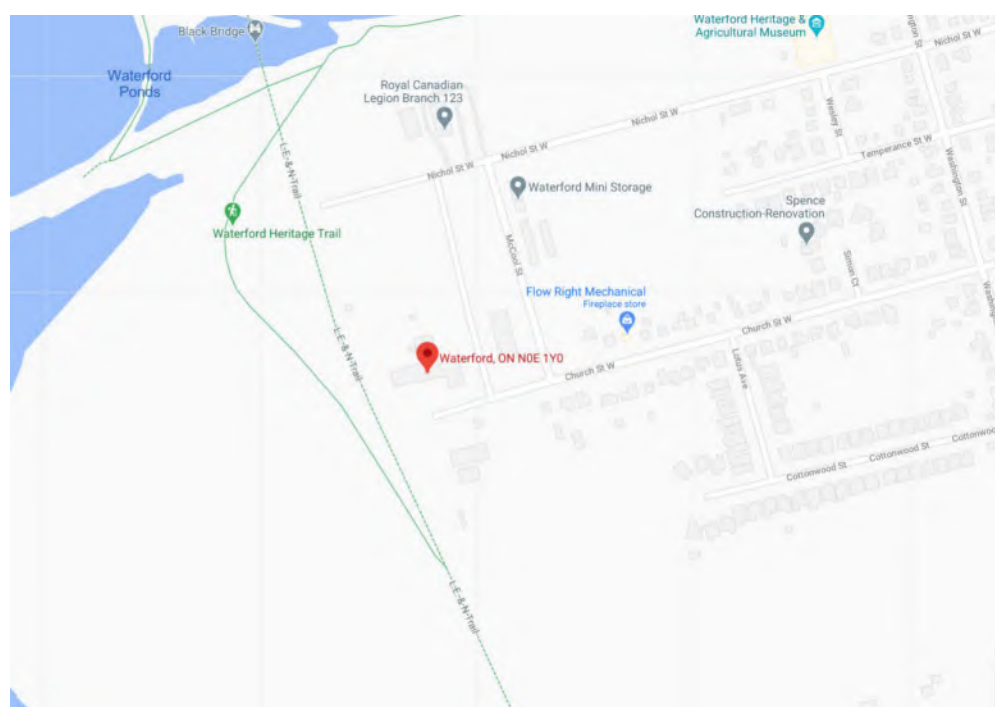
DATE PLOTTED 2023-01-13 12:18:12 PM PROJECT NUMBER & NAME: 21-061 SILOS OF WATERFORD



2 GROSS SITE - PLANNING  
SCALE 1:3000



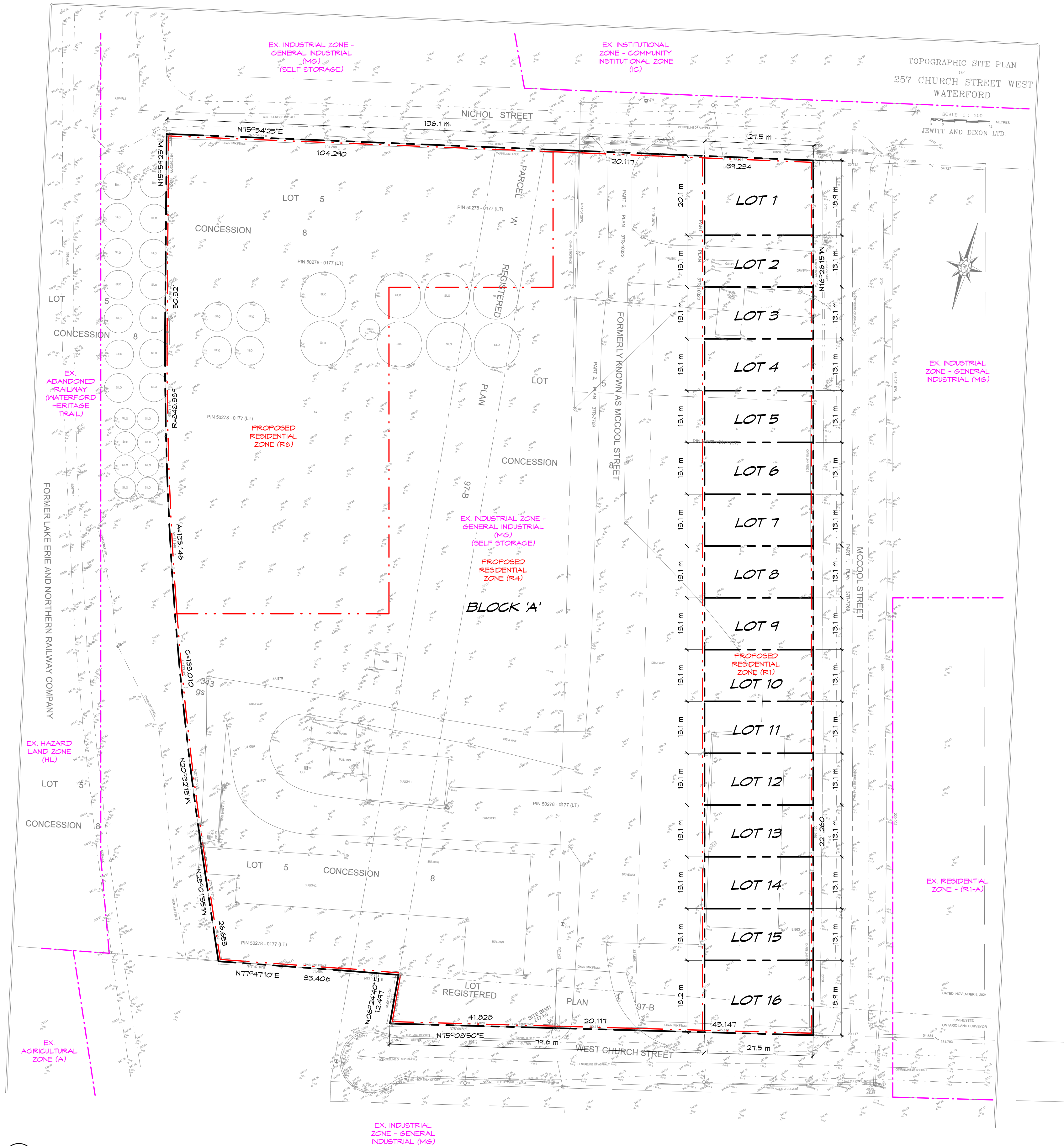
3 GROSS SITE ZONING - BLOCKS / LOTS - PLANNING  
SCALE 1:3000



KEY MAP  
SCALE 1:100



SITE MAP  
SCALE 1:100



1 SITE PLAN PLANNING  
SCALE 1:600

### SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATED: \_\_\_\_\_

SURVEYOR: \_\_\_\_\_  
KIM HUSTED

### OWNER'S CONSENT

I HEREBY CONSENT TO THE FILING OF THIS PLAN IN DRAFT FORM FOR APPROVAL.

DATED: \_\_\_\_\_

OWNER: \_\_\_\_\_  
TOM OHARA

### SITE ZONING

ZONING:  
CURRENT ZONING: INDUSTRIAL ZONE - GENERAL INDUSTRIAL (M6)  
(SELF STORAGE IN ACCORDANCE TO THE TOWN OF WATERFORD,  
ZONING BY-LAW 1-Z-2014 NORFOLK COUNTY - JANUARY-2021-  
CONSOLIDATION)

### LAND USE SUMMARY

PROVISION	LOT(S) / BLOCK(S)	UNITS	AREA (m²)
SINGLE DETACHED DWELLINGS WITH OPTIONAL ACCESSORY DWELLING UNIT	LOTS 1 TO 16	16 UNITS	EXT. 536.05 INT. 360.25 EXT. 910.11 (6084.60m²) (0.61ha) TOTAL
CONDOMINIUM - GROUP TOWNHOUSE, MID-RISE	BLOCK 'A'	-	28,846.43 (2.88ha)

### SECTION 51 (17) PLANNING ACT, R.S.O. 1990

- (a) the boundaries of the land proposed to be subdivided, certified by an Ontario land surveyor;  
• THE BOUNDARIES OF THE LAND PROPOSED SHOWN
- (b) the locations, widths and names of the proposed highways within the proposed subdivision and of existing highways on which the proposed subdivision abuts;  
• LOCATIONS & NAMES OF EX. ROADWAYS ON WHICH THE PROPOSED SUBDIVISION ABUTS SHOWN
- (c) on a small key plan, on a scale of not less than one centimetre to 100 metres, all of the land adjacent to the proposed subdivision that is owned by the applicant or in which the applicant has an interest, every subdivision adjacent to the proposed subdivision and the relationship of the boundaries of the land to be subdivided to the boundaries of the township lot or other original grant of which the land forms the whole or part;  
• SMALL KEY PLAN V4 LAND ADJACENT TO THE PROPOSED SHOWN
- (d) the purpose for which the proposed lots are to be used;  
• PURPOSE OF PROPOSED LOTS ARE TO BE USED FOR RESIDENTIAL
- (e) the existing uses of all adjoining lands;  
• EX. USES OF ALL ADJOINING LANDS SHOWN
- (f) the approximate dimensions and layout of the proposed lots;  
• DIMENSIONS & LAYOUT OF PROPOSED LOTS SHOWN
- (f.1) if any affordable housing units are being proposed, the shape and dimensions of each proposed affordable housing unit and the approximate location of each proposed affordable housing unit in relation to other proposed residential units;  
• NO AFFORDABLE HOUSING UNITS ARE BEING PROPOSED
- (g) natural and artificial features such as buildings or other structures or installations, railways, highways, watercourses, drainage ditches, wetlands and wooded areas within or adjacent to the land proposed to be subdivided;  
• ALL EX. FEATURES SHOWN
- (h) the availability and nature of domestic water supplies;  
• MUNICIPAL WATER SUPPLY TO BE USED
- (i) the nature and porosity of the soil;  
• DOMINANTLY GRAVELLY SANDS OF FLUVIAL OR TILL DERIVATION, OR 40 TO 100cm OF SANDY SEDIMENTS OVER GRAVELLY SANDS. THE SITE IS UNDERLAIN BY CHERT Limestone OF THE MIDDLE DEVONIAN BOIS BLANC FORMATION - PHASE 1 ESA 257 WEST CHURCH ST., WATERFORD, ONTARIO, G2S21354A
- (j) existing contours or elevations as may be required to determine the grade of the highways and the drainage of the land proposed to be subdivided;  
• EX. ELEVATIONS SHOWN
- (k) the municipal services available or to be available to the land proposed to be subdivided; and  
• MUNICIPAL SERVICES AVAILABLE ARE SANITARY, STORM & WATER
- (l) the nature and extent of any restrictions affecting the land proposed to be subdivided, including restrictive covenants or easements. 1994, c.23, s.30; 1996, c.4, s.20 (3); 2016, c.25, Sched. 4, s.8 (1).  
• ALL EX. SURVEY / TOPO INFO. SHOWN  
• EX. EASEMENT ON PART 2, PLAN 3TR-1769

### PLANNING LEGEND

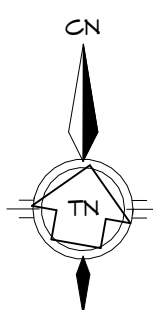
---	PROPERTY BOUNDARY LINE(S)
---	EX. ZONING BOUNDARY LINE(S)
---	PROPOSED ZONING BOUNDARY LINE(S)

NO.	DATE	ISSUANCE

NO.	DATE	ISSUANCE

PROPERTY LEGAL DESCRIPTION:  
PART OF LOT 5, CONCESSION 8  
GEOGRAPHIC TOWNSHIP OF TOWNSEND  
AND PART OF LOT 1,  
AND ALL OF PARCEL 'A'  
BOTH IN REGISTERED PLAN 97-B

APPLICANT:  
VERLINDA  
TOM OHARA  
26 MAIN ST. S.  
WATERFORD, ONTARIO,  
N0E 1Y0  
1.705.205.3235



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G. DOUGLAS VALLEE LIMITED  
2 TALBOT STREET NORTH  
SIMCOE ONTARIO N3Y 3W4  
(519) 426-6270

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PROJECT TITLE:  
SILOS OF WATERFORD  
257 CHURCH ST. W.  
WATERFORD, ONTARIO, CANADA,  
N0E 1Y0

DRAWING TITLE:  
SILOS OF WATERFORD - DRAFT  
PLAN OF SUBDIVISION

CHECKED BY: JV	DRAWN BY: JS
DRAWING SCALE: As indicated	DRAWING NO.: PROJECT NO.: 21-061
	PL101





# The Silos of Waterford

Verlinda Homes

## Urban Design Study

February 2, 2023





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## Introduction

G. Douglas Vallee Limited has been retained by Verlinda Homes to prepare an Urban Design Study in support of an application for Official Plan Amendment, Zoning By-law Amendment and draft plan of subdivision for a property located on the south west corner of West Church and McCool Streets in Waterford, Ontario.

## Site Context

### Subject Lands

The subject lands are 3.49 hectares in area with approximately 118 meters of frontage on West Church Street. Immediately to the West of the site is the Waterford Heritage Trail, which is a shared-use public recreational facility that forms part of the Trans Canada Trail. Public connections to the Waterford Heritage Trail bound the site to both the North and South (see Figure 1).

The site was formerly occupied by the Norfolk Co-operative Company Limited, and served as an agricultural supply depot. The structures on the lands consist of:

- 13 silos on the site plus an additional 22 silos on the adjacent lands to the west
- Various warehouses
- Various storage buildings
- Fueling station



**Figure 1** Aerial View of Subject Lands



### Adjacent Land Uses

As shown in Figure 2, the immediate surrounding land uses consist of the following:

- To the North
  - Nichol Street
  - Vacant land, approximately 2 acres in size zoned hazard land and general industrial
  - Royal Canadian Legion, approximately 2.6 acres in size
  - Proposed residential development for condominium townhouses, zoned R4(H)
- To the East
  - McCool Street
  - Mini storage building site, zoned general industrial MG
  - Single family residential dwellings, zoned R1-B
- To the South
  - West Church Street
  - Proposed residential development for condominium townhouses, currently zoned general industrial MG
  - Single Family residential home
  - Class 1 Industrial use, approximately 2.8 acres zoned general industrial MG
- To the West
  - Waterford Heritage Trail
  - Vacant lands zoned Agricultural and Hazard Land



**Figure 2** Adjacent Land Uses



### Neighborhood Form & Character

The peripheral & surrounding neighbourhood consists of a variety of low density and low rise development, primarily of residential character. Small scale industrial facilities lie immediately adjacent to the subject lands, with a one-storey mini-storage site to the East and a small-scale furniture distribution outlet to the South. Both facilities feature corrugated steel exterior cladding with low-pitch roof assemblies, and utilize the surrounding grounds for vehicular maneuvering and complementary uses (see Figures 3 & 4).



**Figure 3** Waterford Mini Storage  
216 Nichol St. West



**Figure 4** Alpha-Vico Inc.  
272 West Church St.

Along Nichol Street to the North of the lands are two low-rise institutional facilities, including the Waterford Heritage & Agricultural Museum and The Royal Canadian Legion community hall (see Figures 5 & 6).



**Figure 5** Waterford Heritage & Agricultural Museum  
159 Nichol St. West



**Figure 6** Royal Canadian Legion  
223 Nichol St. West

The existing residential homes surrounding the subject lands are comprised of a variety of one, two and three storey single detached, semi-detached and multi-unit dwellings. They include a variety of architectural styles, rooflines, exterior cladding configurations & landscape treatments (see Figures 7 through 15).





**Figure 7** 138 St. James St. S



**Figure 8** 10 Simon Court



**Figure 9** 147 St. James St. S



**Figure 10** 62 Wellington St.



**Figure 11** 22 & 18 Lotus Ave.



**Figure 12** 89 Cottonwood St.



**Figure 13** 103 St. James St. S



**Figure 14** 82 Cottonwood St.



**Figure 15** 170 Wellington St.



Approximately 800m North East of the subject lands lies the central commercial corridor for Waterford, comprised of boutique retail, restaurants and personal service establishments of mixed architectural styles fronting directly onto Alice Street (see Figures 16 through 18).



**Figure 16** Waterford Antique Market  
80b Alice St.



**Figure 17** View towards Silos Site  
Alice St.



**Figure 18** Quilt Junction  
121 Alice St.



### Proposal

The proposed development seeks to refurbish & repurpose the subject lands into a diverse and vibrant mixed-use community, including:

1. **Single Detached Dwellings** front on McCool Street, are geared toward smaller two-storey homes with the option for accessory dwelling units to provide attainable housing for the community of Waterford.
2. **Condominiums Townhouses** occupy the majority of the site and containing an innovative mix of housing styles:
  - a. Two storey stacked townhomes with one smaller accessible unit on the ground floor and a larger second unit above
  - b. Three storey townhomes with accessory dwelling units at grade and a larger primary dwelling above
3. **Condominium Apartments** will be located in the north west corner of the site and offer the following unit styles:
  - a. Studio
  - b. One Bedroom
  - c. Two Bedroom
  - d. Two Bedroom + Den
  - e. Penthouse
4. **Complementary Commercial Uses** integrated into the proposed mid-rise with the aim of offering commercial amenities that serve both the proposed development as well as the surrounding residential areas. These amenities may include restaurant(s), retail store(s), clinic or doctor's office(s), pharmacy, office(s), childcare, and personal service or merchandise shop(s).

The development concept recognizes and respects the low-rise nature of the contextual neighbourhood by staging building heights and massing gradually from McCool and West Church Street, with low-rise two-storey models at the periphery, three storey models towards the center, and the mid-rise building at the North West extent of the site. The intent is to use the height and mass of the existing silo structures as inspiration for the placement and orientation of the mid-rise building so as to maintain sightlines from adjacent areas within the neighbourhood and surrounding community.



**Figure 19** Artist's Presentation of Development Concept

## Policy Context

### Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS) establishes the goal posts for land use planning and community building throughout the Province of Ontario by 'promoting strong, livable, healthy and resilient communities, protecting the environment and public health and safety, and facilitating economic growth'. It specifically promotes endeavors that leverage opportunities for intensification and redevelopment within designated settlement areas, and offer compact land use patterns that make efficient use of land and a 'significant supply and range of housing options'.

As part of a defined Settlement Area, the subject lands and proposed development are consistent with the intents prescribed by the Provincial Policy Statement. The proposal creates a diverse range of housing options, densities and price points to meet current demands and future growth, while encouraging a healthy & active community by improving existing linkages to recreational trails and open spaces.

### Norfolk County Official Plan (2021)

The existing Official Plan designation of the lands is Industrial. While there are several properties on the periphery of the lands to the East and South that are also designated as Industrial, the majority of the surrounding lands to the North, East & South are designated as Urban Residential. The lands to the West of the subject property are designated as Agricultural and Provincially Significant Wetland (see Figure 20).

As noted in the Planning Justification Report, Section 7.13 of the Official Plan encourages the conversion of lands designated as Industrial to other uses more compatible with the contextual neighbourhood. The proposed development seeks to change the Official Plan designation of the lands to Urban Residential, which is consistent with and complementary to the existing neighbourhood.

Furthermore, Section 5.3.1 of the Official Plan encourages 'replacement of non-residential uses with compatible residential or mixed-use development' as part of a residential intensification strategy, and that that 'a minimum of 25% of the annual residential growth be accommodated through infill, intensification and redevelopment within the existing built-up areas'. The proposed development is consistent with and supports these goals as defined by the Official Plan.



**Figure 20** Existing Official Plan Designation



### Norfolk County Zoning By-Law (2021)

The existing Zoning on the lands is General Industrial MG (see Figure 21).

The proposed development seeks to change the Zoning of the lands to Residential Types R1-B, R-4 and R-6, which is consistent with the majority of surrounding context.



**Figure 21** Existing Zoning Designation



### Development Guidelines

Section 5.4 of the Norfolk County Official Plan establishes key points to be considered with respect to Community Design in the evaluation of development proposals. Through this evaluation, the 'County shall seek to maintain and improve the physical design characteristics of the Urban Areas in the context of new and existing development and stress a generally high quality of settlement design throughout the County'.

The proposed development will aim to comply with these points by adopting the guidelines as described below.

#### Neighborhood Structure

*5.4 b) i) shall ensure that new development is designed in keeping with the traditional character of the Urban Areas, in a manner that both preserves the traditional image of the Urban Areas and enhances the sense of place within the County while maintaining the community image of existing settlement areas*

The structure of the proposed development will complement the traditional character of the contextual neighbourhood by introducing dwellings of comparable size and style along the periphery of the site. Increases to density and building height will be made gradually across the development, and will mirror the existing height and massing of the existing silo structures towards the North West extent of the property.

*5.4 b) ii) shall promote efficient and cost-effective development design patterns that minimize land consumption*

By employing gentle densification through the use of innovative housing styles and higher density structures, the proposed development will be an efficient and cost-effective design that minimizes land consumption.

*5.4 b) iii) shall promote the improvement of the physical character, appearance and safety of streetscapes, civic spaces, and parks*

The proposed development will also improve the physical character, appearance and safety of the subject lands by replacing outdated and decrepit industrial buildings with modern, quality constructed homes, introducing street lighting, and by eliminating existing structures that are beyond their useful life and present a potential safety hazard.

#### Parks & Open Space

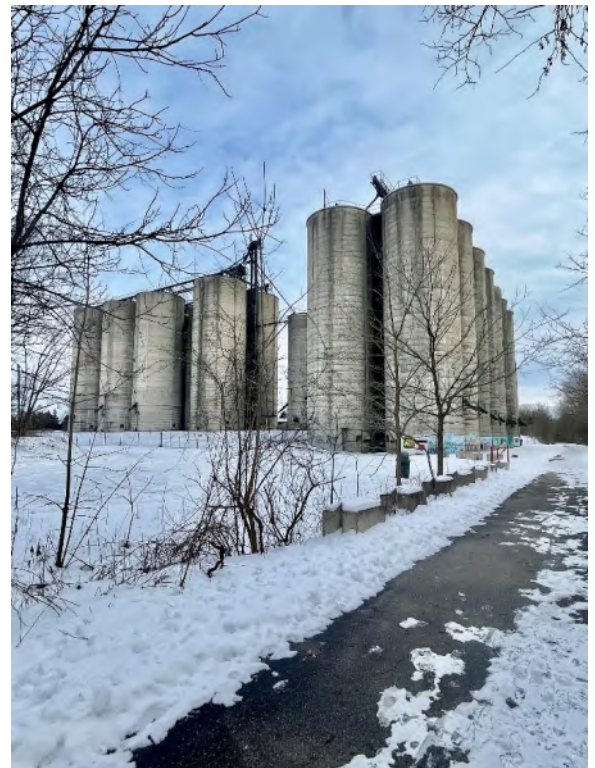
*5.4 b) iv) shall encourage tree retention and tree replacement*

The proposed development will enable the introduction of new trees and plantings that are not presently included on the existing lands as part of the comprehensive landscape and site plan design. The proposed landscaping features will be designed to complement the use of the existing Waterford Heritage Trail system.

#### Pedestrian, Cycling & Trail Linkages

*5.4 j) The County may require the provision of certain pedestrian, cycling and trail linkages through the development approvals process.*

The use of the existing trail linkages on municipal property at the South West and North West extents of the subject lands will be improved as a result of opportunity for additional municipal sidewalks. Additional linkages are also proposed from the development to the Waterford Heritage Trail, and the future residents of the proposed development are expected to use the trail system.





### Public Art

5.4 i) Public art in the County shall generally be encouraged to incorporate themes supporting and promoting local history, civic pride, businesses and technology. The provision of public art in the Downtown Designations shall be encouraged. The County may consider granting increases in height or density for a particular development proposal in exchange for the provision of public art, in accordance with Section 37 of the Planning Act.

The proposed development will actively consider opportunities for the integration of public art. The proponent has taken measures to thoroughly document the existing painted murals on the silos adjacent to the Waterford Heritage Trail, and is keen to develop the most suitable and appropriate means of preserving their memory.

### Crime Prevention

m) The County shall encourage development design considering the principles of Crime Prevention Through Environmental Design (CPTED). Specifically, the County shall encourage proponents of new development to use appropriate lighting to deter crime and to situate buildings on lots to maximize natural surveillance.

Through the site plan agreement process, additional lighting will be introduced to the site which will help deter crime on and around the subject lands. The presence of additional commercial and residential development along the Waterford Heritage Trail will also serve to deter crime on and along the trail itself.

### Sustainability

n) To promote environmentally sustainable development, the County shall encourage the design of sustainable neighbourhoods in keeping with Leadership in Energy and Environmental Design - Neighbourhood Development (LEED ND) design principles in accordance with the policies under Section 11.8.2.1 Sustainable Neighbourhood Design of the Lakeshore Special Policy Area Secondary Plan.

The development will be designed to meet or exceed the requirements of the Ontario Building Code and applicable County standards with respect to sustainable design. The proposed development will also seek to consider additional sustainable initiatives over the course of the site plan agreement, building permit & construction stages, which may include provisions as identified under the LEED ND principles.

### Accessibility

o) The County shall review site plans and drawings submitted in accordance with Section 41 of the Planning Act and Section 9.6.5 (Site Plan Control of this Plan) regarding accessibility for persons with disabilities including but not limited to areas of accessible parking, exterior paths of travel, lighting, ramps, entrances and street furniture.

The proposed development will introduce a variety of housing forms that offer accessible options, including grade level entries and elimination of stairs for select units, as well as barrier free units throughout the mid-rise apartment building. Barrier free access will also be provided to and throughout the commercial areas proposed within the mid-rise building as well as throughout the site itself.

### Conclusion

The proposed development and required planning applications are consistent with and complementary to the urban design requirements and goals of the Norfolk County Official Plan and Provincial Policy Statement. As a compact form of development, the proposal represents a land use that efficiently achieves a varied source of housing forms and commercial amenities that maintains, supports and is compatible with the surrounding neighbourhood.

The approval of the proposed Official Plan and Zoning Amendment applications will result in better utilization of the subject lands, and support the further development of an active, pedestrian friendly community that will enhance surrounding land uses.



## Phase One Environmental Site Assessment Update



257 West Church Street, Waterford, Ontario  
G2S21354A

Verlinda Homes Ltd.  
26 Main Street South  
P.O. Box 1152  
Waterford, Ontario  
N0E 1Y0

## EXECUTIVE SUMMARY

G2S Consulting Inc. (G2S) was retained by Verlinda Homes (the Client) to complete a Phase One Environmental Site Assessment (ESA) Update for the property located at 257 West Church Street in Waterford, Ontario, hereinafter referred to as the 'Site'. Refer to Drawing 1 in Appendix A for the Site Location Plan.

The irregular shaped Site is located on the northwest corner of the intersection of McCool Street and West Church Street, approximately 190 m west of Lotus Avenue, and covers an approximate plan area of 3.5 ha (8.6 ac.). The Study Area consists of residential and commercial land use. The Waterford Ponds are located approximately 160 m north.

G2S understands the Client requires a Phase One ESA Update related to the proposed redevelopment for residential purposes. Since there is a change in property use planned (commercial to residential), a Record of Site Condition (RSC) is required under O.Reg. 153/04, as amended, prior to redevelopment. This Phase One ESA Update was completed in accordance with Schedule D. of O.Reg. 153/04, as amended.

This Phase One ESA Update was conducted to:

- i) develop a preliminary determination of the likelihood that one or more contaminants have affected any land or water on, in or under the Phase One ESA Update property;
- ii) determine the need for a Phase Two ESA; and
- iii) provide a basis for carrying out any Phase Two ESA required.

Based on information collected from the Site visit and records review, the Site was historically occupied by Norfolk Co-operative Company Limited, an agricultural supply depot, from approximately 1975 until 2008. Prior to the development of the current Site buildings in 1975, the Site was vacant agricultural land. The Site was vacant between 2008 and 2019, when the current tenants, Voyago and Synergy Underground Utilities, took occupancy. The Site is currently developed with seven buildings, a fuel cardlock station, and 32 grain silos.

The Phase One ESA Update identified six on-Site PCAs and one off-Site PCA. The PCAs were assessed based on observations of the operations, their location relative to the Site with respect to the inferred groundwater flow direction, their tenure, expected chemical storage amounts, etc. Based on review and evaluation of the information gathered, the following APECs have been identified on-Site:

- APEC 1: Presence of fill material of unknown quality in the area of the silos and grain loaders in the northwest portion of the Site, north of Building A in the area of a berm, and across the entire Site.
- APEC 2: Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D.
- APEC 3: Historical presence of one motor oil above ground storage tank (AST) on the northwest area of the Site.

- APEC 4: Current and historical presence of one furnace oil AST on-Site, south adjacent to Building E.
- APEC 5: Historical presence of one dyed diesel AST at the southwest corner of the Site.
- APEC 6: Historical presence of one waste oil AST on-Site, north of Building A.
- APEC 7: Current and historical presence of a cardlock fuel station with gasoline and diesel underground storage tanks (USTs) and fuel pumps, located at the northeast corner of the Site.
- APEC 8: Current and historical use of Building A on-Site as a service and maintenance garage for vehicles and school buses, with the presence of an oil water separator.
- APEC 9: Current presence of new motor oil AST on the west wall of the shop within Building A.
- APEC 10: Current presence of new motor oil AST in the southeast corner of the shop within Building A.
- APEC 11: Current presence waste oil AST in the northeast corner of the shop within Building A.
- APEC 12: Historical presence of a hydro substation at the north-central portion of the Site.

The Phase One ESA Update identified APECs related to on-Site PCAs. In this regard, a Phase Two ESA is recommended to address the APECs and facilitate RSC filing.



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## 1. INTRODUCTION

G2S Consulting Inc. (G2S) was retained by Verlinda Homes (the Client) to complete a Phase One Environmental Site Assessment (ESA) for the property located at 257 West Church Street in Waterford, Ontario, hereinafter referred to as the 'Site'. Refer to Drawing 1 in Appendix A for the Site Location Plan.

G2S understands the Client requires a Phase One ESA Update related to the proposed redevelopment of the Site for residential purposes. Since there is a change in property use planned (commercial to residential), a Record of Site Condition (RSC) is required under O.Reg. 153/04, as amended, prior to redevelopment. This Phase One ESA Update was completed in accordance with Schedule D. of O.Reg. 153/04, as amended.

The following Phase One ESA report was previously completed for the Site:

- a) *"Phase I Environmental Site Assessment, 257 West Church Street, Waterford, Ontario,"* prepared by Pinchin Environmental Ltd. for 2369929 Ontario Limited, dated August 28, 2013.

This Phase One ESA Update should be read in conjunction with the Phase One ESA report listed above.

### 1.1 Terms of Reference

This Phase One ESA Update was conducted to:

- i. Develop a preliminary determination of the likelihood that one or more contaminants have affected any land or water on, in or under the Phase One ESA Update property;
- ii. Determine the need for a Phase Two ESA; and
- iii. Provide a basis for carrying out any Phase Two ESA required.

The assessment was performed in accordance with the Phase One ESA Update protocols outlined in O. Reg. 153/04, as amended, and meets the requirements of Schedule D of the Regulation.



## 1.2 Phase One ESA Update Property Information

**Table 1: General Site Details**

<b>Municipal Address</b>	257 West Church Street, Waterford
<b>General Site Location</b>	Northwest corner of the intersection of McCool Street and West Church Street, approximately 190 m west of Lotus Avenue.
<b>Approximate Plan Area</b>	3.5 ha (8.6 ac.)
<b>Property Identification Number (PIN)</b>	50278-0177 (LT)
<b>Legal Description</b>	PCL A PL 97B; PT LT 1 PL 97B; PT LT 5 CON 8 TOWNSEND PT 2 37R7769 & AS IN NR298004 (FIRSTLY, SECONDLY), LYING W OF PT 1 37R7769; S/T NR535805, NR542373; NORFOLK COUNTY.
<b>Current Site Owner and Contact Information</b>	2369929 Ontario Limited Bernie Debono General Manager Norfolk Disposal Services Ltd. 811 Old Highway 24 Waterford, ON N0E 1Y0 (519) 443-8022 bernie@norfolkdisposal.ca
<b>Current Site Occupant</b>	Voyago – School Bus Terminal and Bus Maintenance Shop. Synergy Underground Utilities – Internet communications company using the Site for storage purposes. Fuel Cardlock Station – used by transport vehicles off-Site.

The Phase One Study Area includes the Site and lands within approximately 250 m of the Site, as shown on Drawing 2 in Appendix A, hereinafter referred to as the Study Area.

## **2. SCOPE OF INVESTIGATION**

This assessment was performed in accordance with the Phase One ESA protocols and included the following tasks:

1. Records review since the most recent Phase One ESA was completed in 2013 by others.
2. Interviews with pertinent Site contacts.
3. A Site reconnaissance to assess current Site and Study Area conditions and the presence of any visual indications or olfactory evidence of potential contamination. A detailed review of regulatory compliance issues was not within the terms of reference for this assignment.
4. An evaluation of the information gathered from the records review, interviews, and Site reconnaissance.
5. Preparation of this report discussing the information compiled and the corresponding conclusions and recommendations.

### 3. RECORDS REVIEW

Available public records were reviewed to determine the land use history of the Site and Study Area.

#### 3.1 General

##### 3.1.1 Phase One ESA Update Study Area Determination

In accordance with O. Reg. 153/04, as amended, the Phase One ESA Update must include, at a minimum, the Site and any other property that is located within 250 m of the Site boundaries. This is referred to as the Phase One ESA Update Study Area (Study Area) as depicted on Drawing 2, appended.

##### 3.1.2 First Developed Use Determination

In accordance with the Regulation, the following definition applies:

“first developed use” means *the earlier of,*

- i. the first use of a phase one property in or after 1875 that resulted in the development of a building or structure on the property, and
- ii. the first potentially contaminating use or activity on the phase one property;

Based on information from the records review, the first developed use of the Site was in 1975 for commercial purposes. The earliest available records indicate a commercial building was present on Site in 1975.

##### 3.1.3 Chain of Title

A land title search for the Site was conducted online at the Teranet Express website for the Norfolk Land Registry Office. The Land Registry document indicates that the Site was transferred to the current owner, 2369929 Ontario Limited, by vesting order, in October 2013. The Site was previously owned by Norfolk Co-Operative Company Limited from 1965 to 2003, Growmark, Inc. from 2003 to 2009, RSM Richter Inc. in 2009, and Duff & Phelps Canada Restructuring Inc. in 2011. The Land Registry document for the Site is included in Appendix B.

##### 3.1.4 Fire Insurance Plans

Fire Insurance Plans (FIPs) were not published for the community of Waterford.

##### 3.1.5 Street Directories

Street directories were not published for the community of Waterford.

##### 3.1.6 Waste Management Records

The Site and properties within the Study Area were searched by company name in the Hazardous Waste Information Network (HWIN) and the Hazardous Waste Information System (HWIS) databases from 2013 to 2018. Records dated prior to 2013 are included in the previous Phase



One ESA completed by others. Properties within the Study Area were also searched for records currently registered with HWIN, included in Appendix C. The following records were found:

**Table 2: HWIN Records**

Address Direction and Distance from Site	Generator Name	Registered Wastes
257 West Church Street (Site)	Growmark Inc. ON1173008 2009	212 – Aliphatic solvents and residues
	Norfolk Co-operative Company Limited ON1173008 1995-2006	213 – Petroleum distillates 221 – Light fuels 242 – Halogenated pesticides and herbicides
	Langs Bus Lines Limited ON6700682 2018	251 – Oil skimmings & sludges 252 – Waste oils & lubricants 263 – Miscellaneous waste organic chemical
	947465 Ontario Ltd. (Voyago) ON5893115 current	

According to the previous Phase One ESA report completed for the Site, Growmark Inc. and Norfolk Co-operative Company Limited historically generated 6,187 kg of waste oils and lubricants, 4,800 kg of light fuels, and 410 kg of halogenated pesticides on Site between 1999 and 2004. The occupant at 257 West Church Street was deemed to represent a PCA and APEC for the Site, summarized in Section 6 of this report.

### 3.1.7 Environmental Reports

The following previous environmental reports were completed for the Site.

**Table 3: Summary of Previous Environmental Reports**

Report Details	Findings and Conclusions
<b>Title:</b> Phase I Environmental Site Assessment, 257 West Church Street, Waterford, Ontario  <b>Date of Report:</b> August 28, 2013  <b>Author of the Report:</b>	<ul style="list-style-type: none"> <li>At the time of this Phase I ESA, the Site was vacant and formerly utilized as a pesticide/fertilizer/grain depot and cardlock fuel station. The Site was developed with six single-storey slab-on-grade commercial buildings.</li> <li>First development of the Site was at least 1975, when Norfolk Co-Operative Company Limited, an agricultural supply depot, occupied the Site. Operations within the Site buildings historically included: <ul style="list-style-type: none"> <li>Building A (southeast corner of Site): Offices and a maintenance shop for the repair of school buses, including oil servicing and welding, with the presence of scrap metal and a waste oil aboveground storage tank (AST).</li> <li>Building B (southwest corner of Site): Open storage building separated by stalls used for dry chemical storage piles including</li> </ul> </li> </ul>

Report Details	Findings and Conclusions
<p>Pinchin Environmental Ltd.</p> <p><b>Completed for:</b> 2369929 Ontario Limited</p>	<p>fertilizer, potash, ammonium nitrate pills, monoammonium phosphate, calcium sulphate, K-mag, pelletized limestone, ammonia sulfate, and urea. The remainder of the building was used for the storage of equipment.</p> <ul style="list-style-type: none"> <li>○ Building C (located north of Building B): Used for “day” chemical storage, including chemicals stored on shelves within the building. A dispenser rack with three totes (likely once containing chemicals) were identified north of the building. West of the building were two berms, reportedly formerly equipped with sump systems.</li> <li>○ Building D (located north of Building B): Used for bulk chemical storage, with evidence of historical ASTs at the north portion of the building.</li> <li>○ Building E (located north of Buildings C and D): Scale house and observation building. A basement was identified which housed the heating system and a pit. A fuel oil AST was located south adjacent to the building.</li> <li>○ Building F (northwest corner of Site): Used as a water pump house and equipment storage area. Pumping equipment was identified within the basement.</li> <li>○ Cardlock Fuel Station (northeast corner of the Site): Three vent pipes were identified east of the underground storage tanks (USTs) and six vent and fill pipes were located south of the tank nest. USTs contained ethanol, mid-grade ethanol, and diesel. Another concrete pad was identified south of the cardlock station and may have previously been used by the tenants since the fuel dispensers had been removed.</li> <li>○ Various grain silos were located at the northwest portion of the Site, and at one time contained grain elevators and conveyor belts, distributing various types of grain. A metal shed (Building G) containing a 950-gallon AST was located south of the silos. Heavy staining was observed beneath the AST. A hydro substation was also identified in the area of the silos.</li> <li>○ A total of 3 USTs containing fuels and 4 ASTs containing new and used oil and fuel were located on Site.</li> </ul> <ul style="list-style-type: none"> <li>• At the time of this Phase I ESA in 2013, the Site had been vacant for approximately 5 years, since 2008.</li> <li>• According to an EcoLog ERIS report, Growmark Inc. and Norfolk Co-operative Company Limited generated approximately 6,187 kg of waste oils and lubricants, 4,800 kg of light fuels, and 410 kg of halogenated pesticides on Site between 1999 and 2004.</li> <li>• Aerial photographs from 1954/1955 indicate that the Site was vacant agricultural land. An aerial photograph from 1975 shows the east portion of the Site as vacant agricultural land, and a building similar to Building B present on-Site. Some of the silos and the truck scale were also present. In aerial photographs from 2003, 2006, and 2010, the Site was developed similar to 2013.</li> </ul>

Report Details	Findings and Conclusions
	<ul style="list-style-type: none"> <li>As part of the 2013 Phase I ESA, a previous Phase II ESA report completed in 2010 by NewTech was reviewed. The 2010 Phase II ESA revealed the following findings: <ul style="list-style-type: none"> <li>Twenty-two (22) boreholes were advanced to depths between 1.2 and 6 m below ground surface (bgs).</li> <li>Soil samples were submitted for analysis of nitrogen, ammonia, pesticides, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and petroleum hydrocarbons (PHCs).</li> <li>Nineteen (19) temporary monitoring wells were installed on-Site, ranging from 4.5 m to 6 m in depth.</li> <li>No exceedances of the applicable Ministry of Environment (MOE) criteria were noted at this time.</li> </ul> </li> <li>The soil analytical results from the NewTech report were compared to MECP Table 2 Site Condition Standards (SCS) for industrial/commercial/community (ICC) land use, and coarse-grained soils, within a potable groundwater condition. Soil concentrations reviewed were below the applicable Table 2 SCS. It was noted that groundwater was only obtained from one monitoring well (SS-16), which was installed south of the cardlock station. The monitoring well was absent of water, and it was Pinchin's opinion that the groundwater collected from the monitoring well was surface runoff water that entered the well. As part of the NewTech Phase II ESA, soil was not assessed for metals and inorganics.</li> <li>Based on the findings of the 2010 Phase Two ESA, Pinchin recommended completing a Phase Two ESA at the Site.</li> </ul>
<p><b>Title:</b> Phase II Environmental Site Assessment, 257 West Church Street, Waterford, Ontario</p> <p><b>Date of Report:</b> September 19, 2013</p> <p><b>Author of the Report:</b> Pinchin Environmental Ltd.</p> <p><b>Completed for:</b> 2369929 Ontario Limited</p>	<ul style="list-style-type: none"> <li>The purpose of this Phase II ESA was to address potential environmental concerns identified in the Phase I ESA completed by Pinchin in August 2013, for potential acquisition of the Site.</li> <li>The Phase II ESA work was completed on Site between August 30 and September 5, 2013.</li> <li>Nine boreholes were advanced on Site, eight of which were completed as groundwater monitoring wells.</li> <li>Worst case soil samples collected during the drilling program were submitted for the analysis of VOCs, PHCs, phenols, and/or metals and inorganics.</li> <li>Groundwater samples were submitted for analysis of PHCs, VOCs, phenols, and/or inorganics.</li> <li>Soil and groundwater samples were compared to the MECP Table 2 Full Depth Background SCS for ICC land use and coarse-textured soil.</li> <li>Chemical concentrations analysed for both soil and groundwater were below the applicable SCS in the submitted samples.</li> <li>It was noted that the detection limits for various VOC parameters were greater than the Table 2 SCS, and therefore, Pinchin could not confirm the groundwater quality in monitoring wells MW7, MW8 and MW9.</li> <li>It was concluded that based on the findings, no further environmental work was recommended.</li> </ul>



### 3.2 Environmental Source Information

**Table 4: Environmental Source Information**

Document	Source	Pertinent Information
Norfolk County Official Plan: Schedule B-18 – Land Use  Schedule C-1 – Natural Heritage	Norfolk County website	-Site is classified as industrial, and the Study Area is generally classified as industrial, urban residential, hazard lands, and provincially significant wetlands. -Provincially significant wetlands are located approximately 160 m north and 170 m northwest of the Site along the Waterford Ponds. -Significant woodlands are located west adjacent to the Site and approximately 10 m north of the Site and extend further west and north through the Study Area.
Ministry of Natural Resources (MNR) and Forestry, Ontario, Natural Heritage Areas database	MNR online	-Provincially significant wetlands are located approximately 160 m north and 170 m northwest of the Site along the Waterford Ponds. -Woodlands are located west adjacent to the Site and approximately 10 m north of the Site and extend further west and north through the Study Area.
National Pollutant Release Inventory (NPRI) database	NPRI online	-Search for records in the vicinity of the Site was conducted in two-year increments for the years 2013-2017. No records were found for the Site or Study Area.
Ontario Inventory of Polychlorinated Biphenyl (PCB) Storage Sites (1991 & 1995)	MECP	-No records for Site or Study Area.
Environmental Bill of Rights Registry (EBR)	MECP	-No records for Site or Study Area.
Inventory of Coal Gasification Plant Waste Sites in Ontario	MECP	-No records for Site or Study Area.
Inventory of Industrial Sites Producing and Using Coal Tar and Related Tars in Ontario	MECP	-No records for Site or Study Area.
Freedom of Information (FOI) Request	MECP	-Requests generally take several weeks to months to generate a response. Should a response from the government agency change the conclusions or recommendations of this report, an addendum letter will be provided along with the information received.
Waste Disposal Site Inventory, June 1991	MECP	-No records for Site or Study Area.
Brownfields Environmental Site Registry	MECP online	-No records for Site or Study Area.
Technical Standards and Safety Authority (TSSA)	TSSA via email	-Several records were located for the Site, including: <ul style="list-style-type: none"> <li>• One expired gasoline station – card/keylock</li> <li>• One expired gasoline station</li> </ul>

Document	Source	Pertinent Information
		<ul style="list-style-type: none"> <li>Two active liquid fuel tanks</li> <li>One active private fuel outlet – self serve</li> </ul> <p>Additional TSSA records have been requested for the above entries, and generally take several weeks to generate a response. Should a response from TSSA change the conclusions or recommendations of this report, an addendum letter will be provided along with the information received.</p>

TSSA records for the Site were deemed to represent a PCA and APEC for the Site. The environmental source information is included in Appendix C.

### 3.3 Physical Setting Sources

#### 3.3.1 Aerial Photographs

The previous Phase One ESA included aerial photographs from the years 1954/55, 1975, 2003, 2006, and 2010. For ease of reference, an aerial photograph from 2018 is included as Drawing 4 Appendix A. The following table summarizes the information.

**Table 5: Aerial Photographs**

Year	Site Description	Study Area Description
2018	<p>The Site appears similar to that reported in the 2013 Phase One ESA.</p> <p>Seven buildings are located throughout the Site. Various silos are located at the northwest portion of the Site, a cardlock fuel station is located at the northeast corner of the Site surrounded by fencing, and school buses are parked at the central and east portions of the Site. A gravel driveway runs north to south through the central area of the Site, between Nichol Street West and West Church Street.</p>	<p>The Study Area appears similar to that reported in the 2013 Phase One ESA.</p> <p>The Study Area is fully developed with commercial and residential properties. A walking trail is located west adjacent to the Site, followed by woodlands. Woodlands are also located north of the Site and extend to the Waterford Ponds, located approximately 160 m north.</p>

#### 3.3.2 Ontario Base Maps/Topographic and Other Maps

For ease of reference, selected maps are included as Drawings 5 and 6 in Appendix A. The following table summarizes the information.

**Table 6: Topographic and Other Maps**

Item	Year	Site Description	Study Area Description
Topographic Map	2019	<p>The Site appears to be developed with the current Site buildings, and silos appear at the northwest corner of the Site.</p> <p>The ground elevation is approximately 242 m to 246 m asl.</p>	<p>The Study Area is developed with commercial and residential properties. A portion of a railway line runs north to south along the western Site boundary. The</p>

Item	Year	Site Description	Study Area Description
		The expected direction of groundwater flow is north following surface topography towards the Waterford Ponds.	Waterford Ponds are located approximately 160 m north.
Ontario Base Map (OBM)	Reviewed on November 4, 2021	The Site is developed with the current Site buildings. The ground elevation is approximately 245 m asl.	
Palaeozoic Geology of Southern Ontario, Map 2254, Ontario Division of Mines	1972	The Site is underlain by cherty limestone of the Middle Devonian Bois Blanc Formation.	
Generalized Soil Map Regional Municipality of Haldimand-Norfolk, Ontario, Report No. 57	Circa 1985	The Site area is dominantly gravelly sands of fluvial or till derivation, or 40 to 100 cm of sandy sediments over gravelly sands.	

### 3.3.3 Hydrology and Hydrogeology

Surface water from the Site is expected to infiltrate through the unpaved surfaces on-Site.

The Waterford Ponds are located approximately 160 m north. Surface elevations in the area decrease to the north/northwest. Based on our observations and review, the expected direction of groundwater flow underlying the Site is north/northwest towards the Waterford Ponds.

### 3.3.4 Fill Materials

Reference is made to Section 5 of this report for details of fill materials.

### 3.3.5 Water Bodies, Areas of Natural Significance and Groundwater Information

The Waterford Ponds are located approximately 160 m north. Provincially significant wetlands are located approximately 160 m north and 170 m northwest of the Site along the Waterford Ponds. Significant woodlands are located west adjacent to the Site and approximately 10 m north of the Site extending further west and north through the Study Area.

A municipal drinking water supply well and wellhead protection area A (WHPA-A) is located approximately 710 m southwest, and WHPA-D is located approximately 50 m southwest of the Site. The Site is not located within a WHPA; however, the Study Area is. Potable water is supplied to the Site via the municipal system, which sources its water from groundwater water wells.

### 3.3.6 Well Records

According to the MECP database, there were several records within the Study Area (included in Appendix D). A record from a monitoring well located on-Site identified soil as brown sand and silt to a depth of 7.2 m below ground surface (bgs), underlain by brown silt and sand to a depth of 14.5 m bgs. Water level information was not provided.

## 3.4 Site Operating Records

Site Operating Records were requested via a Phase One Questionnaire provided by G2S at the time of this Phase One ESA Update report. The following chart summarizes the records.

**Table 7: Site Operating Records**

Site Operating Records	
Regulatory Permits and Records	No records available
Material Safety Data Sheets	No records available
Underground Utility Drawings	No records available
Chemical Inventory and Storage	No records available
Storage Tanks	No records available
Environmental Monitoring Data	No records available
Waste Management Records	No records available
Process, Production and Maintenance Documents	No records available
Spills and Discharges	No records available
Emergency Response and Contingency Plans	No records available
Environmental Audit Reports	No records available
Facility Site Plans	No records available



## **4. INTERVIEWS**

### **4.1 Site Personnel**

An interview regarding the Site was conducted with Site owner, Mr. Bernie Debono, and Site Representative, Mr. Tom O'Hara, on September 30, 2021. A Phase One Questionnaire completed by Mr. O'Hara is included in Appendix E.

According to the Site owner, the Site was first developed for use by Norfolk Co-operative Company Limited, an agricultural grain supply depot, in approximately 1975 until approximately 2008 when the Site became vacant. The Site was vacant from approximately 2008 until 2019 when Voyago, a school bus terminal, and Synergy, an internet communications company, took occupancy of the Site.

### **4.2 Third Party Individuals**

Third party individuals were not available for interview at the time of this Phase One ESA Update.

### **4.3 Government Officials**

The following government officials were contacted as part of this Phase One ESA Update:

1. Ministry of the Environment, Conservation and Parks (MECP), Freedom of Information and Protection of Privacy Office;
2. Technical Standards and Safety Authority.

## 5. SITE RECONNAISSANCE

Observations of the Site, adjacent and surrounding properties were conducted by walking over the Site. Adjacent and surrounding properties were observed from within the Site or by other public means. Refer to Drawing 3 (Site Plan) in Appendix A. Photographs of the Site and the Study Area are included in Appendix F.

### 5.1 General Requirements

**Table 8: Site Reconnaissance**

Date	September 30, 2021
Time	10:00 am
Weather	Sunny, 15° Celsius
Person who conducted the Site visit	Cassia Dal Bello, B.Sc.
Qualified Person supervising the Site visit	Melissa King, P.Geo.
Facility Operating: Yes/No	Yes

### 5.2 Specific Observations at the Phase One Property

<b>General Observations:</b>
<p>The Site is currently developed with seven buildings, several parking and storage areas, a cardlock fuel station, and 32 grain silos. Entrance to the Site is via West Church Street or Nichol Street West. The Site occupies approximately 3.5 ha (8.6 ac.) and has approximately 175 m of frontage on West Church Street, 225 m of frontage on McCool Street, and 190 m of frontage on Nichol Street West. A walking trail, historically a CNR line, is located west adjacent to the Site, traversing north to south. Descriptions of the various buildings on Site are as follows:</p> <p><b>Building A (southeast area of Site):</b> One-storey slab-on-grade building (~910 m<sup>2</sup>) occupied by Voyago. Voyago uses the central area and areas north of Building A for school bus parking. The building consists of offices at the south portion of the building, and a school bus maintenance shop with a mezzanine at the north portion of the building. Operations include minor body and mechanical work on school buses. A parts room and tool area are located along the east wall of the shop, and two bench ASTs containing new motor oil, and a waste oil AST are located within the shop. Two bay doors are located along the west wall, and one bay door is located along the north wall of the shop. A floor drain runs east to west and north to south at the centre of the shop and drains into an oil water separator located west of Building A.</p> <p><b>Building B (southwest area of Site):</b> One-storey slab-on-grade building (~1,670 m<sup>2</sup>), previously used for grain and fertilizer storage. The building is currently vacant with no operations taking place.</p> <p><b>Buildings C &amp; D (~10 m north of building B):</b> Building C is a slab-on-grade building (~30 m<sup>2</sup>). G2S was not able to enter Building C, however the Site owner indicated that the building is rented out by an electrician who utilizes the building for storage purposes. Building D is a one-storey slab-on-grade commercial building (~250 m<sup>2</sup>) used for storage. Most of the building is vacant, with some areas used for storage of equipment and household items. No operations currently take place within the building.</p> <p><b>Building E (~20 m north of buildings C &amp; D):</b> One-storey building with a basement level (~40 m<sup>2</sup>). G2S was not able to enter Building E, however the Site owner indicated that it is occupied by a tenant who is involved with overseeing the operations at the Site. A heating oil AST was located south adjacent to the building and was situated above the ground on stilts. According to a previous report,</p>

the building was historically used as a scale house and observation building with a basement level that housed the heating equipment for the building.

**Building F (~75 m northwest of Building E):** Slab-on-grade concrete building (~10 m<sup>2</sup>). The building was vacant at the time of the Site visit.

**Building G (~10 m east of Building F):** Metal storage shed (~10 m<sup>2</sup>), currently vacant.

Synergy Underground Utilities occupied the north portion of the Site, adjacent to the silos. The grounds are used for general storage of construction equipment used in the process for underground utility infrastructure projects off-Site.

Approximately 32 grain silos are located at the northwest portion of the Site and are not currently in use.

A cardlock fuel station is located at the northeast portion of the Site and is surrounded by a chain-link fence on the south and west sides, with access to the pumps from Nichol Street West and McCool Street. Two fuel pumps are available for use and are supplied by two USTs located south of the pumps on the south side of the fence.

A driveway/right of way runs north to south through the east portion of the Site and has access to West Church Street and Nichol Street West. The ground surface at the Site is primarily gravel with some landscaped areas.

### On-Site Potentially Contaminating Activities

The following PCAs listed in Table 2 of Schedule D in O. Reg. 153/04, as amended, were observed on Site and/or may have occurred on-Site:

PCA #22 – Fertilizer Manufacturing, Processing, and Bulk Storage

PCA #30 – Importation of Fill Material of Unknown Quality

PCA #28 – Gasoline and Associated Products Storage in Fixed Tanks

PCA #40 – Pesticides (including Herbicides, Fungicides and Anti-Fouling Agents) Manufacturing, Processing, Bulk Storage, and Large-Scale Applications

PCA #52 – Storage, Maintenance, fuelling, and Repair of Equipment, Vehicles, and Materials used to Maintain Transportation Systems

PCA #55: Transformer Manufacturing, Processing, and Use

### Interior Observations

Item	Observations
Building Observations	<p>Building A: Vinyl and ceramic floor tiles, suspended ceiling tiles, drywall, concrete flooring, metal deck walls and ceiling, fluorescent lighting, plywood walls, vinyl baseboards.</p> <p>Building B: Concrete floors, wood and metal deck walls and ceilings, concrete block walls.</p> <p>Building C: Inaccessible.</p> <p>Building D: Metal deck walls and ceilings, concrete and gravel floors.</p> <p>Building E: Inaccessible</p> <p>Building F: Concrete block walls, concrete slab floor, wood ceiling, and shingled roofing</p> <p>Building G: Metal walls, concrete floor, and shingled roofing</p>
Existing and Former Heating and Cooling Systems	<p>Building A: Natural gas-fired exterior wall-mounted HVAC in the office area, and natural gas-fired radiant tube heater in the shop.</p> <p>Building B, C, D, F, G: None</p>

	Building E: A fuel oil forced-air furnace and an air conditioning unit.
<b>Interior Observations</b>	
<b>Item</b>	<b>Observations</b>
Description of Below-Ground Structures	A floor drain is located in Building A that drains into an oil water separator located west of the building, and Building E has a basement level that houses the heating equipment.
Exit and Entry Points	Building A: West and north walls of the building. Building B: North and south walls of the building. Building C: North and south walls of the building. Building D: North, east, and south walls of the building. Building E: East and west walls of the building. Building F: West wall of the building. Building G: West wall of the building.
Drains, Pits and Sumps	A storm water sump is located in Building C. A pit is present in the basement of Building E and was likely used for servicing of the historical truck scale on-Site.
Mechanical Equipment	None observed
Stained Materials	Minor staining was observed on the concrete floor beneath the used oil AST in Building A. The concrete floor appeared to be in good condition.
Noise, Odours, Vibrations	None observed
Storage Tanks and Bulk Containers	Building A: -Two 1,140 L steel bench ASTs for new motor oil were observed in the shop area (one visible ULC number: E81428823, manufactured in 2021, containing 5W-30 motor oil) -One 1,890 L steel waste oil AST for used motor oil was observed in the shop area. Minor staining was identified on the concrete floor. The concrete appeared to be in good condition. -Household sized containers of chemicals used for general purpose cleaning (i.e. window cleaners, kitchen cleaners, etc.) were noted within the office area. -Containers of various oils and lubricants stored in 20-L pails were stored within the shop area. -The Site owner indicated that Wakefield Oil supplies new oil to the Site on an as needed basis, and GFL Environmental picks up the waste oil on-Site on a quarterly basis.
Unidentified Substances	None observed
Hazardous Materials and Special Attention Items:	It is noted that a Designated Substances Survey (DSS) was not within the requested scope of work for this Phase One ESA Update. In this regard, the following is provided for information purposes only and does not constitute a DSS.
(i) Polychlorinated Biphenyls	Polychlorinated Biphenyls (PCBs) were widely used for cooling and lubricating electrical equipment from the



	<p>1930s to the 1970s. The use of PCBs was prohibited in the late 1970s.</p> <p>Given the age of the buildings on Site (circa 1975) there is the potential for PCB containing building materials including light ballasts and PCBs in the former transformer substation located at the northwest portion of the Site.</p>
(ii) Asbestos Containing Materials	<p>Asbestos is a generic term referring to a group of naturally occurring fibrous mineral silicates. Asbestos was used in many products due to its strength and resistance characteristics. Common uses include boiler and pipe insulation, spray-on fireproofing, floor and ceiling tiles, asbestos-cement products, etc. Legislation banned the use of asbestos-containing materials (ACMs) in the mid to late 1980s.</p> <p>Given the age of the buildings on Site (circa 1975) there is the potential for ACMs including vinyl floor tiles and baseboards, suspended ceiling tiles, and plaster ceilings.</p>
(iii) Lead	<p>Lead is a heavy metal typically found in pipes, batteries, lead solder, cabling, insecticides, paints, glass and as an additive to gasoline. In 1976, the federal government limited the amount of lead for interior paints to 0.5% by weight or 5,000 ppm. The Surface Coating Materials Regulation (SOR/2005-109) dated April 19, 2005, as amended, pursuant to the 2005 Hazardous Products Act, revised the standard to limit the amount of lead in certain paints to 0.06% (600 ppm). In October 2010, this was revised to 0.009 % (90 ppm).</p> <p>Given the age of the buildings on Site (circa 1975) there is the potential for lead based paints to be present within the buildings.</p>
(iv) Mercury	<p>Mercury is typically found in a variety of building materials including paints, thermostats and mercury-vapour lamps.</p> <p>Mercury containing building materials within the buildings may include paints and thermostats.</p>
v) Ozone Depleting Substances	<p>Ozone-Depleting Substances (ODSs) include any substances containing chlorofluorocarbon ("CFCs"), hydro chlorofluorocarbon ("HCFCs"), halon or any other material capable of destroying ozone in the atmosphere. Federal regulations eliminated the production and import of CFCs by January 1, 1996 and put a freeze on the production and import of HCFC-22 by January 1, 1996. The regulation also requires the complete replacement of HCFC-22 equipment by the year 2020.</p> <p>No ODS containing equipment was identified on Site.</p>
(vi) Urea Formaldehyde Foam Insulation	<p>Urea Formaldehyde Insulation (UFFI) was used as an insulation material for existing buildings (commonly houses) from the mid-1970s until its ban in Canada in 1980.</p> <p>No UFFI insulation was identified on Site.</p>

Site Limitations	G2S was unable to enter Buildings C and E during the Site visit.
<b>Exterior Observations</b>	
<b>Item</b>	<b>Observations</b>
Structure Exteriors	Building A: Metal deck walls and roofing. Building B: Metal deck walls and roofing. Building C: Plywood walls and metal deck roofing. Building D: Metal deck walls and roofing. Building E: Metal deck and concrete block walls and shingled roofing. Building F: Concrete block walls and wood and shingled roofing. Building G: Metal deck walls and shingled roofing.
Hazardous Materials	None observed
Storage Tanks and Containers	Building C: Three empty fertilizer mixer totes were situated above the ground, north of Building C. The tanks have reportedly been empty since approximately 2008. Building E: One 265 L steel heating oil AST was observed south adjacent to the building. The tank appeared to be in good condition and was situated above the ground on stilts and concrete patio stones. Cardlock Fuel Station (northeast corner of the Site): -Two USTs were identified in the area of the cardlock fuel station, with two fuel pumps connected to the USTs located north of the tank nest. -Three vent/fill pipes were present east of the tanks, and six pipes were present south of the tanks. Fuel is supplied by Canada Clean Fuels or Frew Energy on an as needed basis. The Site owner indicated that the tanks were first installed on-Site in November 1998. -A waste oil separator is located west of Building A.
Unidentified Substances	None observed
Wells	Seven monitoring wells, installed during the 2013 Phase Two ESA completed by others, were located throughout the property during the Site visit.
Potable Water Supply	Municipal (water supply wells).
Underground Utility and Service Corridors	Underground utilities located on-Site may include gas, hydro, sanitary, sewer, storm sewer, and water. Based on the shallow depth of the utility lines present on-Site and the expected depth of groundwater in the area, utilities are unlikely to affect contaminant distribution and transport.
Sewage Disposal	Municipal sewer
Pits and Lagoons	None observed
Stained Materials	None observed
Stressed Vegetation	None observed
Ground Surface	Gravel and landscaped areas cover the entire Site.

Fill and Debris Materials	Unknown quality fill material is suspected across the Site due to the construction of the silos (which are at a lower elevation) and for general grading purposes. The Site Representative indicated that there is fill present on-Site in the area of a former grain loader at the northwest portion of the Site; however, the source was unknown. A pile of granular material (gravel) is present at the central portion of the Site and is hauled off-Site by Synergy for use in installation of internet infrastructure. A grass-covered berm of unknown soil quality is located north of Building A.
Watercourses, Ditches and/or Standing Water	None observed on-Site.
Roads, Parking Facilities and Rights of Way	Access to the Site is via West Church Street and Nichol Street West.
Noises, Odours, Vibrations	None observed
Waste Disposal	Norfolk Disposal Services Limited services the Site for general waste and recycling. A waste bin is located north of Building A.
Storage	General storage of construction equipment was noted at the north portion of the Site, south of the silos. General household storage of equipment and supplies is located within Building D.
<b>Adjacent Land Uses</b>	
North	Nichol Street West followed by the Royal Canadian Legion (223 Nichol Street West) and a woodlot.
South	West Church Street followed by D & R Towing (260 West Church Street), and Alpha-Vico Inc. (272 West Church Street). Residential homes are located in the southeast portion of the Study Area.
East	McCool Street followed by Waterford Mini Storage (216 Nichol Street West) and residential homes.
West	L.E. & N Walking Trail followed by a woodlot.
Current or Former Railway Lines or Spurs	A former railway line that now operates as a walking trail was observed west adjacent to the Site, running north to south.

### 5.2.1 Enhanced Investigation Property

An enhanced investigation of the Site is necessary when the property is being used for one of the following uses as described in clause 32 (1) (b) of Ontario Regulation 153/04 of the EPA. Clause 32 (1) (b) identifies properties that are being used in whole or in part for:

- i. For industrial use
- ii. As a garage
- iii. As a bulk liquid dispensing facility including gasoline service station
- iv. For the operation of dry cleaning equipment.

Due to the current and historical use of the Site as a garage and as a bulk liquid dispensing facility, an enhanced investigation of the property was completed.

(i) *Operations of the Property*

The Site was historically occupied by Norfolk Co-operative Company Limited, an agricultural supply depot, from approximately 1975 until 2008. One of the buildings on-Site (Building A) currently and has historically been used as a garage/servicing and maintenance shop. Prior to Site development of the current Site buildings in 1975, the Site was vacant agricultural land. The property was vacant from approximately 2008 until 2019. According to the Site representative, the current tenant, Voyago, has used Site Building A as a bus servicing shop since approximately 2019. A cardlock fuel station is located at the northeast corner of the Site and has been present since approximately 1998. The Site is currently developed with seven buildings, a cardlock station, and 32 grain silos.

Records from the Technical Standards & Safety Authority (TSSA) confirm Site use as a private fuel outlet with the presence of two active underground fuel tanks. Additional records have been requested from TSSA regarding the details of the USTs; however, a response has not been received at this time.

(ii) *Products Manufactured*

No products are currently being manufactured on-Site. Historically, the Site was used for grain production and storage, along with fertilizer and pesticide storage, mixing and distribution.

(iii) *By-Products and Wastes*

The Site is currently and has historically been registered on the Hazardous Waste Information Network (HWIN). The following records were identified:

Address Direction and Distance from Site	Generator Name	Registered Wastes
257 West Church Street (Site)	Growmark Inc. ON1173008 2009	212 – Aliphatic solvents and residues
	Norfolk Co-operative Company Limited ON1173008 1995-2006	213 – Petroleum distillates 221 – Light fuels 242 – Halogenated pesticides and herbicides
	Langs Bus Lines Limited ON6700682 2018	251 – Oil skimmings & sludges 252 – Waste oils & lubricants 263 – Miscellaneous waste organic chemical
	947465 Ontario Ltd. (Voyago) ON5893115 current	



According to a previous Phase One ESA report completed for the Site, six 187 kg containers of waste oils and lubricants, four 800 kg containers of light fuels, and 410 kg of halogenated pesticides were generated on-Site between 1999 and 2004.

*(iv) Raw Materials Handling and Storage Locations*

- Building B (southwest corner of Site): Historically contained dry chemical storage piles including fertilizer, potash, ammonium nitrate pills, monoammonium phosphate, calcium sulphate, K-mag, pelletized limestone, ammonia sulfate, and urea. The remainder of the building was used for the storage of equipment (1975-2008). The building has been vacant since 2008 with no raw materials currently present on-Site.
- Building C: Historically used for “day” chemical storage, including chemicals stored on shelves within the building (chemicals stored are unknown but are likely related to fertilizer and pesticide use). A dispenser rack with three totes (likely once containing chemicals) was identified north of the building (1975-2008). The building was not accessible by G2S at the time of the Site visit; however, the Site representative indicated that no raw materials are currently stored within the building.
- Building D: Used for bulk chemical storage from 1975-2008 (chemicals stored are unknown but are likely related to fertilizer and pesticide use). No current raw materials are being stored within the building.
- Silos: Historically the silos on-Site stored and dispensed various types of grain product (1975-2008). No raw materials are currently stored within the silos.

*(v) Drums, Totes, and Bins*

Building A: Two 1,140 L steel bench ASTs for new motor oil were observed in the shop area (one visible ULC number: E81428823, manufactured in 2021, containing 5W-30 motor oil). One 1,890 L steel waste oil AST for used motor oil was observed in the shop area. Minor staining was identified on the concrete floor. The concrete appeared to be in good condition. Household sized containers of chemicals used for general purpose cleaning (i.e. window cleaners, kitchen cleaners, etc.) were noted within the office area. Containers of various oils and lubricants stored in 20-L pails were stored within the shop area.

Building C: Three empty fertilizer mixer totes were situated above the ground, north of Building C. The totes have been empty since approximately 2008.

Building E: One 265 L steel heating oil AST was observed south adjacent to the building. The tank appeared to be in good condition and was situated above the ground on stilts and concrete patio stones.

Cardlock Fuel Station (northeast corner of the Site): Two USTs were identified in the area of the cardlock fuel station, with two fuel pumps connected to the USTs located north of the tank nest. Three vent/fill pipes were present east of the tanks, and six were present south of the tanks.

*(vi) Oil Water Separators*

An oil water separator is located west of Building A and was installed in 2015. A drain within the servicing area in Building A drains to the oil water separator which is serviced and emptied regularly as needed.

(vii) *Vehicle and Equipment Maintenance Areas*

A school bus servicing shop is located at the north portion of Building A. Vehicles are serviced for routine maintenance including mechanical work, minor body work, and oil changes.

(viii) *Spills*

A minor area of staining was noted beneath the waste oil AST within the shop area of Building A. The concrete floor appeared to be in good condition with no cracks.

(ix) *Liquid Discharge Points*

No liquid discharging points were observed on-Site.

(x) *Processing and Manufacturing Equipment used in Property Operations*

No processing or manufacturing equipment are used in current Site operations.

(xi) *Hydraulic Lift Equipment*

No hydraulic lift equipment was observed on-Site.

### **5.3 Written Description of Investigation**

The investigation carried out by G2S included inspection and examination of the Site as well as a visual inspection of the Study Area from areas accessible to the public. The investigation included documenting Site and Study Area conditions through notes and photographs. The information compiled was reviewed and evaluated for APECs, as presented in this report.

## 6. REVIEW AND EVALUATION OF INFORMATION

### 6.1 Current and Past Uses

Based on the information gathered from the Site visit, records review and interviews, the following is a summary of the current and past uses of the Site:

**Table 9: Summary of Current and Past Site Uses**

Year	Name of Owner	Description of Property Use	Property Use	Other Observations
2019-current	2369929 Ontario Limited	Voyago, Synergy Underground Utilities, Cardlock Fuel Station	Commercial use	Land registry document indicates the name of owner; Site owner indicated the most recent tenants on Site.
2013-2019		Vacant	Commercial use	Aerial photographs indicate buildings and silos on-Site
2009-2013	RSM Richter Inc. and Duff & Phelps Canada Restructuring Inc.	Vacant	Commercial use	Land registry document indicates the name of owner, and aerial photographs from 2003, 2006, 2010, and 2018 indicate buildings and silos on-Site
2003-2009	Growmark, Inc.	Site was vacant from 2008-2009.	Commercial use	Land registry document indicates the name of owners, previous Phase One ESA completed by others indicates first developed use of the Site, Site representative and HWIN records identified Site occupants.
1975-2003	Norfolk Co-Operative Company Limited	A cardlock fuel station was present on-Site from 1998-2008. Growmark, Inc. occupied the Site from 1999-2008. Norfolk Co-Operative Company Limited occupied the Site from 1975-2004.		
1965-1975		Vacant		
Pre 1965	Unknown	Vacant	Agricultural use	Aerial photographs from 1954/1955 show no buildings on-Site and use as agricultural land.

## 6.2 Potentially Contaminating Activities

The following Potentially Contaminating Activities (PCAs) were identified for the Site and/or Study Area. Refer to Drawing 7 in Appendix A.

**Table 10: Potentially Contaminating Activities**

Address Direction and Distance from Site	Potentially Contaminating Activity Refer to Table 2, Schedule D O.Reg. 153/04	Description	Date(s)	Contaminants of Potential Concern	Results in an APEC (yes/no)
257 West Church Street (Site)	<b>PCA #30</b> – Importation of Fill Material of Unknown Quality	Potential for unknown quality fill materials to be present on-Site during the construction of silos (which are at a lower elevation) and for general grading purposes. The Site Representative indicated that there is fill present on-Site in a former grain loader area at the northwest portion of the Site; however, the source was unknown. A pile of granular material is present at the central portion of the Site and a grass-covered berm of unknown soil quality is located north of Building A.	2019- current	PHCs, BTEX, VOCs, PAHs, Metals & ORPs	Yes – APEC 1
	<b>PCA #22</b> – Fertilizer Manufacturing, Processing, and Bulk Storage	Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D. Chemicals including fertilizer, potash, ammonium nitrate pills, monoammonium phosphate, calcium sulphate, K-mag, pelletized limestone, ammonia sulfate, and urea were historically present on Site.	1975- 2008	OCPs, metals & ORPs	Yes – APEC 2
	<b>PCA #40</b> – Pesticides (including Herbicides, Fungicides and Anti- Fouling Agents) Manufacturing, Processing, Bulk Storage, and Large-Scale Applications				



Address Direction and Distance from Site	Potentially Contaminating Activity Refer to Table 2, Schedule D O.Reg. 153/04	Description	Date(s)	Contaminants of Potential Concern	Results in an APEC (yes/no)
	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	Current and historical presence of gasoline and diesel USTs and fuel pumps at a cardlock fuel station located at the northeast portion of the Site. Historical presence of one motor oil AST, one furnace oil AST, one dyed diesel AST, and one waste oil AST on Site.	1975-current	PHCs, BTEX, VOCs, metals	Yes – APECs 3, 4, 5, 6, and 7
		Current presence of two new motor oil ASTs and one waste oil AST within Building A.	2019-Current		Yes – APECs 9, 10, and 11
	<b>PCA #52</b> – Storage, Maintenance, fuelling, and Repair of Equipment, Vehicles, and Materials used to Maintain Transportation Systems	Current and historical use of Building A on-Site as a servicing garage for vehicles and school buses including minor body work, maintenance, and oil changes. Current presence of an oil water separator west of Building A.	1975-current	PHCs, BTEX, VOCs, metals	Yes – APEC 8
	<b>PCA #55:</b> Transformer Manufacturing, Processing, and Use	Historical presence of a hydro substation at the central portion of the Site.	1975-2013	PCBs	Yes – APEC 12
No Address (West adjacent)	<b>PCA #46</b> – Railyards, Tracks, and Spurs	Former CN rail line is located west adjacent to the Site, traversing north to south.	1935-1980s	PHCs, BTEX, PAHs	No – trans-gradient with respect to potential groundwater flow direction, migration of COPCs offsite is unlikely.

Notes: PHCs - Petroleum Hydrocarbon      VOCs - Volatile Organic Compounds      UST – Underground Storage Tank  
PAHs – Polycyclic Aromatic Hydrocarbons      APEC – Area of Potential Environmental Concern      AST – Aboveground Storage Tank  
PCBs – Polychlorinated Biphenyls      BTEX – Benzene, Toluene, Ethylbenzene, Xylenes      OCPs – Organochlorine Pesticides  
ORPs – Other Regulated Parameters (CN-, As, Se, Sb, CrVI, Hg, pH)

### 6.3 Areas of Potential Environmental Concern

Based on review and evaluation of the PCAs, the following APECs were identified on- Site. Refer to Drawing 8 in Appendix A.

**Table 11: Areas of Potential Environmental Concern**

APEC No.	Description of APEC/ Rationale	Location of APEC on Phase One Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, soil and/or sediment)
1	Presence of fill material of unknown quality in the area of the silos, the former grain loaders, north of Building A in the area of a berm, in the area of a granular pile in the central area of the Site, and across the entire Site.	Entire Site	<b>PCA #30</b> – Importation of Fill Material of Unknown Quality	On-Site	PHCs, BTEX, VOCs, PAHs, metals & ORPs	Soil
2	Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D.	Southwest portion of the Site	<b>PCA #22</b> – Fertilizer Manufacturing, Processing, and Bulk Storage <b>PCA #40</b> – Pesticides (including Herbicides, Fungicides and Anti-Fouling Agents) Manufacturing, Processing, Bulk Storage, and Large-Scale Applications	On-Site	OCPs, metals & ORPs	Soil/ Groundwater
3	Historical presence of one motor oil AST at the northwest area of the Site.	Various areas throughout the Site	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	On-Site	PHCs, BTEX	Soil
4	Current and historical presence of one furnace oil AST, south adjacent to Building E.					

APEC No.	Description of APEC/ Rationale	Location of APEC on Phase One Property	Potentially Contaminating Activity	Location of PCA (on-site or off-site)	Contaminants of Potential Concern	Media Potentially Impacted (Groundwater, soil and/or sediment)
5	Historical presence of one dyed diesel AST at the southwest corner of the Site.	As above	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	On-Site	PHCs, BTEX	Soil
6	Historical presence of one waste oil AST north of Building A.					
7	Current and historical presence of a cardlock fuel station with gasoline and diesel USTs and fuel pumps, located at the northeast corner of the Site.	Northeast area of Site	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	On-Site	PHCs, BTEX, VOCs, metals	Soil/ Groundwater
8	Current and historical use of Building A on Site as a service and maintenance garage for vehicles and school buses, with the presence of an oil water separator.	Southeast area of Site	<b>PCA #52</b> – Storage, Maintenance, fuelling, and Repair of Equipment, Vehicles, and Materials used to Maintain Transportation Systems	On-Site	PHCs, BTEX, VOCs, metals	Soil/ Groundwater
9	Current presence of new motor oil AST on the west wall of the shop within Building A.	Within Building A on-Site	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	On-Site	PHCs, BTEX, VOCs, metals	Soil
10	Current presence of new motor oil AST in the southeast corner of the shop within Building A.					
11	Current presence waste oil AST in the northeast corner of the shop within Building A					
12	Historical presence of a hydro substation at the north-central portion of the Site.	North-central area of Site	<b>PCA #55:</b> Transformer Manufacturing, Processing, and Use	On-Site	PCBs	Soil

Notes: PHCs - Petroleum Hydrocarbons  
UST - Underground Storage Tank  
PCBs – Polychlorinated Biphenyls  
ORPs – Other Regulated Parameters (CN-, As, Se, Sb, CrVI, Hg, pH)

PAHs - Polycyclic Aromatic Hydrocarbons  
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes  
OCPs – Organochlorine Pesticides

VOCs - Volatile Organic Compounds  
AST – Aboveground Storage Tank

## **7. PHASE ONE CONCEPTUAL SITE MODEL**

### **Site Description**

The irregular shaped Site is located on the northwest corner of the intersection of McCool Street and West Church Street, approximately 190 m west of Lotus Avenue, and covers an approximate plan area of 3.5 ha (8.6 ac.). The Study Area consists of residential and commercial land use. The Waterford Ponds are located approximately 160 m north.

Based on information collected from the Site visit and records review, the Site was historically occupied by Norfolk Co-operative Company Limited, an agricultural depot, from approximately 1975 until 2008. Prior to the development of the current Site buildings in 1975, the Site was vacant agricultural land. The Site was vacant from approximately 2008 until 2019, when current tenants Voyago and Synergy Underground Utilities, took occupancy. The Site is currently developed with seven buildings, a fuel cardlock station, and 32 grain silos.

### **Water Bodies/Areas of Natural Significance**

The Waterford Ponds are located approximately 160 m north. Provincially significant wetlands are located approximately 160 m north and 170 m northwest of the Site along the Waterford Ponds. Significant woodlands are located west adjacent to the Site and approximately 10 m north of the Site extending further west and north through the Study Area.

### **Drinking Water Wells**

No drinking water well records are located on-Site or within the Study Area. Potable water is supplied to the Site by the municipal drinking water system which uses groundwater water wells for its' water supply.

A municipal drinking water supply well and wellhead protection area A (WHPA-A) is located approximately 710 m southwest, and WHPA-D is located approximately 50 m southwest of the Site. The Site is not located within a WHPA; however, the Study Area is. Potable water is supplied to the Site via the municipal system, which sources its water from drinking water wells.

### **Geological and Hydrogeological Setting**

The Site is located approximately 242 m to 246 m above sea level. Topographic maps show surface elevation to be decreasing in a north/northwesterly direction, towards the Waterford Ponds. Based on our observations and review, the expected direction of groundwater flow in the immediate area of the Site is north/northwest following surface topography towards the Waterford Ponds, located approximately 160 m north of the Site.

Based on a review of soil and geological mapping for the area, the Site consists of dominantly gravelly sands of fluvial or till derivation, or 40 to 100 cm of sandy sediments over gravelly sands. The Site is underlain by cherty limestone of the Middle Devonian Bois Blanc Formation.

### **Underground Utilities**

Underground utilities located on-Site may include gas, hydro, sanitary and storm sewer, and water. Based on the shallow depth of the utility lines present on-Site and the expected depth of



groundwater in the area (approximately 12 to 14 m below ground surface), utilities are unlikely to affect contaminant distribution and transport.

### Surrounding Properties

The Phase One ESA Update Study Area is developed primarily for residential and commercial land use (as shown on Drawing 2 in Appendix A). North adjacent to the Site consists of Nichol Street West, followed by a woodlot and The Royal Canadian Legion. South adjacent to the Site is West Church Street, followed by D & R Towing (260 West Church Street), and Alpha-Vico Inc. (272 West Church Street). Residential homes are located in the southeast portion of the Study Area. East adjacent to the Site is McCool Street followed by Waterford Mini Storage (216 Nichol Street West) and residential homes. West adjacent to the Site is L.E. & N Walking Trail (former CN rail line) followed by a woodlot.

### Potentially Contaminating Activities (PCAs)

Historical review of the surrounding properties within a 250 m radius of the Site identified six on-Site PCAs and one off-Site PCA, as defined in the amended O. Reg. 153/04. Contaminants of potential concern include PHCs including BTEX, VOCs, PAHs, PCBs, OCPs, and metals and inorganics. PCAs identified during the Phase One ESA Update are summarized in the following table.

Address Direction and Distance from Site	Potentially Contaminating Activity Refer to Table 2, Schedule D O.Reg. 153/04	Description	Date(s)	Contaminants of Potential Concern	Results in an APEC (yes/no)
257 West Church Street (Site)	<b>PCA #30</b> – Importation of Fill Material of Unknown Quality	Potential for unknown quality fill materials to be present on-Site during the construction of silos (which are at a lower elevation) and for general grading purposes. The Site Representative indicated that there is fill present on-Site in a former grain loader area at the northwest portion of the Site; however, the source was unknown. A pile of granular material is present at the central portion of the Site and a grass-covered berm of unknown soil quality is located north of Building A.	2019-current	PHCs, BTEX, VOCs, PAHs, Metals & ORPs	Yes – APEC 1
	<b>PCA #22</b> – Fertilizer Manufacturing, Processing, and Bulk Storage		1975-2008	OCPs, metals & ORPs	Yes – APEC 2

Address Direction and Distance from Site	Potentially Contaminating Activity Refer to Table 2, Schedule D O.Reg. 153/04	Description	Date(s)	Contaminants of Potential Concern	Results in an APEC (yes/no)
	<b>PCA #40</b> – Pesticides (including Herbicides, Fungicides and Anti-Fouling Agents) Manufacturing, Processing, Bulk Storage, and Large-Scale Applications	Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D. Chemicals including fertilizer, potash, ammonium nitrate pills, monoammonium phosphate, calcium sulphate, K-mag, pelletized limestone, ammonia sulfate, and urea were historically present on Site.			
	<b>PCA #28</b> – Gasoline and Associated Products Storage in Fixed Tanks	Current and historical presence of gasoline and diesel USTs and fuel pumps at a cardlock fuel station located at the northeast portion of the Site. Historical presence of one motor oil AST, one furnace oil AST, one dyed diesel AST, and one waste oil AST on Site.	1975-current 2019-Current	PHCs, BTEX, VOCs, metals	Yes – APECs 3, 4, 5 6, and 7
		Current presence of two new motor oil ASTs and one waste oil AST within Building A.			Yes – APECs 9, 10, and 11
	<b>PCA #52</b> – Storage, Maintenance, fuelling, and Repair of Equipment, Vehicles, and Materials used to Maintain Transportation Systems	Current and historical use of Building A on-Site as a servicing garage for vehicles and school buses including minor body work, maintenance, and oil changes. Current presence of an oil water separator west of Building A.	1975-current	PHCs, BTEX, VOCs, metals	Yes – APEC 8

Address Direction and Distance from Site	Potentially Contaminating Activity Refer to Table 2, Schedule D O.Reg. 153/04	Description	Date(s)	Contaminants of Potential Concern	Results in an APEC (yes/no)
	<b>PCA #55:</b> Transformer Manufacturing, Processing, and Use	Historical presence of a hydro substation at the central portion of the Site.	1975-2013	PCBs	Yes – APEC 12
No Address (West adjacent)	<b>PCA #46 –</b> Railyards, Tracks, and Spurs	Former CN rail line is located west adjacent to the Site, traversing north to south.	1935-1980s	PHCs, BTEX, PAHs	No – trans-gradient with respect to potential groundwater flow direction, migration of COPCs offsite is unlikely.

Notes: PHCs - Petroleum Hydrocarbon  
PAHs – Polycyclic Aromatic Hydrocarbons  
APEC – Area of Potential Environmental Concern  
AST – Aboveground Storage Tank  
OC Pesticides – Organochlorine Pesticides  
VOCs - Volatile Organic Compounds  
BTEX – Benzene, Toluene, Ethylbenzene, Xylenes  
UST – Underground Storage Tank  
PCBs – Polychlorinated Biphenyls  
COPCs – Contaminants of Potential Concern

### Areas of Potential Environmental Concern (APECs)

The PCAs were assessed based on observations of the operations, their location relative to the Site with respect to the inferred groundwater flow direction, their tenure, expected chemical storage amounts, etc. Based on review and evaluation of the information gathered, the following APECs have been identified on-Site:

- APEC 1: Presence of fill material of unknown quality in the area of the silos and former grain loaders in the northwest portion of the Site, north of Building A in the area of a berm, in the area of a granular pile in the central area of the Site, and across the entire Site.
- APEC 2: Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D.
- APEC 3: Historical presence of one motor oil above ground storage tank (AST) on the northwest area of the Site.
- APEC 4: Current and historical presence of one furnace oil AST on-Site, south adjacent to Building E.
- APEC 5: Historical presence of one dyed diesel AST at the southwest corner of the Site.

- APEC 6: Historical presence of one waste oil AST on-Site, north of Building A.
- APEC 7: Current and historical presence of a cardlock fuel station with gasoline and diesel underground storage tanks (USTs) and fuel pumps, located at the northeast corner of the Site.
- APEC 8: Current and historical use of Building A on-Site as a service and maintenance garage for vehicles and school buses, with the presence of an oil water separator.
- APEC 9: Current presence of new motor oil AST on the west wall of the shop within Building A.
- APEC 10: Current presence of new motor oil AST in the southeast corner of the shop within Building A.
- APEC 11: Current presence waste oil AST in the northeast corner of the shop within Building A.
- APEC 12: Historical presence of a hydro substation at the north-central portion of the Site.

The Phase One ESA Update identified APECs related to on-Site PCAs. In this regard, a Phase Two ESA is recommended to address the APECs and facilitate RSC filing.



## 8. CONCLUSIONS AND RECOMMENDATIONS

This Phase One ESA Update was conducted to:

- i) develop a preliminary determination of the likelihood that one or more contaminants have affected any land or water on, in or under the Phase One ESA Update property;
- ii) determine the need for a Phase Two ESA; and
- iii) provide a basis for carrying out any Phase Two ESA required.

The assessment was performed in accordance with the Phase One ESA protocols outlined in O. Reg. 153/04, as amended, which came into force on July 1, 2011, and meets the requirements of Schedule D of the Regulation.

Based on information collected from the Site visit and records review, the Site was historically occupied by Norfolk Co-operative Company Limited, an agricultural depot, from approximately 1975 until 2008. Prior to the development of the current Site buildings in 1975, the Site was vacant agricultural land. The Site was vacant from approximately 2008 until 2019, when current tenants Voyago and Synergy Underground Utilities, took occupancy. The Site is currently developed with seven buildings, a fuel cardlock station, and 32 grain silos.

The Phase One ESA Update identified six on-Site PCAs and one off-Site PCA which were assessed based on observations of the operations, their location relative to the Site with respect to the inferred groundwater flow direction, their tenure, and expected chemical storage amounts. Based on review and evaluation of the information gathered, the following APECs have been identified on-Site:

- APEC 1: Presence of fill material of unknown quality in the area of the silos and grain loaders in the northwest portion of the Site, north of Building A in the area of a berm, and across the entire Site.
- APEC 2: Historical use of the Site by Norfolk Co-Operative Company Limited and Growmark Inc. as a fertilizer, pesticide, and grain depot with the historical presence of bulk raw fertilizer and pesticide materials located in Buildings B, C, and D.
- APEC 3: Historical presence of one motor oil above ground storage tank (AST) on the northwest area of the Site.
- APEC 4: Current and historical presence of one furnace oil AST on-Site, south adjacent to Building E.
- APEC 5: Historical presence of one dyed diesel AST at the southwest corner of the Site.
- APEC 6: Historical presence of one waste oil AST on-Site, north of Building A.
- APEC 7: Current and historical presence of a cardlock fuel station with gasoline and diesel underground storage tanks (USTs) and fuel pumps, located at the northeast corner of the Site.

APEC 8: Current and historical use of Building A on-Site as a service and maintenance garage for vehicles and school buses, with the presence of an oil water separator.

APEC 9: Historical presence of a hydro substation at the north-central portion of the Site.

Based on the Phase One ESA Update findings, a Phase Two ESA is recommended to investigate potential environmental impacts in soil and groundwater, resulting from the identified APECs.

### **8.1 Whether Phase Two Environmental Site Assessment Required Before Record of Site Condition Submitted**

It is the opinion of G2S that a Phase Two ESA is required before an RSC can be submitted for the Site.

### **8.2 Record of Site Condition Based on Phase One Environmental Site Assessment Alone**

It is the opinion of G2S that an RSC cannot be submitted for the Site based on a Phase One ESA Update alone; a Phase Two ESA is required before an RSC can be submitted for the Site.

## **9. QUALIFICATIONS OF THE ASSESSOR**

This Phase One ESA Update was conducted by Ms. Dana Haslett, B.A. Ms. Haslett has been trained to conduct Phase One and Two ESAs in accordance with the CSA and O. Reg. 153/04, as amended. She is a Senior Project Manager with over 9 years of professional experience specializing in environmental investigations and project management. Her main areas of expertise include Phase One and Phase Two ESAs, project management, site cleanup/remediation, UST and AST removals, and site remediation. She has completed numerous projects on behalf of private and public-sector clients for industrial, commercial, and residential sites.

This Phase One ESA Update was prepared under the supervision of, and the report was reviewed by Melissa King, a Professional Geoscientist registered with the Professional Geoscientists of Ontario. Ms. King is a Senior Geoscientist and Head of Environmental Services in G2S's Burlington branch office and is a Qualified Person (QP). She has over 23 years of interdisciplinary professional experience specializing in environmental and hydrogeologic investigations and project management. Her main areas of expertise include Phase One and Phase Two ESAs, site cleanup / remediation planning and supervision, site remediation, Risk Assessment, Records of Site Condition and hydrogeologic investigations. She has completed hundreds of projects for commercial, industrial, and residential clients for a wide variety of project types (industrial complexes, commercial developments, entertainment and institutional buildings, and residential development).

## 10. REFERENCES AND SUPPORTING DOCUMENTATION

- a) Canadian Standards Association, Z768-0, Re-affirmed 2016. Phase One Environmental Site Assessment.
- b) Occupational Health and Safety Act - Ministry of Labour (MOL).
- c) Inventory of Coal Gasification Plant Waste Sites in Ontario. Ontario Ministry of the Environment, April 1987.
- d) Waste Disposal Site Inventory. Waste Management Branch Ontario Ministry of the Environment, June 1991.
- e) Hazardous Waste Information Network (HWIN, 1986 – 2005), [www.hwin.ca](http://www.hwin.ca).
- f) Ministry of the Environment, Brownfields Environmental Site Registry, [www.ene.gov.on.ca/environet/BESR/index](http://www.ene.gov.on.ca/environet/BESR/index).
- g) National Pollutant Release Inventory, [www.ec.gc.ca](http://www.ec.gc.ca).
- h) Ontario's Environmental Registry, [www.ebr.gov.on.ca](http://www.ebr.gov.on.ca).
- i) Paleozoic Geology of Southern Ontario, Ontario Division of Mines, Map 2254. Scale 1:1,013,760. Published 1972.
- j) "Soil Survey Map of County of Welland, Province of Ontario," Scale ½ inch to 1 mile. Published by Hydrographic and Map Service. Labelle Building, Ottawa.
- k) Norfolk County Official Plan, Natural Heritage, Schedule C-1. Norfolk County Planning Department. October 2018.
- l) Norfolk County Official Plan, Land Use, Schedule B-18. Norfolk County Planning Department. January 2020.
- m) "2018 Aerial Photograph," viewed online through Google Earth Digital Globe, 2021.
- n) "Waterford, Ontario, Topographic Map", 40-I/16f, Surveys and Mapping Branch, Department of Energy, Mines, and Resources. Scale 1:50,000. Published 2019.
- o) "*Phase I Environmental Site Assessment, 257 West Church Street, Waterford, Ontario*," dated August 28, 2013, prepared by Pinchin Environmental Ltd. for 2369929 Ontario Limited.
- p) "*Phase II Environmental Site Assessment, 257 West Church Street, Waterford, Ontario*," dated September 19, 2013, prepared by Pinchin Environmental Ltd. for 2369929 Ontario Limited.



## 11. LIMITATIONS

This Phase One Environmental Site Assessment (ESA) Update has been prepared for the sole benefit of the Client (Verlinda Homes) and is intended to provide a Phase One ESA Update for the subject Site, 257 West Church Street in Waterford, Ontario. The Phase One ESA Update may not be relied upon by any other person or entity without the expressed written consent of the Client and G2S Consulting Inc. (G2S). Any use which a third party makes of this Phase One ESA Update, or any reliance on decisions made based on it, is the responsibility of such third parties. G2S accepts no responsibility for any loss, damage, expenses, or penalties suffered by any third parties that may arise or result from the use of any information or recommendations contained in this report.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The findings in this Phase One ESA Update are limited to the conditions at the Site at the time of this investigation and supplemented by a historical review and data obtained by G2S as described herein as well as information provided by the Site representative as reported herein. Conclusions presented in this Phase One ESA Update should not be construed as legal advice.

If Site conditions, regulations, codes, guidelines and applicable standards change or if any additional information becomes available at a future date, changes to the findings, conclusions and recommendations in this Phase One ESA Update may be necessary.

This assessment does not wholly eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with the subject property and must be viewed as a mechanism to reduce risk rather than eliminate the risk of contamination concerns.

*At the time of this report, the Covid-19 pandemic restrictions may have limited G2S's access to historical records for review purposes. Due to these limitations, G2S may be required to provide addendums to the report.*

## 12. SIGNATURES AND CLOSING REMARKS

We trust this Phase One ESA Update is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

**G2S Consulting Inc.**



Dana Haslett, B.A.  
Senior Project Manager



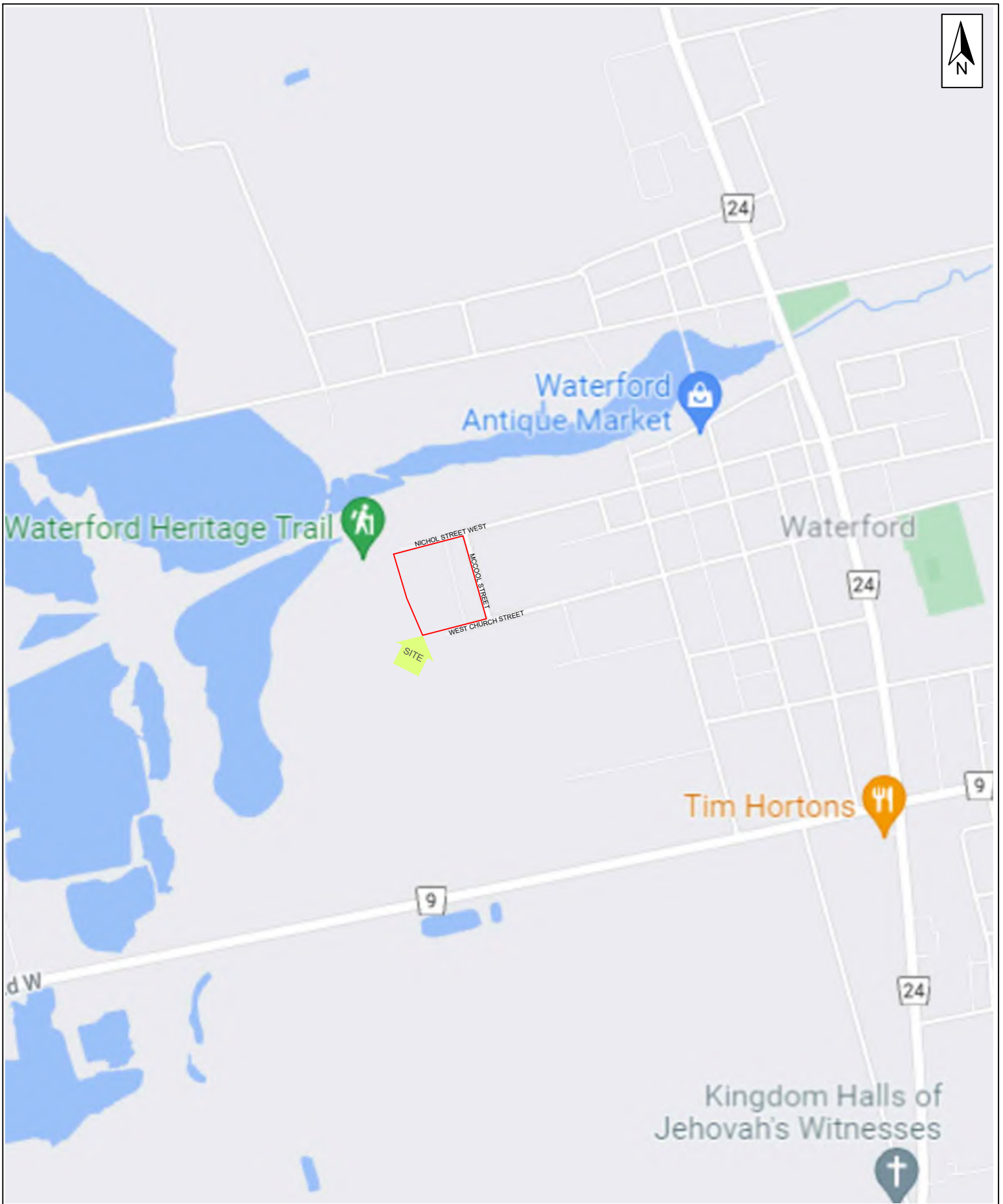
Melissa King, P.Geo., QP<sub>ESA</sub>  
Head of Environmental Services

### **13. APPENDICES**

The following are Appendices A to F which must be read in conjunction with this report.

## **Appendix A: Drawings**





Scale: N.T.S  
Project No.: G2S21354A  
Date: DECEMBER 2021  
Drawn by: DH/MK  
File name: 257CHURCH.dwg

SITE LOCATION  
257 WEST CHURCH STREET

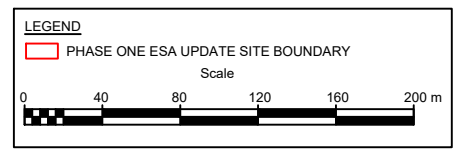
WATERFORD

ONTARIO



Drawing No.

1



2







Scale: N.T.S  
 Project No.: G2S21354A  
 Date: NOVEMBER 2021  
 Drawn by: CDB/MK  
 File name: 257CHURCH.dwg

2018 AERIAL PHOTOGRAPH  
 257 WEST CHURCH STREET

WATERFORD

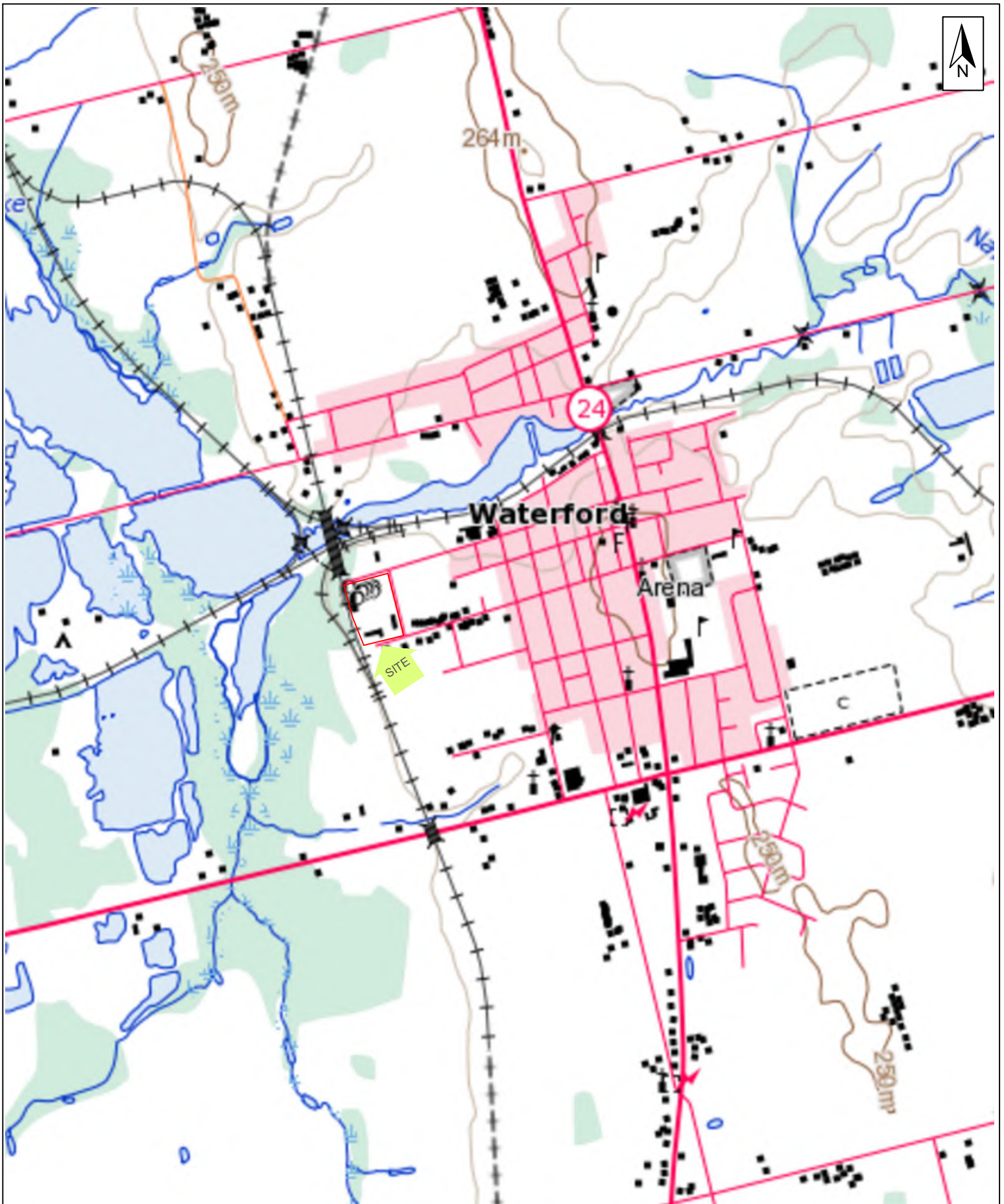
ONTARIO



Drawing No.

4





Scale: N.T.S  
 Project No.: G2S21354A  
 Date: DECEMBER 2021  
 Drawn by: DH/MK  
 File name: 257CHURCH.dwg

2019 TOPOGRAPHIC MAP  
 257 WEST CHURCH STREET  
 WATERFORD

ONTARIO



Drawing No.

5



Scale: N.T.S  
Project No.: G2S21354A  
Date: DECEMBER 2021  
Drawn by: DH/MK  
File name: 257CHURCH.dwg

ONTARIO BASE MAP  
257 WEST CHURCH STREET

WATERFORD

ONTARIO



Drawing No.

6



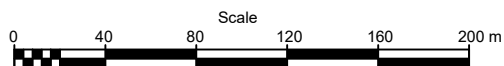


#### POTENTIALLY CONTAMINATING ACTIVITIES

- |  |  |
|--|--|
| #22 FERTILIZER MANUFACTURING, PROCESSING, AND BULK STORAGE   | #46 RAILYARDS, TRACKS, AND SPURS   |
| #28 GASOLINE AND ASSOCIATED PRODUCTS STORAGE IN FIXED  | #52 STORAGE, MAINTENANCE, FUELLING, AND REPAIR OF EQUIPMENT, VEHICLES, AND MATERIALS USED TO MAINTAIN TRANSPORTATION SYSTEMS |
| #30 IMPORTATION OF FILL MATERIAL OF UNKNOWN QUALITY  | #55 TRANSFORMER MANUFACTURING, PROCESSING, AND USE   |
| #40 PESTICIDES (INCLUDING HERBICIDES, FUNGICIDES AND ANTI-FOULING AGENTS) MANUFACTURING, PROCESSING, BULK STORAGE, AND LARGE SCALE APPLICATIONS. |  |

#### LEGEND

- PHASE ONE ESA UPDATE SITE BOUNDARY
- #10 POTENTIALLY CONTAMINATING ACTIVITY (AS DEFINED IN TABLE 2 OF O.REG.153/04)



Scale: AS SHOWN  
 Project No.: G2S21354A  
 Date: DECEMBER 2021  
 Drawn by: DH/MK  
 File name: 257CHURCH.dwg

#### POTENTIALLY CONTAMINATING ACTIVITIES 257 WEST CHURCH STREET

WATERFORD

ONTARIO



Drawing No.

7



#### AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

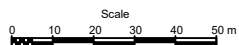
- APEC 1: PRESENCE OF FILL MATERIAL OF UNKNOWN QUALITY IN THE AREA OF THE FORMER GRAIN LOADERS AND ACROSS THE ENTIRE SITE.
- APEC 2: HISTORICAL USE OF THE SITE BY NORFOLK CO-OPERATIVE COMPANY LIMITED AND GROWMARK INC. AS A FERTILIZER, PESTICIDE, AND GRAIN DEPOT WITH THE HISTORICAL PRESENCE OF BULK RAW FERTILIZER AND PESTICIDE MATERIALS LOCATED IN BUILDINGS B, C, AND D.
- APEC 3: HISTORICAL PRESENCE OF ONE MOTOR OIL AST AT THE NORTHWEST AREA OF THE SITE.

#### LEGEND

- PHASE ONE ESA UPDATE SITE BOUNDARY
- MONITORING WELL INSTALLED BY OTHERS (2013)
- \*A\* BUILDING IDENTIFICATION LETTER
- UNDERGROUND STORAGE TANK (UST)
- ABOVE GROUND STORAGE TANK (AST)

- APEC 4: CURRENT AND HISTORICAL PRESENCE OF ONE FURNACE OIL AST, SOUTH ADJACENT TO BUILDING E ON-SITE.
- APEC 5: HISTORICAL PRESENCE OF ONE DYED DIESEL AST AT THE SOUTHWEST CORNER OF THE SITE.
- APEC 6: HISTORICAL PRESENCE OF ONE WASTE OIL AST NORTH OF BUILDING A ON-SITE.
- APEC 7: CURRENT AND HISTORICAL PRESENCE OF A CARDLOCK FUEL STATION WITH GASOLINE AND DIESEL USTS AND FUEL PUMPS, LOCATED AT THE NORTHEAST CORNER OF THE SITE.

- APEC 8: CURRENT AND HISTORICAL USE OF BUILDING A ON-SITE AS A SERVICE AND MAINTENANCE GARAGE FOR VEHICLES AND SCHOOL BUSES, WITH THE PRESENCE OF AN OIL WATER SEPARATOR.
- APEC 9: CURRENT PRESENCE OF NEW MOTOR OIL AST ON WEST WALL OF THE SHOP WITHIN BUILDING A.
- APEC 10: CURRENT PRESENCE OF NEW MOTOR OIL AST IN SOUTHEAST CORNER OF THE SHOP WITHIN BUILDING A.
- APEC 11: CURRENT PRESENCE OF WASTE OIL AST IN NORTHEAST CORNER OF THE SHOP WITHIN BUILDING A.
- APEC 12: HISTORICAL PRESENCE OF A HYDRO SUBSTATION AT THE NORTH-CENTRAL PORTION OF THE SITE.



Scale: AS SHOWN  
Project No.: G2S21354A  
Date: NOVEMBER 2021  
Drawn by: CDB/MK  
File name: 257CHURCH.dwg

#### AREAS OF POTENTIAL ENVIRONMENTAL CONCERN 257 WEST CHURCH STREET

WATERFORD

ONTARIO



Drawing No.

8



## **Appendix B: Site Ownership**

LAND  
REGISTRY  
OFFICE #37

50278-0177 (LT)

PAGE 1 OF 2  
PREPARED FOR G2S  
ON 2021/11/02 AT 13:14:39



\* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT \* SUBJECT TO RESERVATIONS IN CROWN GRANT \*

PROPERTY DESCRIPTION: PCL A PL 97B; PT LT 1 PL 97B; PT LT 5 CON 8 TOWNSEND PT 2 37R7769 & AS IN NR298004 (FIRSTLY, SECONDLY), LYING W OF PT 1 37R7769; S/T NR535805, NR542373; NORFOLK COUNTY

PROPERTY REMARKS:

ESTATE/QUALIFIER:

FEE SIMPLE  
LT CONVERSION QUALIFIED

RECENTLY:

FIRST CONVERSION FROM BOOK

PIN CREATION DATE:

2007/08/20

OWNERS' NAMES

2369929 ONTARIO LIMITED

CAPACITY SHARE

ROWN

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/CHKD
<div><div>** PRINTOUT INCLUDES ALL DOCUMENT TYPES AND DELETED INSTRUMENTS SINCE 2007/08/17 **</div><div>**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:</div><div>** SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES * AND ESCHEATS OR FORFEITURE TO THE CROWN.</div><div>** THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY CONVENTION.</div><div>** ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.</div><div>**DATE OF CONVERSION TO LAND TITLES: 2007/08/20 **</div><div>NR298004 1965/06/17 TRANSFER *** DELETED AGAINST THIS PROPERTY *** REMARKS: SKETCH ATTACHED.</div><div>NR305107 1966/11/02 TRANSFER *** COMPLETELY DELETED *** REMARKS: SKETCH ATTACHED.</div><div>NR307819 1967/05/04 TRANSFER *** COMPLETELY DELETED ***</div><div>NR467246 1990/01/11 CHARGE *** DELETED AGAINST THIS PROPERTY ***</div><div>37R7769 1998/06/16 PLAN REFERENCE</div><div>NR535805 1998/11/03 TRANSFER EASEMENT</div></div>						
					NORFOLK CO-OPERATIVE COMPANY LIMITED	
					NORFOLK CO-OPERATIVE COMPANY LIMITED	
					NORFOLK CO-OPERATIVE COMPANY LIMITED	
					BANK OF MONTREAL	
						C
					THE REGIONAL MUNICIPALITY OF HALDIMAND-NORFOLK	C

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.  
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

LAND  
REGISTRY  
OFFICE #37

50278-0177 (LT)

PAGE 2 OF 2  
PREPARED FOR G2S  
ON 2021/11/02 AT 13:14:39



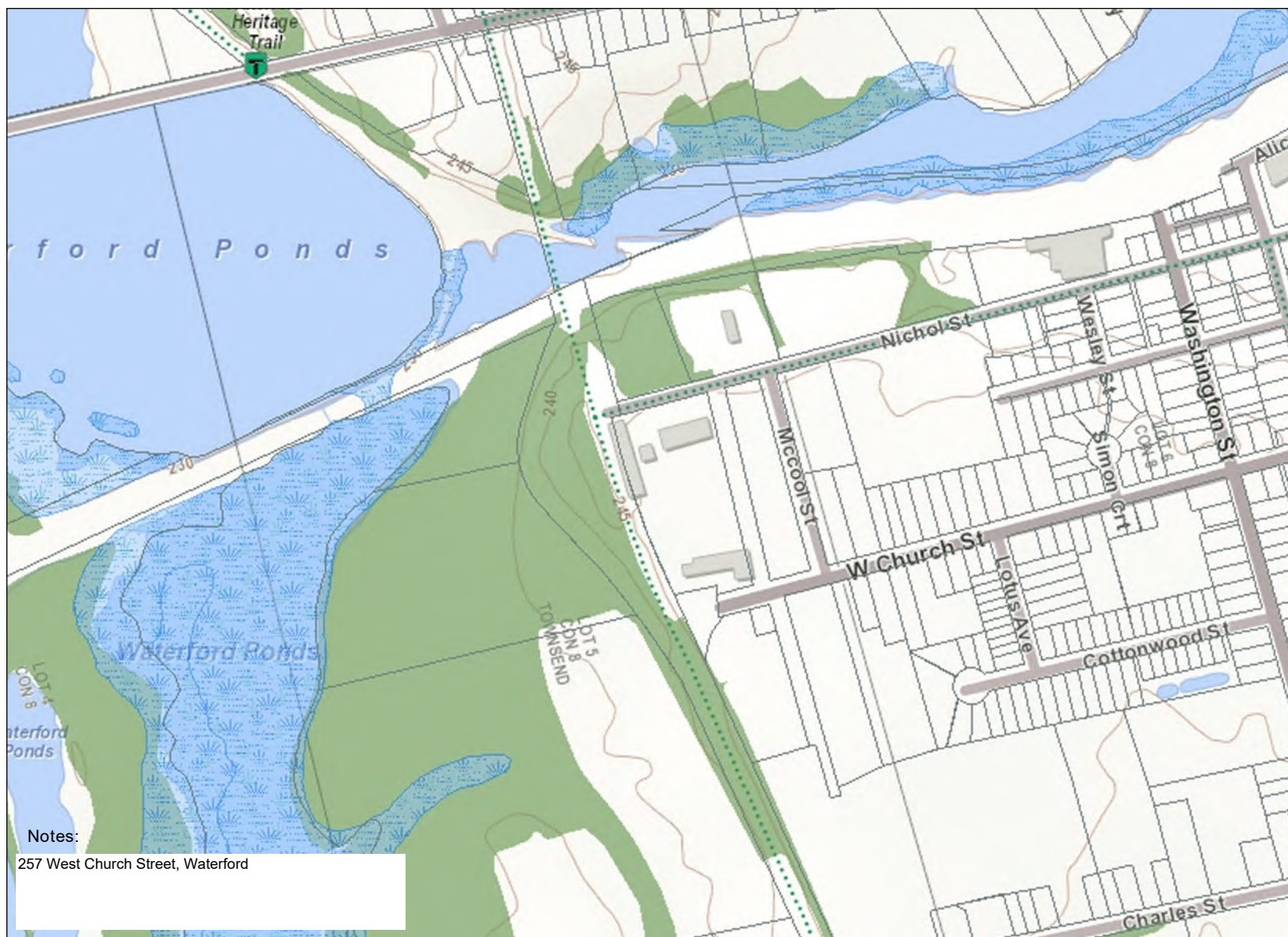
\* CERTIFIED IN ACCORDANCE WITH THE LAND TITLES ACT \* SUBJECT TO RESERVATIONS IN CROWN GRANT \*

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM	PARTIES TO	CERT/ CHKD
NR536943	1999/01/06	TRANSFER		*** COMPLETELY DELETED ***	NORFOLK CO-OPERATIVE COMPANY LIMITED	
NR542373	1999/09/30	TRANSFER EASEMENT			UNION GAS LIMITED	C
NR569171	2003/04/01	CHARGE		*** DELETED AGAINST THIS PROPERTY ***	GROWMARK, INC.	
		CORRECTIONS: 'CHARGE' CHANGED FROM 'GROWMARK INC.' TO 'GROWMARK, INC.' ON 2007/12/03 BY CHARLENE BUCHAN.				
NR589719	2005/05/13	TRANSFER OF CHARGE		*** DELETED AGAINST THIS PROPERTY ***	GROWMARK, INC.	
		REMARKS: NR467246 CORRECTIONS: 'PARTY' CHANGED FROM 'GROWMARK INC.' TO 'GROWMARK, INC.' ON 2007/12/03 BY CHARLENE BUCHAN.				
NK21196	2009/01/30	APL COURT ORDER		*** COMPLETELY DELETED *** ONTARIO SUPERIOR COURT OF JUSTICE	RSM RICHTER INC.	
		REMARKS: COURT APPOINTED RECEIVER OF ASSETS, UNDERTAKING & PROPERTIES				
37R10279	2011/03/07	PLAN REFERENCE				C
37R10322	2011/06/14	PLAN REFERENCE				C
NK48647	2011/12/15	APL AMEND ORDER		*** COMPLETELY DELETED *** ONTARIO SUPERIOR COURT OF JUSTICE	DUFF & PHELPS CANADA RESTRUCTURING INC.	
		REMARKS: AMEND BASED ON CV-11-9375-00CL				
NK65813	2013/10/18	APL VESTING ORDER	\$125,000	ONTARIO SUPERIOR COURT OF JUSTICE	2369929 ONTARIO LIMITED	C
		REMARKS: NR467246, NR569171, NR589719, NK21196, NK48647				

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH DESCRIPTION REPRESENTED FOR THIS PROPERTY.  
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

**Appendix C:**  
**Environmental Source Information**





Notes:

257 West Church Street, Waterford

0.3 0 0.17 0.3 Kilometres

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry (OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

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GTA 2005 / SWOOP 2006 / Simcoe-Muskoka-Dufferin © FirstBase Solutions, 2005 / 2006 / 2008  
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Legend

- Assessment Parcel
- ANSI
- Earth Science Provincially Significant/sciences de la terre d'importance provinciale
- Earth Science Regionally Significant/sciences de la terre d'importance régionale
- Life Science Provincially Significant/sciences de la vie d'importance provinciale
- Life Science Regionally Significant/sciences de la vie d'importance régionale
- Evaluated Wetland
- Provincially Significant/considérée d'importance provinciale
- Non-Provincially Significant/non considérée d'importance provinciale
- Unevaluated Wetland
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System





# Norfolk County OFFICIAL PLAN Schedule "C-1"

## NATURAL HERITAGE LEGEND

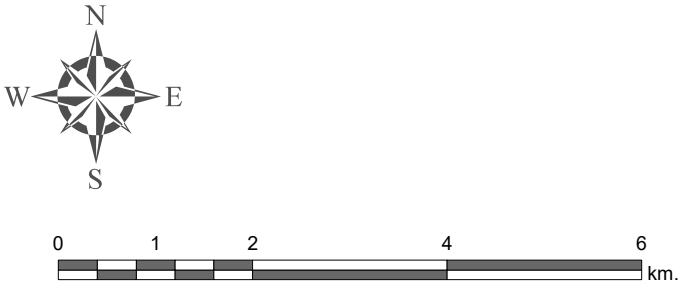
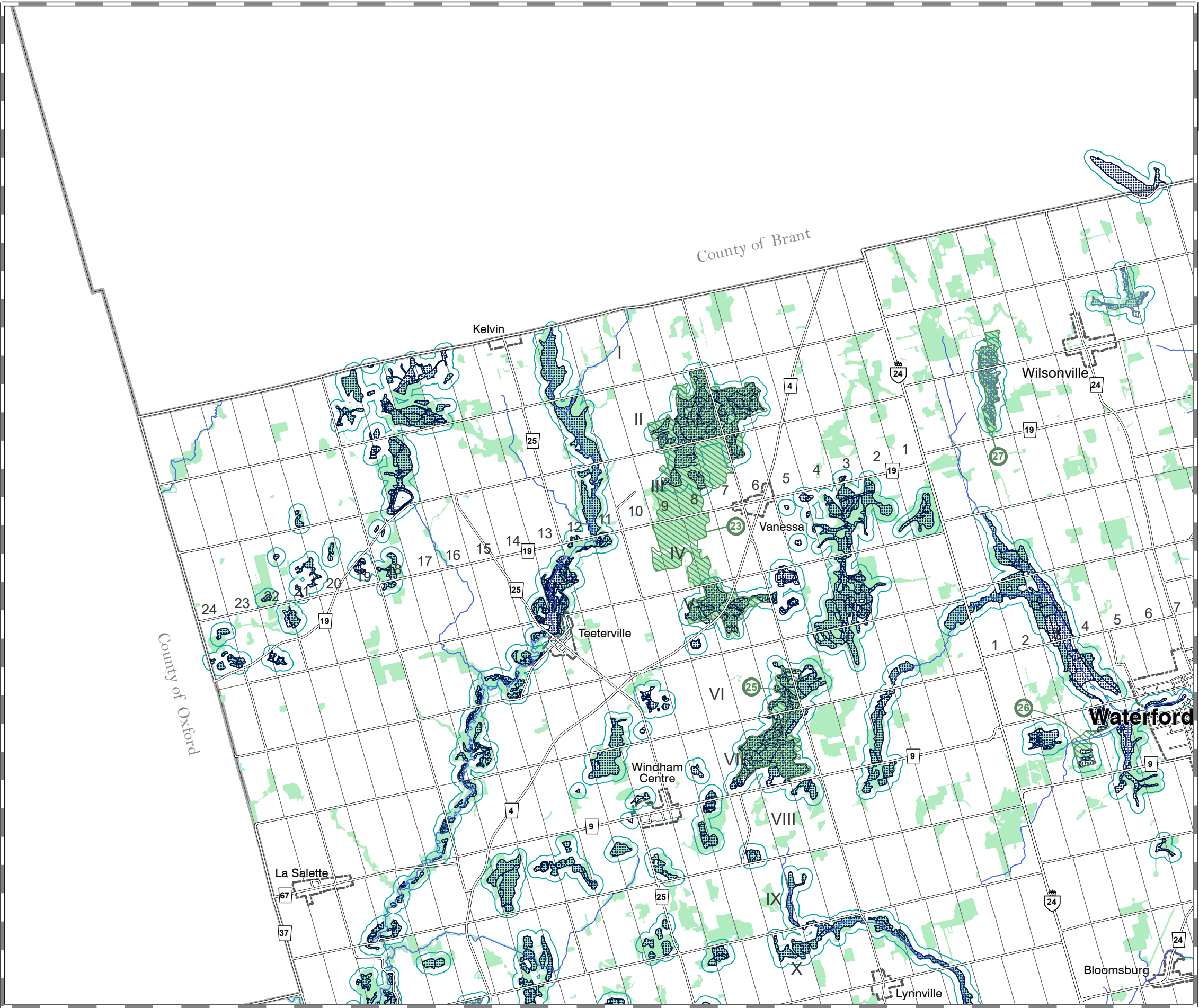
### NATURAL HERITAGE (Section 3.0)

- Provincially Significant Wetland
- Locally Significant Wetland
- Adjacent Land
- Significant Woodland
- Significant Natural Area (See Appendix A)
- Areas of Natural Scientific Interest: Life Science (ANSI)
- Areas of Natural Scientific Interest: Earth Science (ANSI)
- Long Point Biosphere Reserve (Core Area)
- Long Point Biosphere Reserve (Buffer Area)

### LOOKOUT POINT (Section 4.5)

- Existing Lookout Point
- Proposed Lookout Point
- Urban Area Boundary
- Hamlet Area Boundary
- Resort Area Boundary

Revision Date: October 5, 2018





FAQ's by Keyword

[Ask](#)

The HWIN Registered Generator List is a list of all generators registered in HWIN. For each generator, waste classes registered by the generator are displayed. Please note that HWIN will not let a generator enter into a manifest transaction for a specific waste class unless that generator has registered that waste class in HWIN. A generator may, however, add a new waste class at any time (on My HWIN page, click Administration, then Waste Information, then follow the simple instructions).

The Registered Generator List also identifies the status of each generator as "In Good Standing" or "Not in Good Standing". A generator "In Good Standing" has met all obligations for payments associated with registration fees, waste tonnage fees (on-site and off-site) and manifest fees.

It is important to note that a generator's status may change based on the generator's transactions. For example, a generator may make a waste shipment that incurs fees greater than the generator's prepaid account causing the account to have a negative balance. At the time of this transaction, the generator's status in HWIN will change from "In Good Standing" to "Not In Good Standing".

Beginning in September, the Ministry began the transfer of paper manifest data generated during 2002 into HWIN. The Ministry temporarily suspended the "In Good Standing"/"Not In Good Standing" designation on the HWIN Registered Generator List to allow generators time to make payments for paper manifest transactions that had accumulated during the year. To allow generators to fulfill their full obligations under HWIN, including reconciliation of accounts for 2002 and the registration renewal process for 2003, the "In Good Standing"/"Not In Good Standing" designation will remain temporarily suspended. Notice will be provided by the Ministry prior to reactivation of the "In Good Standing"/"Not In Good Standing" designation later in 2003.

Generators with a negative account balance in HWIN after this time will be identified as "Not In Good Standing". Such generators will be in a position of not fulfilling their requirements under [Regulation 347](#). Generators should ensure that their accounts are paid in full to enable them to make any manifest transactions. Please note that HWIN will not allow a generator that is "Not In Good Standing" to enter into a manifest transaction.

For information on the payment of fees associated with paper manifests and registration renewal for 2003, click on the appropriate links on the HWIN home page.

You may view an individual generator's status by typing in the generator's number below and clicking the search button. This search will provide you with the current status of the generator from the HWIN database

Generator number

Company name

voyago

Generator Number	Generator Name	Address	Waste Class	Status
ON3452830	947465 Ontario Ltd	573 Admiral Crt London, Middlesex, Ontario - N5v 4i3 Canada	<a href="#">View</a>	Registered
ON5213889	947465 Ontario Ltd.	614 Talbot St. St. Thomas, Elgin, Ontario - N5p 1c8 Canada	<a href="#">View</a>	Registered
ON5893115	947465 Ontario Ltd	257 West Church Street Waterford, Haldimand - Norfolk R.M., Ontario - N0e 1y0 Canada	<a href="#">View</a>	Registered
ON8587989	947465 Ontario Ltd	100 Cardevco Road Ottawa, Ottawa Carlton (Rm), Ontario - K0a 1l0 Canada	<a href="#">View</a>	Registered
ON6825607	947465 ONT LTD	599 Wabanaki Kitchener, Waterloo (R. M.), Ontario - N2c 2g3 Canada	<a href="#">View</a>	Registered
ON3668866	947465 Ontario Ltd	Pts London, 430 Sovereign Road London, Middlesex, Ontario - N5m 1a2 Canada	<a href="#">View</a>	Registered

You may also download the entire HWIN Registered Generator list. The list is in an XML file in a zip format, and is approximately 1.5 MB in size. The download will take several minutes. To avoid heavy loads on HWIN during registration, the Ministry will only allow downloads of the entire HWIN Registered Generator list **between the hours of 6:00 pm EST and 6:00 am EST**. While the HWIN Registered Generator list is a dynamic list, the version of the list available for download will be a static list. The list will be updated and posted to the HWIN site two times a day - at 4:00 am and 6:00 pm. (Note: the XML download button will only be displayed below for use from 6:00pm to 6:00am).

[Privacy](#) | [Accessibility](#)  
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Version Number: 4.3.4

947465 Ontario Ltd

Active Waste class listing

Waste Class	Waste class name	Primary Characteristic	Physical State	Specific Gravity
212 L	ALIPHATIC SOLVENTS	LIQUID INDUSTRIAL WASTE	Liquid	0.95
213 L	PETROLEUM DISTILLATES	IGNITABLE	Liquid	0.9
251 L	OIL SKIMMINGS & SLUDGES	LIQUID INDUSTRIAL WASTE	Solid	0
251 L	OIL SKIMMINGS & SLUDGES	LIQUID INDUSTRIAL WASTE	Liquid	0.95
252 L	WASTE OILS & LUBRICANTS	LIQUID INDUSTRIAL WASTE	Liquid	0.85



## Cassia Dalbello

---

**From:** Bernie Debono <bernie@norfolkdisposal.ca>  
**Sent:** November 5, 2021 4:41 PM  
**To:** Cassia Dalbello  
**Subject:** Re: Questions regarding 257 West Church Street, Waterford  
**Attachments:** 20211105\_152809.jpg

Hi Cassia,

See responses below:

Who supplies the fuel for the cardlock station, and how often are the tanks filled? **Fuel is supplied by Canada Clean Fuels or Frew Energy on an on call basis.**

When were the tanks installed on Site? **November 1998**

Who supplies new oil to Voyago? **Wakefield Oil**

Who services the waste oil at Voyago, and how often? **GFL Environmental comes quarterly**

What waste disposal company does the property use for general waste and recycling? **Norfolk Disposal Services Limited**

Where on Site is the waste oil separator located? (we did not see it during the Site visit) **See attached photo**

Thanks

**Bernie Debono**  
General Manager  
Norfolk Disposal Services Ltd.  
811 Old Highway 24  
Waterford, ON N0E 1Y0  
(519) 443-8022

On Thu, Nov 4, 2021 at 10:57 AM Cassia Dalbello <[cassiad@g2sconsulting.com](mailto:cassiad@g2sconsulting.com)> wrote:

Hello Bernie,

I have some questions regarding the cardlock station and new and Voyago.

## FW: Fuel Tank Search

From: Cassia Dalbello cassiad@g2sconsulting.com

To: Public Information Services publicinformationsservices@tssa.org

Date: Thu, Sep 30, 2021, 2:30 PM

Good afternoon,

Could you please perform a fuel tank search for the following properties in Waterford, ON:

- 257, 272, 260, 250 West Church Street (alternately Church Street West)
- 208, 216, and 223 Nichol Street West
- 301 Thompson Road West

Thanks!

**Cassia Dal Bello, B.Sc.**

Environmental Scientist

G2S Consulting Inc.



4361 Harvester Road, Unit 12

Burlington, Ontario

L7L 5M4

Tel: 905-331-3735 ext.6010

Fax: 905-642-5999

Cell: 905-220-8587

[cassiad@g2sconsulting.com](mailto:cassiad@g2sconsulting.com)

[www.g2sconsulting.com](http://www.g2sconsulting.com)

**Offices in Burlington and Stouffville**

From: Public Information Services publicinformationsservices@tssa.org

To: Cassia Dalbello cassiad@g2sconsulting.com

Date: Thu, Sep 30, 2021, 4:43 PM

Please refrain from sending documents to head office and only submit your requests electronically via email along with credit card payment. We are all working remotely and mailing in applications with cheques will lengthen the overall processing time.

### RECORD FOUND

Hello,

Thank you for your request for confirmation of public information.

- We confirm that there are records in our database of fuel storage tanks at the subject addresses.

INSTANCE NUMBER	ADDRESS	CITY	PROVINCE	POSTAL CODE	STATUS	FACILITY/DEVICE
10242268	257 WEST CHURCH ST	WATERFORD	ON	N0E 1Y0	EXPIRED	FS GASOLINE STATION - CARD/KEYLOCK
11568306	257 WEST CHURCH ST	WATERFORD	ON	N0E 1Y0	ACTIVE	FS LIQUID FUEL TANK
11568319	257 WEST CHURCH ST	WATERFORD	ON	N0E 1Y0	ACTIVE	FS LIQUID FUEL TANK
64670176	257 WEST CHURCH ST	WATERFORD	ON	N0E 1Y0	EXPIRED	FS GASOLINE STATION - REM MON SITE
	257 WEST					FS PRIVATE FUEL OUTLET -

For a further search in our archives please complete our release of public information form found at [https://www.tssa.org/en/about-tssa/release-of-public-information.aspx?\\_mid\\_=392](https://www.tssa.org/en/about-tssa/release-of-public-information.aspx?_mid_=392) and email the completed form to [publicinformation@tssa.org](mailto:publicinformation@tssa.org) along with a fee of \$56.50 (including HST) per location. The fee is payable with credit card (Visa or MasterCard).

Although TSSA believes the information provided pursuant to your request is accurate, please note that TSSA does not warrant this information in any way whatsoever.

Kind regards,

Mariah



Public Information Agent  
Facilities and Business Services  
345 Carlingview Drive  
Toronto, Ontario M9V 6N9  
Tel: +1-416-734-6222 | Fax: +1-416-734-3568 | E-Mail: [publicinformation@tssa.org](mailto:publicinformation@tssa.org)  
[www.tssa.org](http://www.tssa.org)



---

From: Cassia Dalbello [cassiad@g2sconsulting.com](mailto:cassiad@g2sconsulting.com)

To: Emma Keefe [emmak@g2sconsulting.com](mailto:emmak@g2sconsulting.com)

Date: Tue, Oct 5, 2021, 1:37 PM

**Cassia Dal Bello, B.Sc.**

Environmental Scientist

G2S Consulting Inc.



4361 Harvester Road, Unit 12

Burlington, Ontario

L7L 5M4

Tel: 905-331-3735 ext.6010

Fax: 905-642-5999

Cell: 905-220-8587

[cassiad@g2sconsulting.com](mailto:cassiad@g2sconsulting.com)

[www.g2sconsulting.com](http://www.g2sconsulting.com)

*Offices in Burlington and Stouffville*

---

3 Emails



Technical Standards and Safety Authority  
345 Carlingview Drive  
Toronto, Ontario M9W 6N9  
Customer Service: 1.877.682.8772  
Fax: 416.734.3568  
Email: publicinformation@tssa.org  
www.tssa.org

## Application for Release of Public Information

Issued under the Access and Privacy Code

Clear Form

Print Form

### A. REQUESTOR INFORMATION:

Your File/Project/Reference No: G2S21354 Date: NOV. 2, 2021

Requestor Name: <u>Zoe Barth</u>		Organization <u>G2S Consulting Inc.</u>		<b>For Office Use Only</b> Authorization No. Account No. SR No. P.I No.
Suite/Unit No: <u>12</u>	Street No: <u>4361</u>	Street Name: <u>Harvester Rd.</u>		
City: <u>Burlington</u>	Province: <u>Ontario</u>	Postal Code: <u>L7L 5M4</u>		
Primary Phone: <u>289-795-2727</u>		Secondary Phone: <u>1905 638-2502</u>		
Email: <u>zoeb@g2sconsulting.com</u> <u>melissak@g2sconsulting.com</u>		Fax:		

### B. PROGRAM (check ALL that apply)

☐ Boilers & Pressure Vessels ☐ Elevating & Amusement Devices ☒ Fuels ☐ Upholstered and Stuffed Articles

### C. DETAILS OF REQUEST (please list in detail the information you require)

Please provide full records for the property located @ 257 West Church Street in Waterford, ON. Records were found including instance numbers:  
10242268 11568319 64698525 Postal code (NOE 140)  
11568306 64670176

### D. PLEASE ANSWER ALL THAT APPLY:

Address of Subject Location (one address per form) <u>257 West Church Street, Waterford, ON, NOE 140</u>			
Device/equipment Type:	Owner: <u>2369929 Ontario Limited</u>		
Installation Number:			
CRN:	OIN:	Serial #:	
Victim Name (if applicable):			
Certificate Holder Name (if applicable):		Certificate Holder Date of Birth: (DD-MM-YYYY)	
Date /period requested:			
<input checked="" type="checkbox"/> From (date): <u>1950</u> to (date) <u>Current</u>			
<input type="checkbox"/> Most recent record			





Technical Standards and Safety Authority  
345 Carlingview Drive  
Toronto, Ontario M9W 6N9  
Fax: 416.734.3568  
Customer Service: 1.877.682.8772  
Email: publicinformation@tssa.org  
www.tssa.org

## Application for Release of Public Information Issued under the Access and Privacy Code

### E. REASON FOR REQUEST (please explain the reason for your request)

We need additional information regarding fuel tanks that are located on a property we are completing a Phase One ESA for a record of site condition with the MECP.

→ 257 West Church Street, Waterford

### F. TERMS AND CONDITIONS:

Please refer to the link for our Access and Privacy Code [Access and Privacy Code.pdf](#). If this request includes a release of personal information, TSSA will require consent from the affected party.

Applicant Signature: <u>Zoe Barth</u> 	Date <u>Nov 02, 2021</u>
Please Print and sign before returning to TSSA	

### G. FEES & PAYMENT:

TSSA will provide a fee quote for multiple record requests, which must be approved by the Applicant before a record search commences. For fees for single searches, please refer to Fee Schedule [Website Fee Schedule.pdf](#)

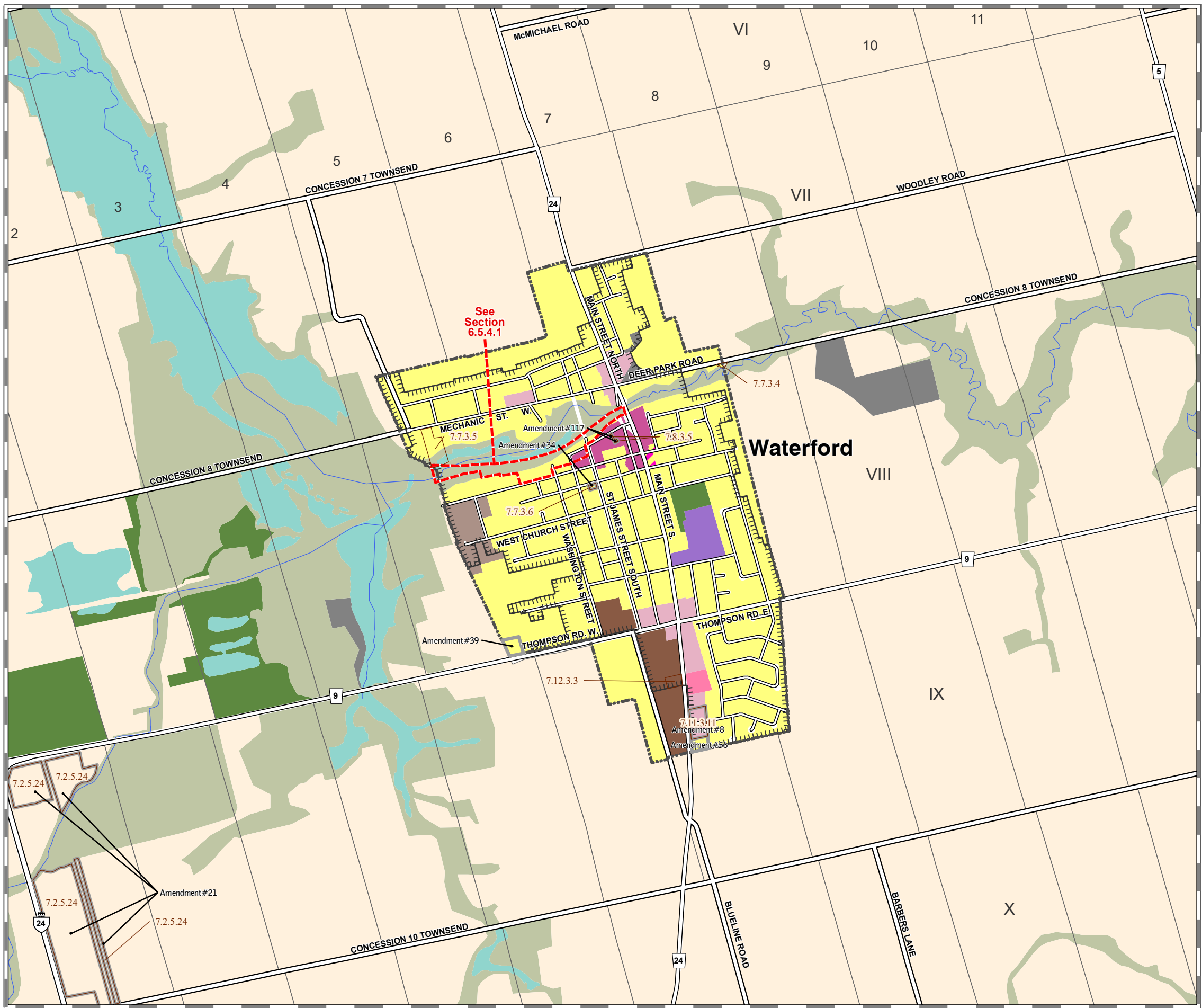
Payment for single record search is attached (please check if payment attached)

	Technical Standards and Safety Authority 345 Carlingview Drive Toronto, Ontario M9W 6N9	<b>COMPLETE FOR CREDIT CARD PAYMENTS</b>	
Card Type:	<input checked="" type="checkbox"/> VISA <input type="checkbox"/> MASTERCARD	Amount of Payment \$	<u>56.50</u>
Card#	<u>4558970106459011</u>	Expiry Date	<u>05</u> / <u>27</u>
In payment of	<u>Record Search</u>		
Name of Card Holder	<u>Zoe</u> <u>Barth</u>	Client Tel. No.	<u>289-795-2727</u>
	First Name Last Name		
Signature of Card Holder		Date	<u>02-11-2021</u> (DD-MM-YYYY)

# Norfolk County OFFICIAL PLAN Schedule "B-18"

## LAND USE LEGEND

- Agricultural
- Hazard Lands
- Provincially Significant Wetland
- Hamlet
- Resort Residential
- Urban Residential
- Mixed Residential/Commercial
- Downtown
- Shopping Centre Commercial
- Commercial
- Protected Industrial
- Industrial
- Major Public Infrastructure
- Major Institutional
- Parks & Open Space
- Urban Waterfront
- Built Boundary
- Special Policy Area
- Site Specific Policy Area
- Industrial Influence
- Marine Use in Hazard Lands (Section 7.3.1(g)(iii))
- Urban Area Boundary
- Hamlet Area Boundary
- Resort Area Boundary



## **Appendix D: Well Records**

Read the [plan to safely reopen Ontario \(https://covid-19.ontario.ca/plan-safely-reopen-ontario-and-manage-covid-19-long-term\)](https://covid-19.ontario.ca/plan-safely-reopen-ontario-and-manage-covid-19-long-term) and continue to follow the [restrictions and public health measures \(https://covid-19.ontario.ca/public-health-measures\)](https://covid-19.ontario.ca/public-health-measures).

## Map: Well records

This map allows you to search and view well record information from reported wells in Ontario.

Full dataset is available in the [Open Data catalogue \(https://data.ontario.ca/dataset/well-records\)](https://data.ontario.ca/dataset/well-records).

[Go Back to Map \(\)](#)

### Well ID

Well ID Number: 7208863

Well Audit Number: Z178011

Well Tag Number: A152552

*This table contains information from the original well record and any subsequent updates.*

### Well Location

Address of Well Location	257 CHURCH ST. W
Township	WATERFORD TOWN
Lot	
Concession	
County/District/Municipality	NORFOLK
City/Town/Village	WATERFORD
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 556902.00 Northing: 4753264.00

Municipal Plan and Sublot Number

Other

### Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	SILT		0 ft	25 ft
BRWN	SAND	SLTY		25 ft	49 ft

### Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	.5 ft	FLUSHMOUNT/ CONCRETE	
.5 ft	38 ft	HOLEPLUG	
38 ft	49 ft	SAND	

### Method of Construction & Well Use

Method of Construction	Well Use
Direct Push	Monitoring and Test Hole



## Status of Well

Monitoring and Test Hole

## Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	39 ft

## Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2.25 inch	PLASTIC	39 ft	49 ft

## Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7241

## Results of Well Yield Testing

After test of well yield, water was

If pumping discontinued, give reason

Pump intake set at

Pumping Rate

Duration of Pumping

Final water level

If flowing give rate

Recommended pump depth

Recommended pump rate

Well Production

Disinfected?

## Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

## Water Details

Water Found at Depth Kind

## Hole Diameter

Depth From	Depth To	Diameter
0 ft	49 ft	6 inch

**Audit Number:** Z178011

**Date Well Completed:** September 03, 2013

**Date Well Record Received by MOE:** October 02, 2013

Updated: October 18, 2021

Published: March 20, 2014

## Related

How to use a Ministry of the Environment map (/page/how-use-ministry-environment-map#wells)

Technical documentation: Metadata record (https://data.ontario.ca/dataset/well-records/resource/3031344e-e3f2-48d5-888c-c1deadfd2f77)

[about Ontario \(https://www.ontario.ca/page/about-ontario\)](https://www.ontario.ca/page/about-ontario)

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## Map: Well records

This map allows you to search and view well record information from reported wells in Ontario.

Full dataset is available in the [Open Data catalogue \(https://data.ontario.ca/dataset/well-records\)](https://data.ontario.ca/dataset/well-records).

[Go Back to Map \(\)](#)

### Well ID

Well ID Number: 7208861

Well Audit Number: Z177907

Well Tag Number: A152600

*This table contains information from the original well record and any subsequent updates.*

### Well Location

Address of Well Location	257 CHURCH ST. W.
Township	WATERFORD TOWN
Lot	
Concession	
County/District/Municipality	NORFOLK
City/Town/Village	WATERFORD
Province	ON
Postal Code	n/a
UTM Coordinates	NAD83 — Zone 17 Easting: 556887.00 Northing: 4753386.00
Municipal Plan and Sublot Number	
Other	

### Overburden and Bedrock Materials Interval

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To
BRWN	SAND	SILT		0 ft	24 ft
BRWN	SILT	SAND		24 ft	48.5 ft

### Annular Space/Abandonment Sealing Record

Depth From	Depth To	Type of Sealant Used (Material and Type)	Volume Placed
0 ft	.5 ft	FLUSHMOUNT/ CONCRETE	
.5 ft	37.5 ft	HOLEPLUG	
37.5 ft	48.5 ft	SAND	

### Method of Construction & Well Use

Method of Construction	Well Use
Direct Push	Monitoring and Test Hole

## Status of Well

Monitoring and Test Hole

## Construction Record - Casing

Inside Diameter	Open Hole or material	Depth From	Depth To
2 inch	PLASTIC	0 ft	37.5 ft

## Construction Record - Screen

Outside Diameter	Material	Depth From	Depth To
2.25 inch	PLASTIC	37.5 ft	38.5 ft

## Well Contractor and Well Technician Information

Well Contractor's Licence Number: 7241

## Results of Well Yield Testing

After test of well yield, water was

If pumping discontinued, give reason

Pump intake set at

Pumping Rate

Duration of Pumping

Final water level

If flowing give rate

Recommended pump depth

Recommended pump rate

Well Production

Disinfected?

## Draw Down & Recovery

Draw Down Time(min)	Draw Down Water level	Recovery Time(min)	Recovery Water level
SWL			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
45		45	
50		50	
60		60	

## Water Details

Water Found at Depth Kind

## Hole Diameter



Depth From	Depth To	Diameter
0 ft	48.3 ft	6 inch

**Audit Number:** Z177907

**Date Well Completed:** September 04, 2013

**Date Well Record Received by MOE:** October 02, 2013

Updated: October 18, 2021

Published: March 20, 2014

## Related

How to use a Ministry of the Environment map (/page/how-use-ministry-environment-map#wells)

Technical documentation: Metadata record (<https://data.ontario.ca/dataset/well-records/resource/3031344e-e3f2-48d5-888c-c1deadfd2f77>)

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**Appendix E:**  
**Phase One Questionnaire**

# PHASE I ESA QUESTIONNAIRE



5-5100 South Service Rd., Burlington, ON L7L 6A5  
P 905.331.3735 F 905.634.6533  
G2Senvironmental.com

Site Address:	257 Church St, Waterford, ON		
Project #:	The Silos of Waterford		
Owner:	2369929 Ontario Limited	Occupant:	Tenants
Interviewee:	Bernie Debraff Tom	Relation to Site:	Owner
Property and Building Description and Size:			

1. Has the property or an adjacent property(s) currently or previously been used for an industrial or commercial use? If yes, please specify activities and time frames.

Interviewee	Observed During Site Visit
Yes No Unknown	Yes No

NOTES: Co-op Site - Silos holding Grain prior to transport  
 ② Bus Parking & Repair  
 ③ Storage ④ Card Lock Fuel Depot

2. Are there or have there been in the past, any damaged or discarded automotive or industrial batteries, pesticides, paints, or other chemicals in the aggregate, stored on or used at the property or on any of the adjacent properties? If yes, please specify location.

Interviewee	Observed During Site Visit
Yes No Unknown	Yes No

NOTES:

3. Are there currently, or have there been in the past, any industrial containers of chemicals located on the property or on any of the adjacent properties? If yes, please specify location.

Interviewee	Observed During Site Visit
Yes No Unknown	Yes No

NOTES: Containers of fertilizers and pesticides historically stored on site.



Phase I ESA Questionnaire

4. Are you aware or do you have any prior knowledge that fill material has been brought onto the property that originated from an unknown origin or contaminated site? If yes, please specify location.

Interviewee	Observed During Site Visit
Yes <input type="radio"/> No <input checked="" type="radio"/> Unknown	Yes <input type="radio"/> No <input checked="" type="radio"/>

NOTES: *Fill brought to the site in the northwest portion of the site - unknown origin/quality*

5. Has the property or any of the adjacent properties been used for the any of the following industries/activities/storage/related activities, either currently or historically (please mark where applicable):

AREA OF CONCERN	YES	NO	COMMENT
Chemicals	✓		Storage
Electrical Equipment	✓		Storage
Metal Smelting and/or Processing		X	
Mining		X	
Milling		X	
Petroleum and Natural Gas		X	
Drilling/Production/Processing/Retailing and/or Distribution (Including Gasoline Station)		X	
Transportation	✓		BWS Repair + Parking
Junkyard, waste disposal/landfill/waste treatment and/or Processing, Recycling		X	
Wood, Pulp and Paper Products		X	
Appliance Equipment and/or Engine Repair/Reconditioning/Salvage		X	
Ash Deposit from boilers and/or other Thermal Facilities		X	
Asphalt Tar Manufacturing		X	
Coal Gasification		X	
Medical/Chemical/Radiological and/or Biological Labs		X	
Rifle and/or Pistol Firing Ranges		X	
Road Salt Storage Facilities		X	
Dry Cleaning Facilities		X	
Commercial Printing Facilities and/or Photo Developing Laboratory		X	
Site which have been or are likely to have been contaminated by substances migrating from other properties.		X	



Phase I ESA Questionnaire

6. Are there currently, or have there been in the past, any pits, ponds, or lagoons located on the property in connection with waste treatment or waste disposal? If yes, please specify location.

Interviewee			Observed During Site Visit	
Yes	No	Unknown	Yes	No

NOTES:

7. Is there currently any, or has there been in the past, stained soil on the property? If yes, please specify location.

Interviewee			Observed During Site Visit	
Yes	No	Unknown	Yes	No

NOTES: Small fuel spillage at Card Lock.  
Staining (minor) beneath waste oil AST in Building A.

8. Are there currently, or have there been in the past, any registered or unregistered storage tanks (above or underground) located on the property? If yes, please specify location.

Interviewee			Observed During Site Visit	
Yes	No	Unknown	Yes	No

NOTES: Currently 2 new motor oil ASTs and one waste oil AST in Building A.  
2 USTs @ cardlock station Various other historical ASTs on site.

9. Are there currently, or have there been in the past, any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the property or adjacent to any structure located on the property? If yes, please specify location.

Interviewee			Observed During Site Visit	
Yes	No	Unknown	Yes	No

NOTES:

vent & fill pipes located in the area of the cardlock station. (approximately 9)

Phase I ESA Questionnaire

10. Is there currently, or have there been in the past, evidence of leaks, spills or staining by substances other than water, or foul odours, associated with any flooring, drains, walls, ceilings, or exposed grounds on the property? If yes, please specify location.

Interviewee	Observed During Site Visit
<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Unknown	Yes <input checked="" type="radio"/> No

NOTES: Small spills at Card Lock.

11. If the property is served by a private well or non-public water system, is there evidence or do you have prior knowledge that contaminants have been identified in the well or system that exceed guidelines applicable to the water system? If yes, please specify location.

Interviewee	Observed During Site Visit
Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Yes <input checked="" type="radio"/> No

NOTES:

12. If the property served by a private well or non-public water system, have there been in the past, any well designated as contaminated by any government environmental/health agency? If yes, please specify location.

Interviewee	Observed During Site Visit
Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Yes <input checked="" type="radio"/> No

NOTES:

13. Are you aware of any environmental liens or governmental notification relating to past or recurrent violations of environmental laws with respect to the property or any facility located on the property? If yes, please specify.

Interviewee	Observed During Site Visit
Yes <input checked="" type="radio"/> No <input type="radio"/> Unknown	Yes <input checked="" type="radio"/> No

NOTES:

Phase I ESA Questionnaire

14. Are you aware of current or past existence of hazardous substances or petroleum products with respect to the property or any facility located on the property? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<input checked="" type="radio"/> No <input type="radio"/> Unknown	<input checked="" type="radio"/> Yes	<input type="radio"/> No

NOTES: Fuel Card Lock depot - Archive ✓  
new + used oil in building A, current cardlock fuel station.

15. Are you aware of any current or past existence of environmental violations with respect to the property or any facility located on the property? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<input checked="" type="radio"/> No <input type="radio"/> Unknown	<input type="radio"/> Yes	<input checked="" type="radio"/> No

NOTES:

16. Are you aware of any environmental site assessment of the property or facility that indicated the presence of hazardous substances or petroleum products on, or contamination of, the property or recommended further assessment of the property? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<input checked="" type="radio"/> No <input type="radio"/> Unknown	<input type="radio"/> Yes	<input checked="" type="radio"/> No

NOTES:

17. Are you aware of any past, threatened, or pending lawsuits or administrative proceedings concerning a release or threatened release of any hazardous substance or petroleum products involving the property by any owner or occupant of the property? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<input checked="" type="radio"/> No <input type="radio"/> Unknown	<input type="radio"/> Yes	<input checked="" type="radio"/> No

NOTES:



Phase I ESA Questionnaire

18. Does the property discharge wastewater (not including sanitary waste or storm water) onto or adjacent to the property and/or into a storm water system? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<u>No</u>	Unknown	
		Yes	<u>No</u>

NOTES:

19. Are you aware of any hazardous substances or petroleum products, unidentified waste materials, tires, automotive or industrial batteries, or any other waste materials that have been dumped above grade, buried and/or burned on the property? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<u>No</u>	Unknown	
		Yes	<u>No</u>

NOTES:

20. Is there, or has there been in the past, a transformer, capacitor, or any hydraulic equipment for which there are any records indicating the presence of PCBs? If yes, please specify.

Interviewee		Observed During Site Visit	
Yes	<u>No</u>	Unknown	
		<u>Yes</u>	No

NOTES: Former hydro substation located @ the central portion of the site - no longer present.

21. Are there currently any site operating records available for the property? (please provide documents if obtainable):


SITE OPERATING RECORD	YES	NO	N/A
Regulatory Permits and Records			✓
Material Safety Data Sheets			✓
Underground Utility Drawings	✓		
Chemical Inventory and Storage		✓	
Storage Tanks		✓	
Environmental Monitoring Data			✓
Waste Management Records			✓
Process, Production and Maintenance Documents			✓
Spills and Discharges			✓
Emergency Response and Contingency Plans			✓
Environmental Audit Reports			✓
Facility Site Plans			✓



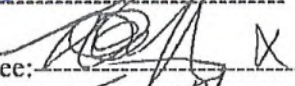
Phase I ESA Questionnaire

---

Date: Sept 30, 2021

Signature of Assessor: 

Name of Assessor: Cassia Dal Bello







Signature of Interviewee:  X

Name of Interviewee: Tom O'Hara / Bernie Debono

## **Appendix F: Site Photos**

Picture and Description	
	
<b>Photo #1:</b> View of Silos and Buildings B and D.	<b>Photo #2:</b> Office area of Building A.
	
<b>Photo #3:</b> Shop area of Building A.	<b>Photo #4:</b> One new oil AST in the shop area of Building A.
	
<b>Photo #5:</b> Second new oil AST in the shop area of Building A.	<b>Photo #6:</b> Used oil AST with minor concrete staining in the shop area of Building A.



Picture and Description	
	
<b>Photo #7:</b> Servicing area within the shop of Building A.	<b>Photo #8:</b> Exterior of Building A with school bus parking.
	
<b>Photo #9:</b> Exterior of building A.	<b>Photo #10:</b> Interior of Building B.
	
<b>Photo #11:</b> Interior of Building B.	<b>Photo #12:</b> Exterior of Building B.



Picture and Description	
	
<b>Photo #13:</b> Exterior of Buildings D and B.	<b>Photo #14:</b> Interior of Building D.
	
<b>Photo #15:</b> Interior of Building D.	<b>Photo #16:</b> Exterior of Building C, with empty fertilizer totes.
	
<b>Photo #17:</b> Exterior of Buildings C and D.	<b>Photo #18:</b> Silos at northwest portion of the Site.



Picture and Description	
	
<b>Photo #19:</b> Area of former grain dryer with fill materials.	<b>Photo #20:</b> Base area of silos.
	
<b>Photo #21:</b> Exterior of Building E.	<b>Photo #22:</b> Heating oil AST south adjacent to Building E.
	
<b>Photo #23:</b> North area of Site.	<b>Photo #24:</b> East property boundary, facing south.



Picture and Description	
	
<b>Photo #25:</b> Tank nest at cardlock station.	<b>Photo #26:</b> Fuel pumps at cardlock station.
	
<b>Photo #27:</b> Electrical equipment associated with the USTs.	<b>Photo #28:</b> Fill and vent pipes near tank nest.
	
<b>Photo #29:</b> View of silos and school bus parking.	<b>Photo #30:</b> One of seven monitoring wells located on Site.



# vallee

*Consulting Engineers,  
Architects & Planners*

March 2, 2023

Verlinda Homes Ltd.  
26 Main St. South  
Waterford, Ontario  
N0E 1Y0

**Attention: Mr. Tom O'Hara**

**Reference: Functional Servicing Report  
Silos of Waterford  
Waterford, Norfolk County  
Our Project #21-061**

## Introduction

This Functional Servicing Report has been prepared in support of the zoning by-law amendment application required for the construction of an 8-storey 164-unit mid-rise residential building, 76-unit condo development and 16 single-detached dwelling units with 16 accessory dwelling units, for a combined total of 272 units. The subject site is located at 257 West Church Street in Waterford - Norfolk County. This report presents the conceptual functional servicing for the proposed development, including sanitary servicing, storm servicing and domestic and fire water servicing. The indicated designs are conceptual and may be altered prior to final design approvals in order to improve efficiency and produce cost savings.

## Background

The proposed 3.49 ha development site is located on the western edge of Waterford and is bounded by Nichol Street to the north, McCool Street to the east, Church Street West to the south and the LE & N rail trail to the west. The development site was formerly home to the Norfolk Co-operative Company Limited, an agricultural supply depot which contains several miscellaneous buildings and numerous old grain silos. Refer to Figure 1.



**Figure 1 – Site Location**



The subject property is currently zoned as a “General Industrial Zone (MG)”. The proposed development will be re-zoned and will consist of the following construction:

- Urban Residential Zone Type 1 (R1)
  - 16 – 2-storey single detached residential dwelling lots fronting on McCool Street
  - 16 – accessory dwelling units
- Urban Residential Zone Type 4 (R4)
  - 8 – 1-storey stacked residential dwelling units
  - 16 – 3-storey stacked residential dwelling units
  - 52 – 1 and 2-storey stacked residential dwelling units
- Urban Residential Zone Type 6 (R6)
  - 8-storey residential mid-rise building with 164 units and main floor commercial space.
- Storm and sanitary infrastructure to support proposed construction
- Underground stormwater management facility
- Curbs, sidewalks and other miscellaneous items to support proposed construction

## Sanitary Servicing

Norfolk County GIS mapping and record drawings indicate existing 200mm asbestos cement sanitary sewers on West Church Street, Nichol Street and passing through the proposed development site, connecting West Church Street and Nichol Street. It is proposed that the existing sanitary sewer on the development property will be removed/abandoned and rerouted along McCool Street to service Zone R1. An internal sanitary sewer network will service Zone R4 and Zone R6 of the development and will discharge sanitary flows to the existing sanitary sewer along Nichol Street. Refer to DWG C100 – General Plan of Services in Appendix D.

Sanitary design flows for the proposed development were calculated using the Norfolk County Design Criteria. Table 1 presents the flow information associated with each of proposed development blocks. In summary, the proposed development is anticipated to generate a total additional sanitary flow of approximately 17.31 L/s to the existing sanitary sewer at the intersection of Nichols and McCool Street. Detailed calculations are outlined in Appendix A.

<b>Table 1</b> <b>Sanitary Design Flow Information</b>				
	<b>Zone R1</b>	<b>Zone R4</b>	<b>Zone R6 Residential</b>	<b>Zone R6 Commercial</b>
Total Number of Units	32	76	164	-
Population Density (persons/units)	2.75	2.75	2.75	90 persons/ha
Per Capita Flow (L/person/day)	450	450	450	40000 L/ha/day
Peak Extraneous Flow (L/sec/ha)	0.28	0.28	0.28	-
Development Area (ha)	0.61	2.06	0.82	0.30
Infiltration Flow (L/s)	0.17	0.58	0.23	-
Sewage Flow (L/s)	0.46	1.09	2.35	0.14
Peak Design Flow (L/s)	2.12	5.09	9.62	0.48

**G. DOUGLAS VALLEE LIMITED**  
**Consulting Engineers, Architects & Planners**

To confirm the calculations presented, Vallee has requested that sanitary hydraulic modelling be completed by the Norfolk County consultant to determine if the existing County infrastructure provides adequate capacity to accommodate the estimated sanitary design flow from the proposed development.

## Stormwater Management

Under existing conditions, the subject site features several miscellaneous buildings, numerous old grain silos, gravel and asphalt driveways and parking areas and some grassed areas. Runoff from the site drains overland in a north westerly direction towards the LE & N rail trail, ultimately discharging to the Waterford Ponds. The stormwater management (SWM) quantity control objective for the development is to reduce and/or control the total post-development peak flow rates from the site to levels that do not exceed the allowable pre-development flow rates, for all storm events up to and including the 100-year storm event.

To meet this objective, runoff from the proposed development will be detained and released at a rate such that the pre-development peak flow rates from the subject site are not exceeded. Runoff from the 16 single residential dwelling lots fronting on McCool Street will drain uncontrolled overland to a proposed storm sewer along McCool Street. Refer to Area POST1B shown on drawing 21-061 POST – Post-Development SWM Drainage Area in Appendix B. The remaining area of the development site is referred to as POST1A, and will be controlled by the proposed SWM facility. All storm events (2-year to 100-year) will be conveyed to a proposed underground SWM storage facility through a storm sewer network. Controlled discharge from the underground SWM storage facility will be released to a proposed storm sewer system to be installed along the LE & N rail trail before released to the Waterford Ponds.

Vallee has been in contact with Infrastructure Ontario, the owners of the rail trail, who are in support of the proposed development. Further details of the anticipated outlet will follow in the detail design submission once zoning is in place.

Visual OTTHYMO was utilized to simulate the pre-development and post-development conditions for the subject site and determine the storage volume and orifice control required to meet the quantity control objective. The proposed underground chamber system utilizes 231 StormTech MC-4500 chambers with a 300mm stone reservoir above and below the chambers, resulting in a total storage volume of 1230 m<sup>3</sup>. To control the release rate from the proposed facility, a 100mm orifice and a 300mm orifice will be installed in the outlet control structure (STMH9). The following equation was used to estimate discharge, and corresponding calculations can be found in Appendix A.

$$Q = C * A * \sqrt{2 * g * h}$$

where:

Q = Discharge in cms

C = constant, 0.63

A = orifice area in m<sup>2</sup>

g = gravitational constant, 9.81 m/s<sup>2</sup>

h = height above orifice, m

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Table 2 summarizes the peak total post-development runoff rates found using Visual OTTHYMO and compares them to the allowable total pre-development release rates for all storm events up to and including the 100-year storm event. Supporting calculations can be found in Appendix B.

<b>Table 2</b> <b>Pre to Post-Development Flow Rates</b>			
<b>Event</b>	<b>Total Pre (cms)</b>	<b>Total Post (cms)</b>	<b>Net Change (cms)</b>
2-year	0.084	0.081	-0.002
5-year	0.191	0.145	-0.050
10-year	0.276	0.204	-0.067
25-year	0.384	0.272	-0.111
50-year	0.518	0.340	-0.172
100-year	0.628	0.409	-0.212

For all storm events the peak post-development discharge has been controlled to less than the peak pre-development runoff for the entire development site and external drainage areas combined. During the detailed design stage, low-impact development infiltration practices will be analyzed to reduce the required storage volume.

Stormwater quality control for the site will be analyzed during the detailed design stage. At that time, multiple quality control solutions will be investigated, such as low-impact development (LID) treatment, chamber isolator rows, and oil grit separators (OGS), and the most practical solution that meets the municipal design criteria will be proposed.

## Water Servicing

Norfolk County GIS mapping and record drawings indicate existing 150mm ductile iron diameter watermain along Nichol Street and West Church Street, and through the proposed development site connecting West Church Street and Nichol Street. It is proposed that the watermain on Nichol Street be extended and utilized to service Zone R4 and R6 in the proposed development. In addition, the existing watermain on the development property will be removed/abandoned and rerouted along McCool Street to service Zone R1. Refer to DWG C100 – General Plan of Services in Appendix D.

Norfolk County's design criteria stipulates the following requirements for system pressures, and the system shall be designed to meet the greater of either of the following requirements;

- Fire flow conditions– not less than 140 kPa
- Normal operating conditions – not less than 280 kPa

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### **Domestic Water Demand**

The following summarizes the domestic water flow information for the proposed development:

#### **Zone R1:**

- Total Number of Units: 32
- Population: 2.75 persons per unit (88 people)
- Average Daily Water Demand (per person) 0.450 m<sup>3</sup>/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand: 89.10 m<sup>3</sup>/day (1.03 L/s)
- Peak Hourly Demand Factor (Residential) 4.00
- Peak Hourly Demand 6.60 m<sup>3</sup>/hour (1.83 L/s)

#### **Zone R4:**

- Total Number of Units: 76
- Population: 2.75 persons per unit (209 people)
- Average Daily Water Demand (per person) 0.450 m<sup>3</sup>/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand 211.61 m<sup>3</sup>/day (2.45 L/s)
- Peak Hourly Demand Factor: 4.0
- Peak Hourly Demand: 15.68 m<sup>3</sup>/hour (4.35 L/s)

#### **Zone R6 - Residential:**

- Total Number of Units: 164
- Population: 2.75 persons per unit (462 people)
- Average Daily Water Demand (per person) 0.450 m<sup>3</sup>/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand (Residential): 456.64 m<sup>3</sup>/day (5.29 L/s)
- Peak Hourly Demand Factor (Residential) 4.00
- Peak Hourly Demand (Residential) 33.83 m<sup>3</sup>/hour (9.40 L/s)

#### **Zone R6 - Commercial:**

- Floor Area 0.30 ha
- Population: 90 people/ha (27 people)
- Average Daily Water Demand (per person) 0.450 m<sup>3</sup>/person/day
- Maximum Day Demand Factor: 2.25
- Maximum Day Demand (Commercial): 27.34 m<sup>3</sup>/day (0.32 L/s)
- Peak Hourly Demand Factor (Commercial): 2.0
- Peak Hourly Demand (Commercial): 1.01 m<sup>3</sup>/hour (0.28 L/s)

In summary, the proposed development is anticipated to have a total maximum daily demand of 9.08 L/s and a maximum hourly demand of 15.86 L/s. Refer to Appendix C for detailed calculations.



## **Fire Water Service**

According to the County GIS online mapping, there are three existing fire hydrants located in proximity to the development site. The first hydrant is located on Nichol Street, 50m west of McCool Street, the second is located at the west end of West Church Street, and the last is located on the south side of development property on the existing access road.

Typically, available fire flow during the maximum day demand is the critical criteria when evaluating a watermain distribution system's ability to service a residential subdivision. The estimated fire flow requirement for the development has been determined using the recommendations of the Fire Underwriters Survey – 2020 (FUS).

Vallee has retained ARC Engineering Solutions Inc to review the preliminary Fire Underwriters Survey (FUS) calculations completed for the proposed development and advise on potential infrastructure requirements. Refer to the Fire Water Infrastructure Assessment in Appendix C for details. Updated FUS calculations have since been completed and are appended in Appendix C. In summary, it was found that using the County's requirement of the FUS guidelines to analyze the site, a fire flow of 133 L/s is required.

Information obtained from Norfolk County ISMP indicates that the existing municipal watermain can supply approximately 70 L/s, as shown in Appendix C. Consequently, on-site fire water storage reservoirs will be utilized to provide the remaining required fire fighting capacity. Using the FUS criteria, approximately 456 m<sup>3</sup> of storage is required, to be provided by four 114 m<sup>3</sup> precast cisterns.

In addition, the 8-storey residential mid-rise building will be fully sprinklered and standpipe system with a hose connection will be included. A fire pump will also be installed to provide adequate pressure for both the sprinklers and standpipe. Lastly, dry hydrants will be installed for the fire department to access the stored fire fighting water and wet hydrants will be installed every 90m along the fire access route and within 45m of the fire department connection to the 8-storey mid-rise building. Refer to the Fire Water Infrastructure Assessment in Appendix C, for the proposed conceptual fire water infrastructure layout.

Vallee has requested that an analysis of the hydraulic modelling be conducted by the County's consultant to determine the existing water servicing capacity and constraints on the existing water system to ensure adequate system flows and pressure for the aforementioned domestic and fire demands.

## **Road Reconstruction**

To facilitate the construction of the single-detached dwellings on McCool Street and rerouting the Church Street West sanitary sewer, McCool Street will require full reconstruction from Church Street West to Nichol Street. This will include a 7.5m road width complete with new storm, sanitary, watermain, sidewalk and curb and gutter. Runoff from the existing roadside ditch on the east side of McCool Street will be collected and conveyed to proposed storm sewer.

Along the condo block frontage on West Church Street and Nichol Street, new sidewalk and curb and gutter will be constructed, and the full road depth will be reconstructed where required to facilitate the new storm, sanitary and watermain. Lastly, West Church Street and Nichol Street will be resurfaced within the limits indicated on DWG C100 – General Plan of Services in Appendix D.

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## Conclusions and Recommendations

The functional servicing design for the proposed development can be summarized as follows:

- The existing 200mm sanitary sewer on the development property will be removed/abandoned and rerouted along McCool Street to Zone R1.
- Zone R4 and R6 will be serviced by a sanitary sewer that connects to the existing 200mm sanitary sewer along Nichol Street.
- A peak sanitary design flow of approximately 17.31 L/s is anticipated from the proposed development.
- Modelling from the Norfolk County's consultant has been requested to determine if existing County infrastructure provides adequate capacity to accommodate the estimated sanitary design flow.
- Storm sewers will convey stormwater in catchment POST1A to the proposed SWM storage facility, ultimately releasing to the Waterford Ponds via a storm sewer.
- Runoff from catchment POST1B and POST2 will remain uncontrolled.
- Under all storm events, the total post-development peak flow rates from the controlled and uncontrolled catchments are attenuated to less than or equal to the pre-development peak flows under all storm events.
- Quality control will be analyzed during the detailed design stage.
- The existing 200mm watermain on the development property will be removed/abandoned and rerouted along McCool Street to service Zone R1.
- The existing 200mm watermain on Nichol Street will be extended and shall serve as the water supply for Zone R4 and R6.
- The domestic maximum day demand and peak hourly demand were found to be 9.08 L/s and 15.86 L/s, respectively.
- The required fire flow demand for the proposed development was found to be 133 L/s using the FUS criteria.
- The existing municipal watermain can supply approximately 70 L/, therefore, on-site fire water storage reservoirs will be utilized to provide the remaining required fire fighting capacity.
- An analysis of the hydraulic modelling by the County consultants has been requested to determine the water servicing capacity and constraints on the existing water system to ensure adequate system flows and pressure for the domestic and fire demands.

It is recommended that this report be provided to the Norfolk County and the Long Point Region Conservation Authority in support of the application for zoning by-law amendment for the proposed development.

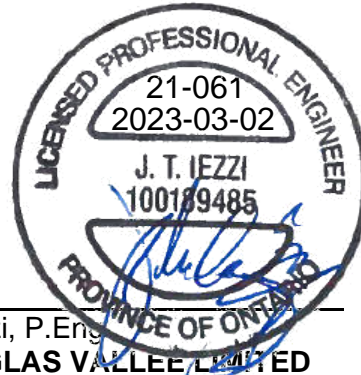
We trust that this information is complete and sufficient for submission. Should you have any questions or require further information please do not hesitate to contact us.

**G. DOUGLAS VALLEE LIMITED**  
**Consulting Engineers, Architects & Planners**

Respectfully submitted,



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**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects and Planners



John Iezzi, P.Eng.  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects and Planners

#### Appendix A

– 21-061 Sanitary Flow Calculation

#### Appendix B

– Soil Parameters  
– 21-061 PRE – Pre-Development SWM Drainage Area  
– 21-061 POST – Post-Development SWM Drainage Area  
– 21-061 SWM Parameters and Calculations  
– Visual OTTHYMO Summary Output

#### Appendix C

– Domestic Water Demand Calculations  
– Fire Flow Calculation Distances  
– FUS Calculations  
– Norfolk ISMP Map  
– *Fire Water Infrastructure Assessment* by ARC Engineering Inc. dated January 14, 2022

#### Appendix D

– Refer to DWG C100 – General Plan of Services

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## **APPENDIX A**

21-061 Sanitary Flow Calculation



## Norfolk County Design Criteria Section 9.2 - Sanitary Sewage Flow

### 9.2.01 Tributary Population

Residential Development:	2.75 persons/unit
Units:	16 Units
Accessopry Dwelling Units:	16 Units
Total Units:	32 Units
Number of Persons:	88 persons
Site Area	0.61 ha

### 9.2.02 Sewage Flow

Residential Development:	0.45 m <sup>3</sup> /person/day
Average Sewage Flow:	0.458 L/s

### 9.2.03 Peak Sanitary Flow Factor

Commercial Peaking Factor Formula:	
$M = 1 + (14 / (4 + [14 / \{4 + P^{(0.5)}\}]))$	
P =	0.088
M =	4.258

### 9.2.04 Infiltration Allowance

Infiltration Allowance:	0.28 L/s/ha
Infiltration Allowance:	0.171 L/s

### 9.2.05 Design Flow

Design Flow:  
 Design Flow = (Average Sewage Flow \* Peak Sanitary Flow Factor) + Infil. Allowance

Design Flow =	2.12 L/s
---------------	----------

## Norfolk County Design Criteria Section 9.2 - Sanitary Sewage Flow

### 9.2.01 Tributary Population

Residential Development:	2.75 persons/unit
Units:	76 Units
Number of Persons:	209 persons
Site Area	2.06 ha

### 9.2.02 Sewage Flow

Residential Development:	0.45 m <sup>3</sup> /person/day
Average Sewage Flow:	1.089 L/s

### 9.2.03 Peak Sanitary Flow Factor

Commercial Peaking Factor Formula:  
 $M = 1 + (14 / (4 + [14 / \{4 + P^{(0.5)}\}]))$   
 P =  
 M =

0.209  
 4.141

### 9.2.04 Infiltration Allowance

Infiltration Allowance:	0.28 L/s/ha
Infiltration Allowance:	0.578 L/s

### 9.2.05 Design Flow

Design Flow:  
 Design Flow = (Average Sewage Flow \* Peak Sanitary Flow Factor) + Infil. Allowance

Design Flow =	5.09 L/s
---------------	----------

## Norfolk County Design Criteria Section 9.2 - Sanitary Sewage Flow

### 9.2.01 Tributary Population

Residential Development:	2.75 persons/unit
Units:	164 Units
Number of Persons:	451 persons
Site Area	0.82 ha

### 9.2.02 Sewage Flow

Residential Development:	0.45 m <sup>3</sup> /person/day
Average Sewage Flow:	2.349 L/s

### 9.2.03 Peak Sanitary Flow Factor

Commercial Peaking Factor Formula:  
 $M = 1 + (14 / (4 + [14 / \{4 + P^{(0.5)}\}]))$   
P =  
M =

0.451  
3.997

### 9.2.04 Infiltration Allowance

Infiltration Allowance:	0.28 L/s/ha
Infiltration Allowance:	0.230 L/s

### 9.2.05 Design Flow

Design Flow:  
Design Flow = (Average Sewage Flow \* Peak Sanitary Flow Factor) + Infil. Allowance

Design Flow =	9.62 L/s
---------------	----------

## Norfolk County Design Criteria Section 9.2 - Sanitary Sewage Flow

### 9.2.01 Tributary Population

Commercial Development:	90 persons/ha
Commercial Area:	0.30 ha
Number of Persons:	27 persons

### 9.2.02 Sewage Flow

Commercial Development:	40 m <sup>3</sup> /ha/day
Average Sewage Flow:	0.139 L/s

### 9.2.03 Peak Sanitary Flow Factor

Commercial Peaking Factor Formula:

$$M = 0.8(1 + (14 / (4 + (Pe^{0.5}))))$$

Pe =	0.027
------	-------

M =	3.490
-----	-------

### 9.2.05 Design Flow

Design Flow:

Design Flow = (Average Sewage Flow \* Peak Sanitary Flow Factor)

Design Flow =	0.48 L/s
---------------	----------



**Summary of Design Flows**

**McCool Street Single Detached Dwellings  
with Accessory Dwellings**

2.12 L/s

**Condo Development**

5.09 L/s

**Mid-Rise - Residential (Level 2-8)**

9.62 L/s

**Mid-Rise - Commercial (Level 1)**

0.48 L/s

<b>Total Design Flow:</b>	<b>17.31 L/s</b>
---------------------------	------------------

## **APPENDIX B**

Soil Parameters

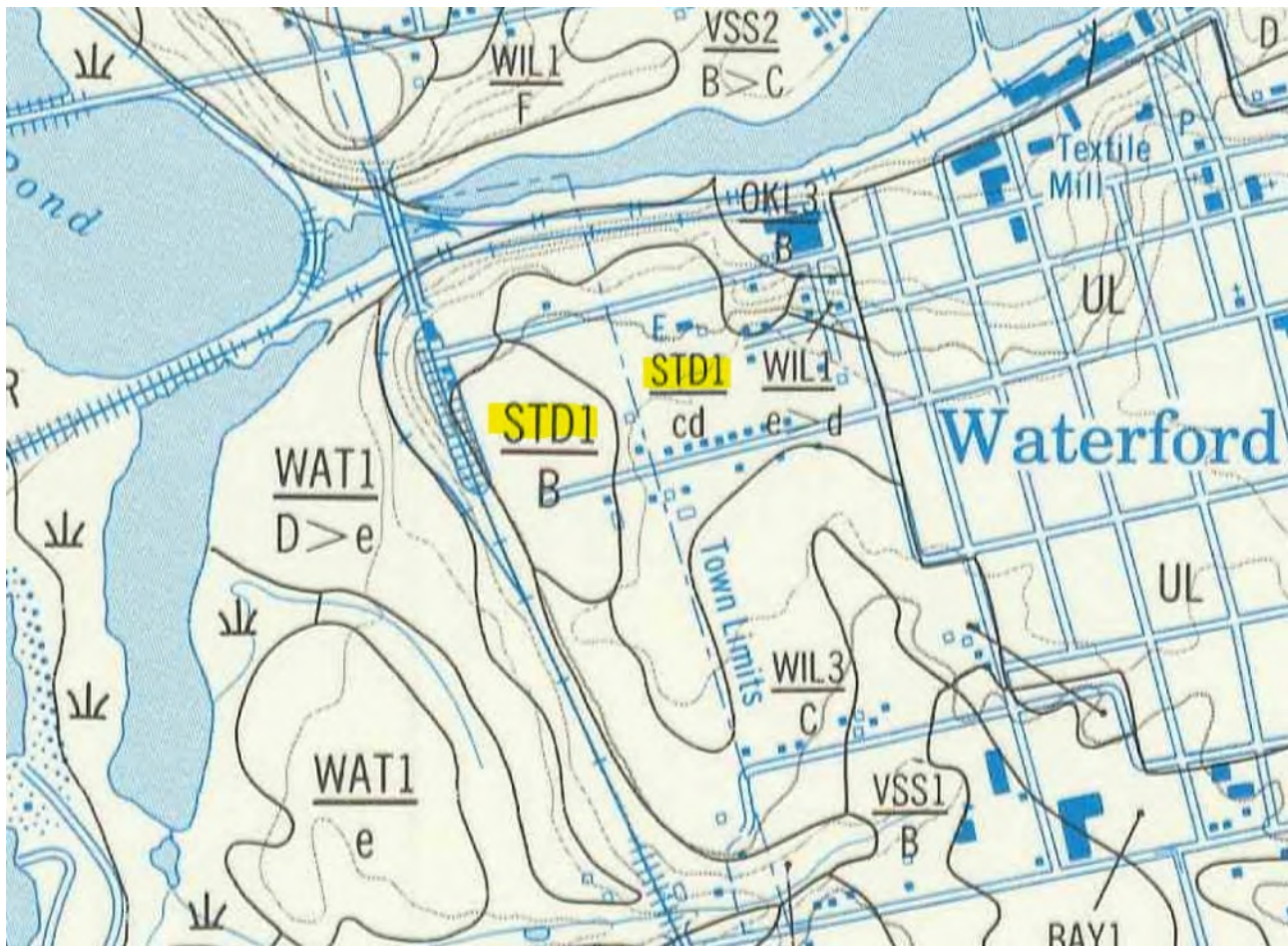
21-061 PRE – Pre-Development SWM Drainage Area

21-061 POST – Post-Development SWM Drainage Area

21-061 SWM Parameters and Calculations

Visual OTTHYMO Summary Output

## 21-061 Soil Parameters



STD - Scotland				
STD 1	STD	None	40-100 cm sandy textures over gravelly sandy till	Rapid to well

CHART C2-2 - HYDROLOGIC SOIL GROUPS FOR GENERAL SOIL TYPES

<u>Sands, sandy loams, and gravels</u> - overlying sand, gravel or limestone bedrock, very well drained - ditto, imperfectly drained - Shallow, overlying precambrian bedrock or clay subsoil	A  AB  B
<u>Coarse loams</u> - overlying sand, gravel or limestone, well drained - shallow, overlying precambrian bedrock or clay subsoil	AB  B
<u>Medium textured loams</u> - shallow, overlying limestone bedrock - overlying medium textured subsoil	B  BC
<u>Silt loams, some loams</u> - with good internal drainage - with slow internal drainage and good external drainage	BC  C
<u>Clays, clay loams, silty clay loams</u> - with good internal drainage - with imperfect or poor external drainage - with slow internal drainage and good external drainage	C  C  D

Note: Soils are classified on the basis of bare soil having maximum swelling at the end of a long storm whose rainfall exceeds infiltration into soil. Classifications shown are subject to modification as experience dictates.

Classifications are based on S.C.S. definitions (9) modified to suit Ontario conditions.



CHART C2-8 - SOIL/LAND USE CURVE NUMBERS

Land Use	Hydrologic Soil Group						
	A	AB	B	BC	C	CD	D
Fallow (special cases only)	77	82	86	89	91	93	94
Crop and other improved land	66*	70	74	78	82	84	86
Pasture & other unimproved land	58*	62*	65	71	76	79	81
Woodlots and forest	50*	54*	58	65	71	74	77
Impervious areas (paved)	98						
Bare rock draining <u>directly</u> to stream	98						
Bare rock draining <u>indirectly</u> to stream	70						
Water surfaces	100 (use in special cases only)						

Notes

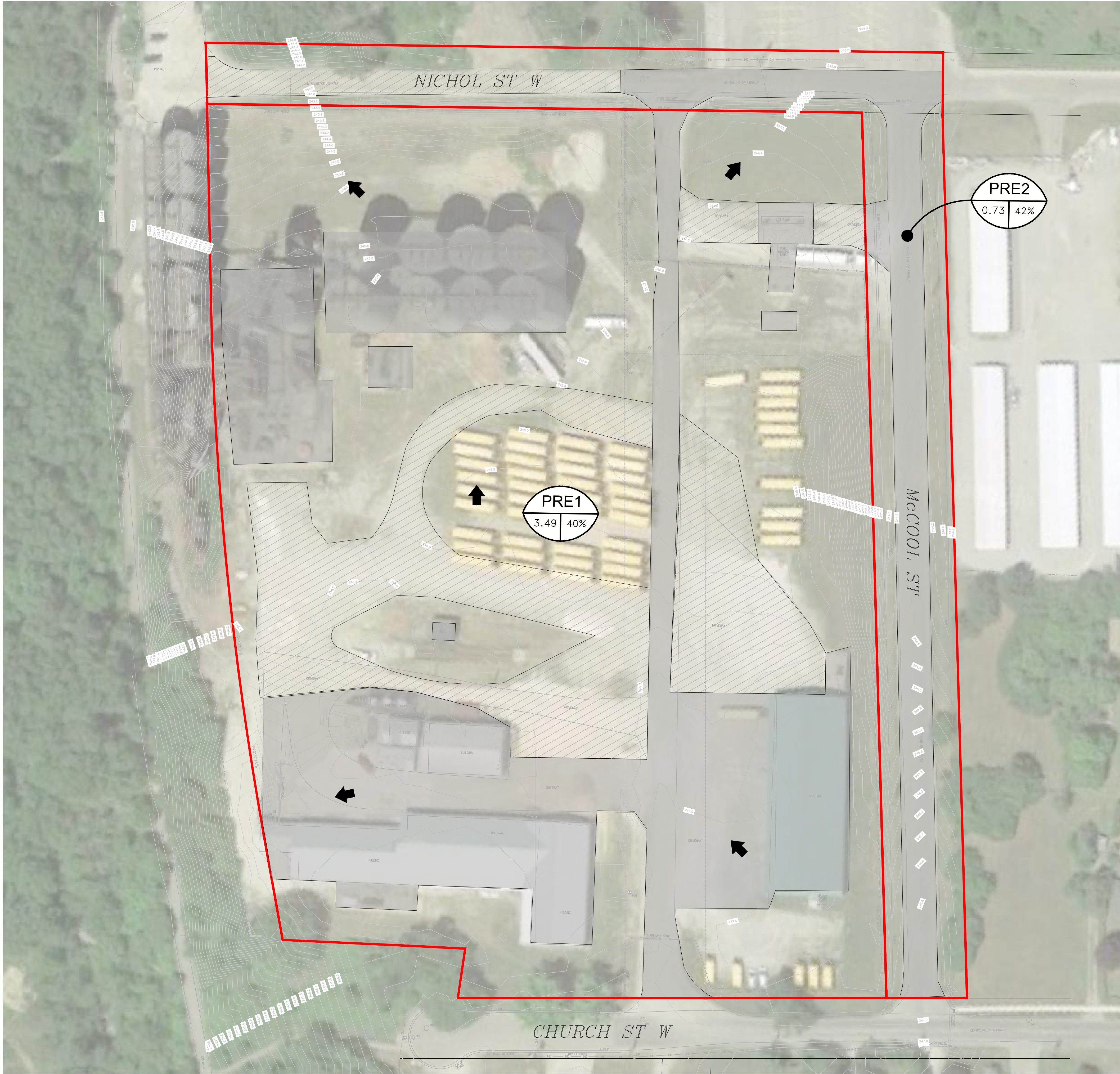
- Figures are based on average antecedent moisture condition (AMC II) except those marked \*, which are initially wet (AMC III) or an intermediate condition. For definition of AMC's see Chart C2-10.
- Table is not applicable to frozen soils or to periods in which snowmelt contributes to runoff.
- For detailed values in urban areas see Table 2.2 of ref. 14.
- Source: SCS Handbook of Hydrology, Chapter 9 (9), with modifications.

CHART C2-9 - PERCENT IMPERVIOUSNESS OF URBAN AREAS

Urban Land Use	% Imperviousness
Business - Commercial	40 - 90
Industrial - Light	45 - 65
Industrial - Heavy	50 - 70
Residential - Low density	20 - 30
Residential - Medium density	25 - 35
Residential - High density	30 - 40

Source: SCS Handbook of Hydrology, Chapter 15 (9)





**LEGEND**

➡ OVERLAND FLOW (MAJOR)

— PROPERTY/CATCHMENT BOUNDARY

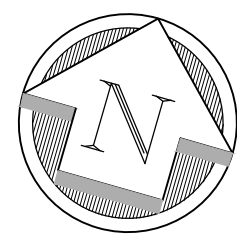
▨ IMPERVIOUS AREA – GRAVEL

■ IMPERVIOUS AREA – ASPHALT/CONCRETE

○ SWM — SWM DRAINAGE AREA

0.99 | 35.0% — TOTAL IMPERVIOUS PERCENTAGE (%)

— AREA (ha)



REV. No.	DATE	REVISION
0	JAN 19/2023	ISSUED FOR FUNCTIONAL SERVICING

SCALE: 5 10 15  
HORIZONTAL : 1:500

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Architects & Planners

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SIMCOE, ONTARIO N3Y 3W4  
(519) 426-6270

Stamp

**PRELIMINARY**  
NOT TO BE USED  
FOR CONSTRUCTION

Project Title

**SILOS OF WATERFORD**  
WATERFORD, NORFOLK COUNTY

Drawing Title	
PRE-DEVELOPMENT SWM DRAINAGE AREA	
Designed by : NLB	Drawn By : NLB
Checked by : JI	Date Started : 1/18/2023
Drawing Scale : 1:500	Drawing No. <b>PRE</b>
Project No. <b>20-128</b>	





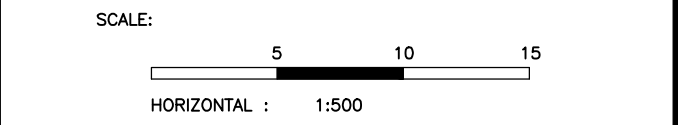
**LEGEND**

➔ OVERLAND FLOW (MAJOR)

--- PROPERTY/CATCHMENT BOUNDARY

**SWM** — SWM DRAINAGE AREA  
0.99 35.0% — TOTAL IMPERVIOUS PERCENTAGE (%)  
— AREA (ha)

REV. No.	DATE	REVISION
0	JAN 19/2023	ISSUED FOR FUNCTIONAL SERVICING



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**PRELIMINARY**  
NOT TO BE USED  
FOR CONSTRUCTION

Project Title

**SILOS OF WATERFORD**  
WATERFORD, NORFOLK COUNTY

Drawing Title	
POST-DEVELOPMENT SWM DRAINAGE AREA	
Designed by :	Drawn By :
NLB	NLB
Checked by :	Date Started :
JL	1/19/2023
Drawing Scale :	Drawing No.
1:500	<b>POST</b>
Project No.	21-061

### Pre-Development Catchment Parameters

Drainage Area	Runoff Coefficient Areas (ha)			Area (ha)	Composite Runoff Coeff.	TIMP (%)
	0.25	0.75	0.95			
PRE1	2.39	0.60	1.10	3.49	0.51	40%
PRE2	0.47	0.07	0.26	0.73	0.52	42%

$$C = 0.9 (\% \text{ imperv}) + 0.25 (1 - \% \text{ Imperv})$$

$$\% \text{ Imperv} = \frac{C - 0.25}{0.65} \times 100$$

### Post-Development Catchment Parameters

Drainage Area	Controlled?	Area (ha)	Imperv. Area (ha)	Directly Connected Imperv. (ha)	TIMP (%)	XIMP (%)
			(2)	(3)	(2)/(1)	(3)/(1)
POST1A	Controlled	2.88	2.66	0.98	92%	34%
POST1B	Uncontrolled	0.61	0.28	0.10	46%	16%
POST2	Uncontrolled	0.73	0.46	0.22	63%	31%

### Soil Parameters

Soil Type	AB - Sandy textures over gravelly sandy till		
CN (-)	70		
Initial Abstraction	9.0		
Infiltration Rate (i) (m/hr)		0.0114	
Void Ratio (Vr)		0.4	
Drainage Time (ts) (hr)		48	
Max allowable stone depth (drmax) (m)		1.37	



### Pre-Development Flow Rates

Design Storm	Q (m3/s)		
	TOTAL PRE	POST1B + POST 2 (Uncontrolled)	TARGET POST1A
2	0.084	0.073	0.011
5	0.191	0.119	0.072
10	0.276	0.149	0.127
25	0.384	0.203	0.181
50	0.518	0.240	0.278
100	0.628	0.277	0.351

### Pre-Development Rainfall Volumes

Return Period	Pre-Development		
	Area (ha.)	Vol. (mm)	Vol. (m3)
2	3.49	9.339	325.9
5		17.473	609.8
10		23.424	817.5
25		31.657	1104.8
50		38.464	1342.4
100		45.393	1584.2

### Post-Development Rainfall Volumes (Uncontrolled)

Return Period	POST1A		
	Area (ha.)	Vol. (mm)	Vol. (m3)
2	2.88	27.869	802.6
5		41.142	1184.9
10		49.816	1434.7
25		61.019	1757.3
50		69.820	2010.8
100		78.477	2260.1

Return Period	POST1B + POST2		
	Area (ha.)	Vol. (mm)	Vol. (m3)
2	1.34	15.496	207.6
5		25.079	336.1
10		31.787	425.9
25		40.840	547.3
50		48.196	645.8
100		55.597	745.0

100 YR POST1A - 100 YR PRE + 100YR POST1B + POST2	1420.9
Overall Target Pond Storage (10% Surplus) (m3)	1563.0

### Chamber Parameters

Model	MC-4500	
Number of Chambers	231	
Number of End Caps	28	
Depth of Stone Above Chamber	300	mm
Depth of Stone Below Chambers	305	mm
Base of Stone Elev.	242.10	m
Base of Chamber Elev.	242.41	m
Height of Chambers	1525	mm
Top of Chamber Elv.	243.93	m
Top of Stone Elev.	244.23	m
Min. Cover (For Vehicles)	0.70	m (min 600mm plus 100mm pavement layer)
Min Surface Elev.	244.63	m
Max. Cover	2.10	m
Max Surface Elev.	246.03	m
System Footprint	936.33	m2
Impermeable liner?	No	

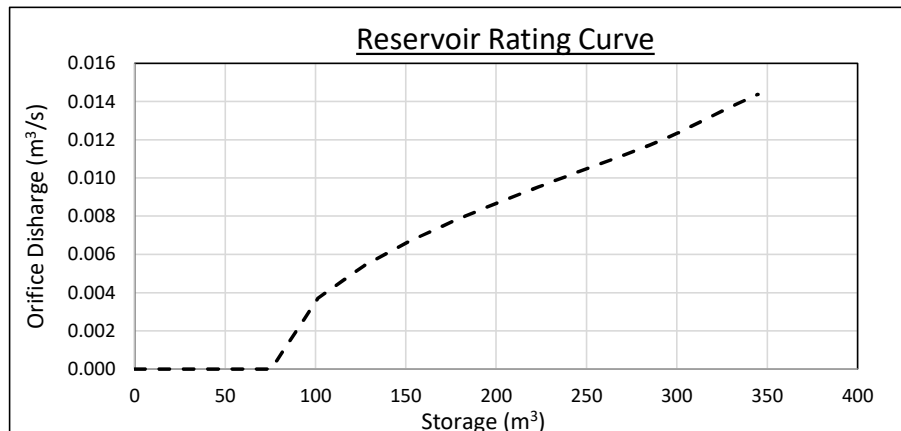
### Orifice Parameters

	Diameter	0.100	m
	Area	0.0079	m2
<b>Orifice #1</b>	Elevation	242.40	m
	Depth	0.30	m
	Diameter	0.300	m
<b>Orifice #2</b>	Area	0.0707	m2
	Elevation	243.00	m

### Stage-Storage-Discharge

Description	Elevation (m)	Stage (mm)	Stage (m)	Volume (m3)	Height Above Invert (m)	Q (m3/s) Orifice 1	Q (m3/s) Orifice 2	Q (m3/s) Total
Base of Stone Storage	242.10	0	0.000	0.00	0.000	0.000	0.000	0.000
	242.20	102	0.102	38.04	0.000	0.000	0.000	0.000
	242.30	203	0.203	76.09	0.000	0.000	0.000	0.000
Base of Chamber/Orifice 1	242.41	305	0.305	114.13	0.005	0.002	0.000	0.002
	242.51	406	0.406	193.13	0.106	0.007	0.000	0.007
	242.61	508	0.508	271.47	0.208	0.010	0.000	0.010
	242.71	610	0.610	349.00	0.310	0.012	0.000	0.012
	242.81	711	0.711	425.55	0.411	0.014	0.000	0.014
	242.91	813	0.813	500.93	0.513	0.016	0.000	0.016
	243.01	914	0.914	574.94	0.614	0.017	0.023	0.041
	243.12	1016	1.016	647.34	0.716	0.019	0.067	0.086
	243.22	1118	1.118	717.91	0.818	0.020	0.092	0.112
Orifice 2	243.32	1219	1.219	786.33	0.919	0.021	0.111	0.132
	243.42	1321	1.321	852.25	1.021	0.022	0.128	0.150
	243.52	1422	1.422	915.22	1.122	0.023	0.143	0.166
	243.62	1524	1.524	974.58	1.224	0.024	0.156	0.180
	243.73	1626	1.626	1029.27	1.326	0.025	0.168	0.193
	243.83	1727	1.727	1076.04	1.427	0.026	0.179	0.206
Top of Chamber	243.93	1829	1.829	1116.20	1.529	0.027	0.190	0.217
	244.03	1930	1.930	1154.24	1.630	0.028	0.200	0.228
	244.13	2032	2.032	1192.29	1.732	0.029	0.210	0.239
Top of Stone Storage	244.23	2134	2.134	1230.33	1.834	0.030	0.219	0.249

\*Storage volumes obtained from OTTHYMO



### Pre-Development to Post-Development Flow Rates

Return Period	Q (m3/s)			Check
	TOTAL PRE	TOTAL POST	Net	
2	0.084	0.081	-0.003	✓
5	0.191	0.145	-0.046	✓
10	0.276	0.204	-0.072	✓
25	0.384	0.272	-0.112	✓
50	0.518	0.340	-0.178	✓
100	0.628	0.409	-0.219	✓

### Stage-Storage of Chambers

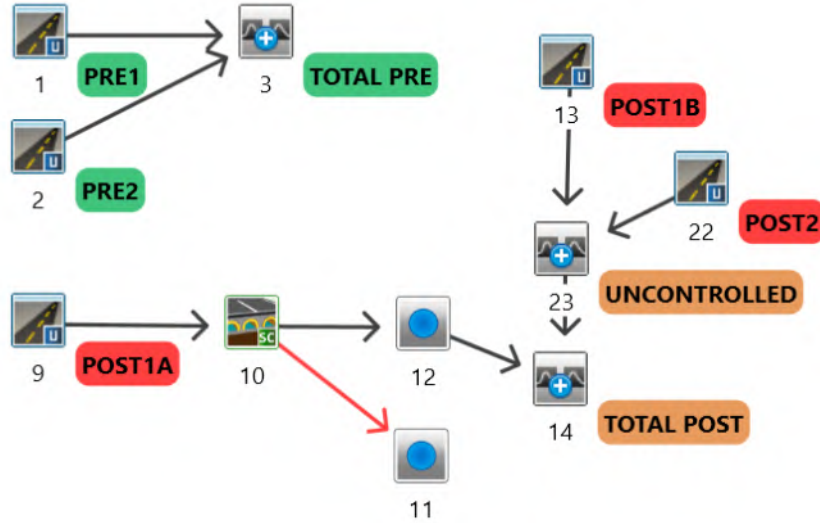
Description	Elevation (m)	Ponding Depth (m)	Total Volume (m3)	Total Q (m3/s)
Base of Stone Storage	242.10	0.0	0.0	0.000
	242.20	0.1	38.0	0.000
	242.30	0.2	76.1	0.000
Base of Chamber/Orifice 1	242.41	0.3	114.1	0.002
	242.51	0.4	193.1	0.007
	242.61	0.5	271.5	0.010
	242.71	0.6	349.0	0.012
	242.81	0.7	425.5	0.014
	242.91	0.8	500.9	0.016
	243.01	0.9	574.9	0.041
	243.12	1.0	647.3	0.086
	243.22	1.1	717.9	0.112
	243.32	1.2	786.3	0.132
Orifice 2	243.42	1.3	852.3	0.150
	243.52	1.4	915.2	0.166
	243.62	1.5	974.6	0.180
	243.73	1.6	1029.3	0.193
	243.83	1.7	1076.0	0.206
	243.93	1.8	1116.2	0.217
Top of Chamber	244.03	1.9	1154.2	0.228
	244.13	2.0	1192.3	0.239
	244.23	2.1	1230.3	0.249

\*Storage volumes obtained from AutoCAD Civil 3D

### Approximate Ponding Stages

Return Period	Flow From Chambers (m3/s)	Utilized Storage (m3)	Ponding Depth (m)	Elev. (m)
2	0.033	553	0.88	242.98
5	0.097	678	1.06	242.98
10	0.130	778	1.21	243.16
25	0.166	916	1.42	243.52
50	0.193	1028	1.62	243.72
100	0.223	1136	1.88	243.98

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Visual OTTHYMO MODEL



2-YEAR STORM

=====

V V I SSSS U U A L (v 6.2.2007)

V V I SS U U A A L

V V I SS U U A A A A L

V V I SS U U A A L

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voim.dat  
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DATE: 01/20/2023 TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

\*\*\*\*\*  
\*\* SIMULATION : 01\_2-Year Norfolk \*\*  
\*\*\*\*\*

CHICAGO STORM | IDF curve parameters: A= 529.711  
| Ptotal= 35.21 mm | B= 4.501  
C= 0.745  
used in: INTENSITY = A / (t + B)^C  
Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.68	1.00	17.69	2.00	5.90	3.00	3.14
0.17	3.04	1.17	72.24	2.17	5.09	3.17	2.94
0.33	3.53	1.33	22.78	2.33	4.50	3.33	2.76
0.50	4.26	1.50	12.62	2.50	4.04	3.50	2.60
0.67	5.49	1.67	8.98	2.67	3.68	3.67	2.47
0.83	8.02	1.83	7.08	2.83	3.39	3.83	2.35

CALIB |  
STANDHYD ( 0009) | Area (ha)= 2.88  
ID= 1 DT= 5.0 min | Total Imp(%)= 92.00 Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.68	1.083	17.69	2.083	5.90	3.08	3.14
0.167	2.68	1.167	17.69	2.167	5.90	3.17	3.14
0.250	3.04	1.250	72.24	2.250	5.09	3.25	2.94
0.333	3.04	1.333	72.24	2.333	5.09	3.33	2.94
0.417	3.53	1.417	22.78	2.417	4.50	3.42	2.76
0.500	3.53	1.500	22.78	2.500	4.50	3.50	2.76
0.583	4.26	1.583	12.62	2.583	4.04	3.58	2.60
0.667	4.26	1.667	12.62	2.667	4.04	3.67	2.60
0.750	5.49	1.750	8.98	2.750	3.68	3.75	2.47
0.833	5.49	1.833	8.98	2.833	3.68	3.83	2.47
0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35
1.000	8.02	2.000	7.08	3.000	3.39	4.00	2.35

Max.Eff.Inten.(mm/hr)= 72.24 428.06  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 3.54 (ii) 8.04 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.26 0.13

PEAK FLOW (cms)= 0.19 0.19 0.353 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 34.21 24.60 27.87  
TOTAL RAINFALL (mm)= 35.21 35.21 35.21  
RUNOFF COEFFICIENT = 0.97 0.70 0.79

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON  
IN= 2--> OUT= 3 | CHAMBER:  
DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33

DEPTH	STORAGE	DEPTH	STORAGE
(mm)	(cu.m.)	(mm)	(cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53



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737.00	444.51		1829.00	1116.20
762.00	463.40		1854.00	1125.71
787.00	482.21		1880.00	1135.22
813.00	500.93		1905.00	1144.73
838.00	519.57		1930.00	1154.24
864.00	538.12		1956.00	1163.75
889.00	556.58		1981.00	1173.26
914.00	574.94		2007.00	1182.77
940.00	593.20		2032.00	1192.29
965.00	611.35		2057.00	1201.80
991.00	629.40		2083.00	1211.31
1016.00	647.34		2108.00	1220.82
1041.00	665.17		2134.00	1230.33
1067.00	682.87		0.00	0.00

DEPTH	DISCHARGE		DEPTH	DISCHARGE
(m)	(cms)		(m)	(cms)
0.000	0.000		0.919	0.132
0.005	0.002		1.021	0.150
0.106	0.007		1.122	0.166
0.208	0.010		1.224	0.180
0.310	0.012		1.326	0.193
0.411	0.014		1.427	0.206
0.513	0.016		1.529	0.217
0.614	0.041		1.630	0.228
0.716	0.086		1.732	0.239
0.818	0.112		1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW:ID= 2	2.88	0.353	1.33	27.87
OUTFLOW:ID= 1	2.88	0.033	2.50	19.15
OVERFLOW:ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%) = 31.28  
Time to reach Max storage (Hr) = 2.50  
Volume of water for drawdown in LID (cu.m.) = 464.13  
Volume of maximum water storage (cu.m.) = 540.64  
Calculated Drawdown Time (Hr) = 19.08

| Junction Command(0011) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3 ( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2 ( 0011)	0.00	0.00	0.00	0.00

| Junction Command(0012) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 1 ( 0010)	2.88	0.03	2.50	19.15
OUTFLOW: ID= 2 ( 0012)	2.88	0.03	2.50	19.15

| CALIB |  
| STANDHYD ( 0013) | Area (ha)= 0.61  
| ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 16.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----									
TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs
0.083	2.68		1.083	17.69		2.083	5.90		3.08
0.167	2.68		1.167	17.69		2.167	5.90		3.17
0.250	3.04		1.250	72.24		2.250	5.09		3.25
0.333	3.04		1.333	72.24		2.333	5.09		3.33
0.417	3.53		1.417	22.78		2.417	4.50		3.42
0.500	3.53		1.500	22.78		2.500	4.50		3.50
0.583	4.26		1.583	12.62		2.583	4.04		3.58
0.667	4.26		1.667	12.62		2.667	4.04		3.67
0.750	5.49		1.750	8.98		2.750	3.68		3.75
0.833	5.49		1.833	8.98		2.833	3.68		3.83
0.917	8.02		1.917	7.08		2.917	3.39		3.92
1.000	8.02		2.000	7.08		3.000	3.39		4.00

Max.Eff.Inten.(mm/hr)= 72.24 17.46  
over (min)= 5.00 20.00  
Storage Coeff. (min)= 2.22 (ii) 16.41 (ii)  
Unit Hyd. Tpeak (min)= 5.00 20.00  
Unit Hyd. peak (cms)= 0.30 0.06

PEAK FLOW (cms)= 0.02 0.01 0.022 (iii)  
TIME TO PEAK (hrs)= 1.33 1.58 1.33  
RUNOFF VOLUME (mm)= 34.21 8.71 12.77  
TOTAL RAINFALL (mm)= 35.21 35.21 35.21  
RUNOFF COEFFICIENT = 0.97 0.25 0.36

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |  
| STANDHYD ( 0022) | Area (ha)= 0.73  
| ID= 1 DT= 5.0 min | Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.27
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	69.76	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----									
TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs
0.083	2.68		1.083	17.69		2.083	5.90		3.08
0.167	2.68		1.167	17.69		2.167	5.90		3.17
0.250	3.04		1.250	72.24		2.250	5.09		3.25
0.333	3.04		1.333	72.24		2.333	5.09		3.33
0.417	3.53		1.417	22.78		2.417	4.50		3.42
0.500	3.53		1.500	22.78		2.500	4.50		3.50
0.583	4.26		1.583	12.62		2.583	4.04		3.58
0.667	4.26		1.667	12.62		2.667	4.04		3.67
0.750	5.49		1.750	8.98		2.750	3.68		3.75
0.833	5.49		1.833	8.98		2.833	3.68		3.83
0.917	8.02		1.917	7.08		2.917	3.39		3.92
1.000	8.02		2.000	7.08		3.000	3.39		4.00

Max.Eff.Inten.(mm/hr)= 72.24 26.47  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 2.34 (ii) 14.36 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.30 0.08

\*TOTALS\*  
PEAK FLOW (cms)= 0.04 0.01 0.050 (iii)  
TIME TO PEAK (hrs)= 1.33 1.50 1.33  
RUNOFF VOLUME (mm)= 34.21 10.40 17.77  
TOTAL RAINFALL (mm)= 35.21 35.21 35.21  
RUNOFF COEFFICIENT = 0.97 0.30 0.50

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD ( 0023) |  
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.  
(ha) (cms) (hrs) (mm)  
ID1= 1 ( 0013): 0.61 0.022 1.33 12.77  
+ ID2= 2 ( 0022): 0.73 0.050 1.33 17.77  
===== ID = 3 ( 0023): 1.34 0.072 1.33 15.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD ( 0014) |  
| 1 + 2 = 3 | AREA QPEAK TPEAK R.V.  
(ha) (cms) (hrs) (mm)  
ID1= 1 ( 0012): 2.88 0.033 2.50 19.15  
+ ID2= 2 ( 0023): 1.34 0.072 1.33 15.50  
===== ID = 3 ( 0014): 4.22 0.081 1.33 17.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |  
| STANDHYD ( 0002) | Area (ha)= 0.73  
| ID= 1 DT= 5.0 min | Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.31	0.42
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	69.76	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----									
TIME	RAIN		TIME	RAIN		TIME	RAIN		TIME
hrs	mm/hr		hrs	mm/hr		hrs	mm/hr		hrs
0.083	2.68		1.083	17.69		2.083	5.90		3.08
0.167	2.68		1.167	17.69		2.167	5.90		3.17
0.250	3.04		1.250	72.24		2.250	5.09		3.25
0.333	3.04		1.333	72.24		2.333	5.09		3.33
0.417	3.53		1.417	22.78		2.417	4.50		3.42
0.500	3.53		1.500	22.78		2.500	4.50		3.50
0.583	4.26		1.583	12.62		2.583	4.04		3.58
0.667	4.26		1.667	12.62		2.667	4.04		3.67
0.750	5.49		1.750	8.98		2.750	3.68		3.75
0.833	5.49		1.833	8.98		2.833	3.68		3.83
0.917	8.02		1.917	7.08		2.917	3.39		3.92
1.000	8.02		2.000	7.08		3.000	3.39		4.00

Max.Eff.Inten.(mm/hr)= 72.24 22.21  
over (min)= 5.00 20.00  
Storage Coeff. (min)= 2.34 (ii) 15.23 (ii)

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Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.30	0.07	
*TOTALS*			
PEAK FLOW (cms)=	0.00	0.02	0.016 (iii)
TIME TO PEAK (hrs)=	1.33	1.58	1.58
RUNOFF VOLUME (mm)=	34.21	9.66	9.64
TOTAL RAINFALL (mm)=	35.21	35.21	35.21
RUNOFF COEFFICIENT =	0.97	0.27	0.27

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----  
| CALIB |  
| STANDHYD ( 0001) | Area (ha)= 3.49  
| ID= 1 DT= 5.0 min | Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00  
-----

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.40	2.09
Dep. Storage (mm)=	9.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	152.53	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.68	1.083	17.69	2.083	5.90	3.08	3.14
0.167	2.68	1.167	17.69	2.167	5.90	3.17	3.14
0.250	3.04	1.250	72.24	2.250	5.09	3.25	2.94
0.333	3.04	1.333	72.24	2.333	5.09	3.33	2.94
0.417	3.53	1.417	22.78	2.417	4.50	3.42	2.76
0.500	3.53	1.500	22.78	2.500	4.50	3.50	2.76
0.583	4.26	1.583	12.62	2.583	4.04	3.58	2.60
0.667	4.26	1.667	12.62	2.667	4.04	3.67	2.60
0.750	5.49	1.750	8.98	2.750	3.68	3.75	2.47
0.833	5.49	1.833	8.98	2.833	3.68	3.83	2.47
0.917	8.02	1.917	7.08	2.917	3.39	3.92	2.35
1.000	8.02	2.000	7.08	3.000	3.39	4.00	2.35

Max.Eff.Inten.(mm/hr)=	72.24	20.55	
over (min)=	5.00	20.00	
Storage Coeff. (min)=	3.75 (ii)	17.04 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.27	0.06	
*TOTALS*			
PEAK FLOW (cms)=	0.00	0.07	0.069 (iii)
TIME TO PEAK (hrs)=	1.33	1.58	1.58
RUNOFF VOLUME (mm)=	26.21	9.34	9.34
TOTAL RAINFALL (mm)=	35.21	35.21	35.21
RUNOFF COEFFICIENT =	0.74	0.27	0.27

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----  
| ADD HYD ( 0003) |  
1 + 2 = 3
ID1= 1 ( 0001): AREA QPEAK TPEAK R.V.  
(ha) (cms) (hrs) (mm)  
+ ID2= 2 ( 0002): 3.49 0.069 1.58 9.34  
0.73 0.016 1.58 9.64  
=====

ID = 3 ( 0003): 4.22 0.084 1.58 9.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

**5-YEAR STORM**

```
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
```

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OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
OOO T T H H Y Y M M OOO
```

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat  
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\d560e12a-89f6-4cde-9c45-519560735648\scen  
Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\d560e12a-89f6-4cde-9c45-519560735648\scen

DATE: 01/20/2023 TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

\*\*\*\*\* SIMULATION : 02\_5-Year Norfolk \*\*\*\*\*

CHICAGO STORM | IDF curve parameters: A= 583.017  
| Ptotal= 49.03 mm | B= 3.007  
C= 0.703  
used in: INTENSITY = A / (t + B)^C  
Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	4.20	1.00	23.22	2.00	8.64	3.00	4.87
0.17	4.72	1.17	96.03	2.17	7.56	3.17	4.58
0.33	5.42	1.33	29.33	2.33	6.76	3.33	4.32
0.50	6.44	1.50	17.13	2.50	6.13	3.50	4.10
0.67	8.09	1.67	12.62	2.67	5.63	3.67	3.90
0.83	11.39	1.83	10.19	2.83	5.22	3.83	3.72

CALIB |  
| STANDHYD ( 0009) | Area (ha)= 2.88  
| ID= 1 DT= 5.0 min | Total Imp(%)= 92.00 Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 635.09  
over (min)= 5.00 10.00  
Storage Coeff.(min)= 3.16 (ii) 7.18 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.27 0.14

PEAK FLOW (cms)= 0.25 0.29 0.517 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 48.03 37.59 41.14  
TOTAL RAINFALL (mm)= 49.03 49.03 49.03  
RUNOFF COEFFICIENT = 0.98 0.77 0.84

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON  
IN= 2--> OUT= 3 | CHAMBER:  
DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33

DEPTH	STORAGE	DEPTH	STORAGE
(mm)	(cu.m.)	(mm)	(cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53
737.00	444.51	1829.00	1116.20
762.00	463.40	1854.00	1125.71
787.00	482.21	1880.00	1135.22
813.00	500.93	1905.00	1144.73
838.00	519.57	1930.00	1154.24
864.00	538.12	1956.00	1163.75
889.00	556.58	1981.00	1173.26
914.00	574.94	2007.00	1182.77
940.00	593.20	2032.00	1192.29
965.00	611.35	2057.00	1201.80
991.00	629.40	2083.00	1211.31
1016.00	647.34	2108.00	1220.82
1041.00	665.17	2134.00	1230.33
1067.00	682.87	0.00	0.00

DEPTH	DISCHARGE	DEPTH	DISCHARGE
(m)	(cms)	(m)	(cms)
0.000	0.000	0.919	0.132
0.005	0.002	1.021	0.150
0.106	0.007	1.122	0.166
0.208	0.010	1.224	0.180
0.310	0.012	1.326	0.193
0.411	0.014	1.427	0.206
0.513	0.016	1.529	0.217
0.614	0.041	1.630	0.228
0.716	0.086	1.732	0.239
0.818	0.112	1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW:ID= 2	2.88	0.517	1.33	41.14
OUTFLOW:ID= 1	2.88	0.097	1.83	32.25
OVERFLOW:ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 21.62  
Time to reach Max storage (Hr)= 1.83  
Volume of water for drawdown in LID (cu.m.)= 486.19  
Volume of maximum water storage (cu.m.)= 648.26  
Calculated Drawdown Time (Hr)= 19.42

| Junction Command(0011) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2( 0011)	0.00	0.00	0.00	0.00

| Junction Command(0012) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 1( 0010)	2.88	0.10	1.83	32.25
OUTFLOW: ID= 2( 0012)	2.88	0.10	1.83	32.25

CALIB |  
| STANDHYD ( 0013) | Area (ha)= 0.61  
| ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 16.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n	0.013	0.250

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 34.15  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 1.98 (ii) 12.83 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.31 0.08  
  
PEAK FLOW (cms)= 0.03 0.02 \*TOTALS\*  
TIME TO PEAK (hrs)= 1.33 1.50 1.33  
RUNOFF VOLUME (mm)= 48.03 16.52 21.55  
TOTAL RAINFALL (mm)= 49.03 49.03 49.03  
RUNOFF COEFFICIENT = 0.98 0.34 0.44

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0022)	Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 0.46	IMPERVIOUS 0.27
Dep. Storage (mm)= 1.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	2.00
Length (m)= 69.76	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 60.33  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 2.09 (ii) 10.73 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.31 0.09  
  
PEAK FLOW (cms)= 0.06 0.03 \*TOTALS\*  
TIME TO PEAK (hrs)= 1.33 1.50 1.33  
RUNOFF VOLUME (mm)= 48.03 19.05 28.03  
TOTAL RAINFALL (mm)= 49.03 49.03 49.03  
RUNOFF COEFFICIENT = 0.98 0.39 0.57

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0023)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0013):	0.61	0.036	1.33	21.55
+ ID2= 2 ( 0022):	0.73	0.073	1.33	28.03
ID = 3 ( 0023):	1.34	0.109	1.33	25.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0014)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0012):	2.88	0.097	1.83	32.25
+ ID2= 2 ( 0023):	1.34	0.109	1.33	25.08

ID = 3 ( 0014): 4.22 0.145 1.67 29.97

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0002)	Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 0.31	IMPERVIOUS 0.42
Dep. Storage (mm)= 1.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	2.00
Length (m)= 69.76	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 51.54  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 2.09 (ii) 11.29 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.31 0.09  
  
PEAK FLOW (cms)= 0.00 0.04 \*TOTALS\*  
TIME TO PEAK (hrs)= 1.33 1.50 0.036 (iii)  
RUNOFF VOLUME (mm)= 48.03 17.95 17.94  
TOTAL RAINFALL (mm)= 49.03 49.03 49.03  
RUNOFF COEFFICIENT = 0.98 0.37 0.37

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 3.49
STANDHYD ( 0001)	Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 1.40	IMPERVIOUS 2.09
Dep. Storage (mm)= 9.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	2.00
Length (m)= 152.53	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	4.20	1.083	23.22	2.083	8.64	3.08	4.87
0.167	4.20	1.167	23.22	2.167	8.64	3.17	4.87
0.250	4.72	1.250	96.03	2.250	7.56	3.25	4.58
0.333	4.72	1.333	96.03	2.333	7.56	3.33	4.58
0.417	5.42	1.417	29.33	2.417	6.76	3.42	4.32
0.500	5.42	1.500	29.33	2.500	6.76	3.50	4.32
0.583	6.44	1.583	17.13	2.583	6.13	3.58	4.10
0.667	6.44	1.667	17.13	2.667	6.13	3.67	4.10
0.750	8.09	1.750	12.62	2.750	5.63	3.75	3.90
0.833	8.09	1.833	12.62	2.833	5.63	3.83	3.90
0.917	11.39	1.917	10.19	2.917	5.22	3.92	3.72
1.000	11.39	2.000	10.19	3.000	5.22	4.00	3.72

Max.Eff.Inten.(mm/hr)= 96.03 48.08  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 3.34 (ii) 12.80 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.28 0.08  
  
PEAK FLOW (cms)= 0.00 0.16 \*TOTALS\*  
TIME TO PEAK (hrs)= 1.33 1.50 0.156 (iii)  
RUNOFF VOLUME (mm)= 40.03 17.47 17.47  
TOTAL RAINFALL (mm)= 49.03 49.03 49.03  
RUNOFF COEFFICIENT = 0.82 0.36 0.36

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.



17-089 Thompson Farm Subdivision  
Visual OTTHYMO MODEL

-----				
ADD HYD ( 0003)				
1 + 2 = 3				
-----				
		AREA	QPEAK	TPEAK
		(ha)	(cms)	(hrs)
				R.V.
				(mm)
ID1= 1 ( 0001):		3.49	0.156	1.50
+ ID2= 2 ( 0002):		0.73	0.036	1.50
				17.47
				17.94
=====				
ID = 3 ( 0003):		4.22	0.191	1.50
				17.55

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

**10-YEAR STORM**

```
=====
V  V  I  SSSSS  U  U  A  L          (v 6.2.2007)
V  V  I  SS      U  U  A  A  L
V  V  I  SS      U  U  AAAAA  L
V  V  I  SS      U  U  A  A  L
VV    I  SSSSS  UUUUU  A  A  LLLLL
```

```
OOO  TTTT  TTTT  H  H  Y  Y  M  M  OOO  TM
O  O  T  T  H  H  Y  Y  MM  MM  O  O
O  O  T  T  H  H  Y  Y  M  M  O  O
OOO  T  T  H  H  Y  Y  M  M  OOO
```

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat  
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\1f9e277f-d4dc-42bf-a562-18d78f46e9f1\scen  
Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\1f9e277f-d4dc-42bf-a562-18d78f46e9f1\scen

DATE: 01/20/2023

TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

```
*****
** SIMULATION : 03_10-Year Norfolk **
*****
```

```
-----
| CHICAGO STORM |
| Ptotal= 57.94 mm |
-----
```

IDF curve parameters: A= 670.324  
B= 3.007  
C= 0.698

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	5.04	1.00	27.43	2.00	10.30	3.00	5.84
0.17	5.66	1.17	111.84	2.17	9.03	3.17	5.49
0.33	6.49	1.33	34.58	2.33	8.07	3.33	5.18
0.50	7.70	1.50	20.31	2.50	7.33	3.50	4.92
0.67	9.66	1.67	15.00	2.67	6.74	3.67	4.68
0.83	13.55	1.83	12.13	2.83	6.25	3.83	4.47

```
-----
| CALIB |
| STANDHYD ( 0009) |
| ID= 1 DT= 5.0 min |
-----
```

Area (ha)= 2.88  
Total Imp(%)= 92.00 Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
-----
TIME  RAIN | TIME  RAIN | ' TIME  RAIN | TIME  RAIN
hrs  mm/hr | hrs  mm/hr | ' hrs  mm/hr | hrs  mm/hr
0.083 5.04 | 1.083 27.43 | 2.083 10.30 | 3.08 5.84
0.167 5.04 | 1.167 27.43 | 2.167 10.30 | 3.17 5.84
0.250 5.66 | 1.250 111.84 | 2.250 9.03 | 3.25 5.49
0.333 5.66 | 1.333 111.84 | 2.333 9.03 | 3.33 5.49
0.417 6.49 | 1.417 34.58 | 2.417 8.07 | 3.42 5.18
0.500 6.49 | 1.500 34.58 | 2.500 8.07 | 3.50 5.18
0.583 7.70 | 1.583 20.31 | 2.583 7.33 | 3.58 4.92
0.667 7.70 | 1.667 20.31 | 2.667 7.33 | 3.67 4.92
0.750 9.66 | 1.750 15.00 | 2.750 6.74 | 3.75 4.68
0.833 9.66 | 1.833 15.00 | 2.833 6.74 | 3.83 4.68
0.917 13.55 | 1.917 12.13 | 2.917 6.25 | 3.92 4.47
1.000 13.55 | 2.000 12.13 | 3.000 6.25 | 4.00 4.47
```

Max.Eff.Inten.(mm/hr)= 111.84 772.51  
over (min) 5.00 10.00  
Storage Coeff. (min)= 2.97 (ii) 6.75 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.28 0.14

PEAK FLOW (cms)= 0.30 0.36 0.629 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 56.94 46.14 49.82  
TOTAL RAINFALL (mm)= 57.94 57.94 57.94  
RUNOFF COEFFICIENT = 0.98 0.80 0.86

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON
| IN= 2--> OUT= 3 | CHAMBER:
| DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33
-----
```

DEPTH	STORAGE	DEPTH	STORAGE
(mm)	(cu.m.)	(mm)	(cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53
737.00	444.51	1829.00	1116.20
762.00	463.40	1854.00	1125.71
787.00	482.21	1880.00	1135.22
813.00	500.93	1905.00	1144.73
838.00	519.57	1930.00	1154.24
864.00	538.12	1956.00	1163.75
889.00	556.58	1981.00	1173.26
914.00	574.94	2007.00	1182.77
940.00	593.20	2032.00	1192.29
965.00	611.35	2057.00	1201.80
991.00	629.40	2083.00	1211.31
1016.00	647.34	2108.00	1220.82
1041.00	665.17	2134.00	1230.33
1067.00	682.87	0.00	0.00

DEPTH	DISCHARGE	DEPTH	DISCHARGE
(m)	(cms)	(m)	(cms)
0.000	0.000	0.919	0.132
0.005	0.002	1.021	0.150
0.106	0.007	1.122	0.166
0.208	0.010	1.224	0.180
0.310	0.012	1.326	0.193
0.411	0.014	1.427	0.206
0.513	0.016	1.529	0.217
0.614	0.041	1.630	0.228
0.716	0.086	1.732	0.239
0.818	0.112	1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW:ID= 2	2.88	0.629	1.33	49.82
OUTFLOW:ID= 1	2.88	0.130	1.83	40.88
OVERFLOW:ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 17.95  
Time to reach Max storage (Hr)= 1.83  
Volume of water for drawdown in LID (cu.m.)= 493.52  
Volume of maximum water storage (cu.m.)= 740.83  
Calculated Drawdown Time (Hr)= 19.50

-----  
Junction Command(0011)

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2( 0011)	0.00	0.00	0.00	0.00

-----  
Junction Command(0012)

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 1( 0010)	2.88	0.13	1.83	40.88
OUTFLOW: ID= 2( 0012)	2.88	0.13	1.83	40.88

```
-----
| CALIB |
| STANDHYD ( 0013) | Area (ha)= 0.61
| ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 16.00
-----
```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n	0.013	0.250

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 57.68  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 1.86 (ii) 10.66 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.32 0.09  
  
PEAK FLOW (cms)= 0.03 0.03 0.046 (iii)  
TIME TO PEAK (hrs)= 1.33 1.33  
RUNOFF VOLUME (mm)= 56.94 22.27 27.81  
TOTAL RAINFALL (mm)= 57.94 57.94 57.94  
RUNOFF COEFFICIENT = 0.98 0.38 0.48

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0022)	Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)=	0.46	0.27	
Dep. Storage (mm)=	1.00	9.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	69.76	40.00	
Mannings n =	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 81.80  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.97 (ii) 9.62 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.31 0.11  
  
PEAK FLOW (cms)= 0.07 0.04 0.101 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 56.94 25.31 35.11  
TOTAL RAINFALL (mm)= 57.94 57.94 57.94  
RUNOFF COEFFICIENT = 0.98 0.44 0.61

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0023)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0013):	0.61	0.046	1.33	27.81
+ ID2= 2 ( 0022):	0.73	0.101	1.33	35.11
ID = 3 ( 0023):	1.34	0.147	1.33	31.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0014)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0012):	2.88	0.130	1.83	40.88
+ ID2= 2 ( 0023):	1.34	0.147	1.33	31.79

ID = 3 ( 0014): 4.22 0.204 1.50 37.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0002)	Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)=	0.31	0.42	
Dep. Storage (mm)=	1.00	9.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	69.76	40.00	
Mannings n =	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 70.52  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 1.97 (ii) 10.08 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.31 0.10

PEAK FLOW (cms)= 0.00 0.05 0.051 (iii)  
TIME TO PEAK (hrs)= 1.33 1.50 1.50  
RUNOFF VOLUME (mm)= 56.94 23.99 23.98  
TOTAL RAINFALL (mm)= 57.94 57.94 57.94  
RUNOFF COEFFICIENT = 0.98 0.41 0.41

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 3.49
STANDHYD ( 0001)	Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area (ha)=	1.40	2.09	
Dep. Storage (mm)=	9.00	9.00	
Average Slope (%)=	1.00	2.00	
Length (m)=	152.53	40.00	
Mannings n =	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	5.04	1.083	27.43	2.083	10.30	3.08	5.84
0.167	5.04	1.167	27.43	2.167	10.30	3.17	5.84
0.250	5.66	1.250	111.84	2.250	9.03	3.25	5.49
0.333	5.66	1.333	111.84	2.333	9.03	3.33	5.49
0.417	6.49	1.417	34.58	2.417	8.07	3.42	5.18
0.500	6.49	1.500	34.58	2.500	8.07	3.50	5.18
0.583	7.70	1.583	20.31	2.583	7.33	3.58	4.92
0.667	7.70	1.667	20.31	2.667	7.33	3.67	4.92
0.750	9.66	1.750	15.00	2.750	6.74	3.75	4.68
0.833	9.66	1.833	15.00	2.833	6.74	3.83	4.68
0.917	13.55	1.917	12.13	2.917	6.25	3.92	4.47
1.000	13.55	2.000	12.13	3.000	6.25	4.00	4.47

Max.Eff.Inten.(mm/hr)= 111.84 66.06  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 3.15 (ii) 11.48 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.28 0.09

PEAK FLOW (cms)= 0.00 0.22 0.224 (iii)  
TIME TO PEAK (hrs)= 1.33 1.50 1.50  
RUNOFF VOLUME (mm)= 48.94 23.43 23.42  
TOTAL RAINFALL (mm)= 57.94 57.94 57.94  
RUNOFF COEFFICIENT = 0.84 0.40 0.40

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

17-089 Thompson Farm Subdivision  
Visual OTTHYMO MODEL

-----				
ADD HYD ( 0003)				
1 + 2 = 3				
-----				
		AREA	QPEAK	TPEAK
		(ha)	(cms)	(hrs)
				R.V.
				(mm)
ID1= 1 ( 0001):		3.49	0.224	1.50
+ ID2= 2 ( 0002):		0.73	0.051	1.50
				23.42
				23.98
=====				
ID = 3 ( 0003):		4.22	0.276	1.50
				23.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----



**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

**25-YEAR STORM**

```
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
```

```
OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
OOO T T H H Y Y M M OOO
```

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat  
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\7c0c3f58-ac24-4b2f-a116-5d327f27171e\scen  
Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\7c0c3f58-ac24-4b2f-a116-5d327f27171e\scen

DATE: 01/20/2023 TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

\*\*\*\*\* SIMULATION : 04\_25-Year Norfolk \*\*\*\*\*

CHICAGO STORM | IDF curve parameters: A= 721.533  
| Ptotal= 69.38 mm | B= 2.253  
C= 0.679  
used in: INTENSITY = A / (t + B)^C  
Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	6.34	1.00	31.84	2.00	12.58	3.00	7.30
0.17	7.08	1.17	131.63	2.17	11.08	3.17	6.87
0.33	8.07	1.33	39.74	2.33	9.96	3.33	6.50
0.50	9.51	1.50	23.97	2.50	9.08	3.50	6.18
0.67	11.82	1.67	17.98	2.67	8.38	3.67	5.90
0.83	16.33	1.83	14.70	2.83	7.79	3.83	5.64

CALIB |  
| STANDHYD ( 0009) | Area (ha)= 2.88  
| ID= 1 DT= 5.0 min | Total Imp(%)= 92.00 Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.34	1.083	31.84	2.083	12.58	3.08	7.30
0.167	6.34	1.167	31.84	2.167	12.58	3.17	7.30
0.250	7.08	1.250	131.63	2.250	11.08	3.25	6.87
0.333	7.08	1.333	131.63	2.333	11.08	3.33	6.87
0.417	8.07	1.417	39.74	2.417	9.96	3.42	6.50
0.500	8.07	1.500	39.74	2.500	9.96	3.50	6.50
0.583	9.51	1.583	23.97	2.583	9.08	3.58	6.18
0.667	9.51	1.667	23.97	2.667	9.08	3.67	6.18
0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

Max.Eff.Inten.(mm/hr)= 131.63 945.01  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 2.78 (ii) 6.33 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.28 0.15

PEAK FLOW (cms)= 0.35 0.44 0.772 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 68.38 57.23 61.02  
TOTAL RAINFALL (mm)= 69.38 69.38 69.38  
RUNOFF COEFFICIENT = 0.99 0.82 0.88

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON  
| IN= 2--> OUT= 3 | CHAMBER:  
| DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33

DEPTH	STORAGE	DEPTH	STORAGE
(mm)	(cu.m.)	(mm)	(cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53
737.00	444.51	1829.00	1116.20
762.00	463.40	1854.00	1125.71
787.00	482.21	1880.00	1135.22
813.00	500.93	1905.00	1144.73
838.00	519.57	1930.00	1154.24
864.00	538.12	1956.00	1163.75
889.00	556.58	1981.00	1173.26
914.00	574.94	2007.00	1182.77
940.00	593.20	2032.00	1192.29
965.00	611.35	2057.00	1201.80
991.00	629.40	2083.00	1211.31
1016.00	647.34	2108.00	1220.82
1041.00	665.17	2134.00	1230.33
1067.00	682.87	0.00	0.00

DEPTH	DISCHARGE	DEPTH	DISCHARGE
(m)	(cms)	(m)	(cms)
0.000	0.000	0.919	0.132
0.005	0.002	1.021	0.150
0.106	0.007	1.122	0.166
0.208	0.010	1.224	0.180
0.310	0.012	1.326	0.193
0.411	0.014	1.427	0.206
0.513	0.016	1.529	0.217
0.614	0.041	1.630	0.228
0.716	0.086	1.732	0.239
0.818	0.112	1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW:ID= 2	2.88	0.772	1.33	61.02
OUTFLOW:ID= 1	2.88	0.166	1.75	52.02
OVERFLOW:ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 14.75  
Time to reach Max storage (Hr)= 1.75  
Volume of water for drawdown in LID (cu.m.)= 507.51  
Volume of maximum water storage (cu.m.)= 867.31  
Calculated Drawdown Time (Hr)= 19.67

| Junction Command(0011) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2( 0011)	0.00	0.00	0.00	0.00

| Junction Command(0012) |

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 1( 0010)	2.88	0.17	1.75	52.02
OUTFLOW: ID= 2( 0012)	2.88	0.17	1.75	52.02

CALIB |  
| STANDHYD ( 0013) | Area (ha)= 0.61  
| ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 16.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n	0.013	0.250

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.34	1.083	31.84	2.083	12.58	3.08	7.30
0.167	6.34	1.167	31.84	2.167	12.58	3.17	7.30
0.250	7.08	1.250	131.63	2.250	11.08	3.25	6.87
0.333	7.08	1.333	131.63	2.333	11.08	3.33	6.87
0.417	8.07	1.417	39.74	2.417	9.96	3.42	6.50
0.500	8.07	1.500	39.74	2.500	9.96	3.50	6.50
0.583	9.51	1.583	23.97	2.583	9.08	3.58	6.18
0.667	9.51	1.667	23.97	2.667	9.08	3.67	6.18
0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

Max.Eff.Inten.(mm/hr)= 131.63 80.02  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.75 (ii) 9.46 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.12  
  
PEAK FLOW (cms)= 0.04 0.05 0.073 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 68.38 30.28 36.36  
TOTAL RAINFALL (mm)= 69.38 69.38 69.38  
RUNOFF COEFFICIENT = 0.99 0.44 0.52

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0022)	Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area	(ha)= 0.46	0.27	
Dep. Storage	(mm)= 1.00	9.00	
Average Slope	(%)= 1.00	2.00	
Length	(m)= 69.76	40.00	
Mannings n	= 0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.34	1.083	31.84	2.083	12.58	3.08	7.30
0.167	6.34	1.167	31.84	2.167	12.58	3.17	7.30
0.250	7.08	1.250	131.63	2.250	11.08	3.25	6.87
0.333	7.08	1.333	131.63	2.333	11.08	3.33	6.87
0.417	8.07	1.417	39.74	2.417	9.96	3.42	6.50
0.500	8.07	1.500	39.74	2.500	9.96	3.50	6.50
0.583	9.51	1.583	23.97	2.583	9.08	3.58	6.18
0.667	9.51	1.667	23.97	2.667	9.08	3.67	6.18
0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

Max.Eff.Inten.(mm/hr)= 131.63 111.18  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.84 (ii) 8.61 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.12  
  
PEAK FLOW (cms)= 0.08 0.06 0.129 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 68.38 33.90 44.58  
TOTAL RAINFALL (mm)= 69.38 69.38 69.38  
RUNOFF COEFFICIENT = 0.99 0.49 0.64

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0023)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0013):	0.61	0.073	1.33	36.36
+ ID2= 2 ( 0022):	0.73	0.129	1.33	44.58
ID = 3 ( 0023):	1.34	0.202	1.33	40.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0014)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0012):	2.88	0.166	1.75	52.02
+ ID2= 2 ( 0023):	1.34	0.202	1.33	40.84

ID = 3 ( 0014): 4.22 0.272 1.50 48.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0002)	Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area	(ha)= 0.31	0.42	
Dep. Storage	(mm)= 1.00	9.00	
Average Slope	(%)= 1.00	2.00	
Length	(m)= 69.76	40.00	
Mannings n	= 0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.34	1.083	31.84	2.083	12.58	3.08	7.30
0.167	6.34	1.167	31.84	2.167	12.58	3.17	7.30
0.250	7.08	1.250	131.63	2.250	11.08	3.25	6.87
0.333	7.08	1.333	131.63	2.333	11.08	3.33	6.87
0.417	8.07	1.417	39.74	2.417	9.96	3.42	6.50
0.500	8.07	1.500	39.74	2.500	9.96	3.50	6.50
0.583	9.51	1.583	23.97	2.583	9.08	3.58	6.18
0.667	9.51	1.667	23.97	2.667	9.08	3.67	6.18
0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

Max.Eff.Inten.(mm/hr)= 131.63 96.66  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.84 (ii) 9.00 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.12  
  
PEAK FLOW (cms)= 0.00 0.08 0.077 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.42  
RUNOFF VOLUME (mm)= 68.38 32.34 32.33  
TOTAL RAINFALL (mm)= 69.38 69.38 69.38  
RUNOFF COEFFICIENT = 0.99 0.47 0.47

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 3.49
STANDHYD ( 0001)	Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

IMPERVIOUS		PERVIOUS (i)	
Surface Area	(ha)= 1.40	2.09	
Dep. Storage	(mm)= 9.00	9.00	
Average Slope	(%)= 1.00	2.00	
Length	(m)= 152.53	40.00	
Mannings n	= 0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	6.34	1.083	31.84	2.083	12.58	3.08	7.30
0.167	6.34	1.167	31.84	2.167	12.58	3.17	7.30
0.250	7.08	1.250	131.63	2.250	11.08	3.25	6.87
0.333	7.08	1.333	131.63	2.333	11.08	3.33	6.87
0.417	8.07	1.417	39.74	2.417	9.96	3.42	6.50
0.500	8.07	1.500	39.74	2.500	9.96	3.50	6.50
0.583	9.51	1.583	23.97	2.583	9.08	3.58	6.18
0.667	9.51	1.667	23.97	2.667	9.08	3.67	6.18
0.750	11.82	1.750	17.98	2.750	8.38	3.75	5.90
0.833	11.82	1.833	17.98	2.833	8.38	3.83	5.90
0.917	16.33	1.917	14.70	2.917	7.79	3.92	5.64
1.000	16.33	2.000	14.70	3.000	7.79	4.00	5.64

Max.Eff.Inten.(mm/hr)= 131.63 90.89  
over (min)= 5.00 15.00  
Storage Coeff. (min)= 2.95 (ii) 10.28 (ii)  
Unit Hyd. Tpeak (min)= 5.00 15.00  
Unit Hyd. peak (cms)= 0.29 0.09  
  
PEAK FLOW (cms)= 0.00 0.32 0.320 (iii)  
TIME TO PEAK (hrs)= 1.33 1.50 1.50  
RUNOFF VOLUME (mm)= 60.38 31.66 31.66  
TOTAL RAINFALL (mm)= 69.38 69.38 69.38  
RUNOFF COEFFICIENT = 0.87 0.46 0.46

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

17-089 Thompson Farm Subdivision  
Visual OTTHYMO MODEL

-----				
ADD HYD ( 0003)				
1 + 2 = 3				
-----				
		AREA	QPEAK	TPEAK
		(ha)	(cms)	(hrs)
				R.V.
				(mm)
ID1= 1 ( 0001):		3.49	0.320	1.50
+ ID2= 2 ( 0002):		0.73	0.077	1.42
				32.33
=====				
ID = 3 ( 0003):		4.22	0.384	1.50
				31.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-----

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

**50-YEAR STORM**

```
V V I SSSS U U A L (v 6.2.2007)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
```

```
OOO TTTT TTTT H H Y Y M M OOO TM
O O T T H H Y Y MM MM O O
O O T T H H Y Y M M O O
OOO T T H H Y Y M M OOO
```

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voindat  
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\59e2c3db-4a71-45d1-8cec-8538f69d851d\scen  
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DATE: 01/20/2023

TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

```
*****
** SIMULATION : 05_50-Year Norfolk **
*****
```

```
CHICAGO STORM |
| Ptotal= 78.32 mm |
```

IDF curve parameters: A= 766.038  
B= 1.898  
C= 0.668  
used in: INTENSITY = A / (t + B)^C  
Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	7.35	1.00	35.40	2.00	14.38	3.00	8.44
0.17	8.19	1.17	146.50	2.17	12.71	3.17	7.96
0.33	9.32	1.33	43.93	2.33	11.45	3.33	7.55
0.50	10.95	1.50	26.91	2.50	10.46	3.50	7.18
0.67	13.53	1.67	20.36	2.67	9.66	3.67	6.85
0.83	18.53	1.83	16.73	2.83	9.00	3.83	6.56

```
CALIB |
| STANDHYD ( 0009) |
| ID= 1 DT= 5.0 min |
```

Area (ha)= 2.88  
Total Imp(%)= 92.00 Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
----- TRANSFORMED HYETOGRAPH -----
TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
0.083 7.35 | 1.083 35.40 | 2.083 14.38 | 3.08 8.44
0.167 7.35 | 1.167 35.40 | 2.167 14.38 | 3.17 8.44
0.250 8.19 | 1.250 146.50 | 2.250 12.71 | 3.25 7.96
0.333 8.19 | 1.333 146.50 | 2.333 12.71 | 3.33 7.96
0.417 9.32 | 1.417 43.93 | 2.417 11.45 | 3.42 7.55
0.500 9.32 | 1.500 43.93 | 2.500 11.45 | 3.50 7.55
0.583 10.95 | 1.583 26.91 | 2.583 10.46 | 3.58 7.18
0.667 10.95 | 1.667 26.91 | 2.667 10.46 | 3.67 7.18
0.750 13.53 | 1.750 20.36 | 2.750 9.66 | 3.75 6.85
0.833 13.53 | 1.833 20.36 | 2.833 9.66 | 3.83 6.85
0.917 18.53 | 1.917 16.73 | 2.917 9.00 | 3.92 6.56
1.000 18.53 | 2.000 16.73 | 3.000 9.00 | 4.00 6.56
```

Max.Eff.Inten.(mm/hr)= 146.50 1075.04  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 2.67 (ii) 6.06 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.29 0.15

PEAK FLOW (cms)= 0.39 0.51 0.881 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 77.32 65.96 69.82  
TOTAL RAINFALL (mm)= 78.32 78.32 78.32  
RUNOFF COEFFICIENT = 0.99 0.84 0.89

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON
IN= 2--> OUT= 3 | CHAMBER:
DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33
```

DEPTH (mm)	STORAGE (cu.m.)	DEPTH (mm)	STORAGE (cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53
737.00	444.51	1829.00	1116.20
762.00	463.40	1854.00	1125.71
787.00	482.21	1880.00	1135.22
813.00	500.93	1905.00	1144.73
838.00	519.57	1930.00	1154.24
864.00	538.12	1956.00	1163.75
889.00	556.58	1981.00	1173.26
914.00	574.94	2007.00	1182.77
940.00	593.20	2032.00	1192.29
965.00	611.35	2057.00	1201.80
991.00	629.40	2083.00	1211.31
1016.00	647.34	2108.00	1220.82
1041.00	665.17	2134.00	1230.33
1067.00	682.87	0.00	0.00

DEPTH (m)	DISCHARGE (cms)	DEPTH (m)	DISCHARGE (cms)
0.000	0.000	0.919	0.132
0.005	0.002	1.021	0.150
0.106	0.007	1.122	0.166
0.208	0.010	1.224	0.180
0.310	0.012	1.326	0.193
0.411	0.014	1.427	0.206
0.513	0.016	1.529	0.217
0.614	0.041	1.630	0.228
0.716	0.086	1.732	0.239
0.818	0.112	1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW: ID= 2	2.88	0.881	1.33	69.82
OUTFLOW: ID= 1	2.88	0.193	1.75	60.77
OVERFLOW: ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 12.96  
Time to reach Max storage (Hr)= 1.75  
Volume of water for drawdown in LID (cu.m.)= 514.64  
Volume of maximum water storage (cu.m.)= 970.05  
Calculated Drawdown Time (Hr)= 19.83

| Junction Command(0011) |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 3( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2( 0011)	0.00	0.00	0.00	0.00

| Junction Command(0012) |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 1( 0010)	2.88	0.19	1.75	60.77
OUTFLOW: ID= 2( 0012)	2.88	0.19	1.75	60.77

```
CALIB |
| STANDHYD ( 0013) | Area (ha)= 0.61
| ID= 1 DT= 5.0 min | Total Imp(%)= 46.00 Dir. Conn.(%)= 16.00
```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n	0.013	0.250



**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)= 146.50 98.34  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.67 (ii) 8.78 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.12  
  
PEAK FLOW (cms)= 0.04 0.06  
TIME TO PEAK (hrs)= 1.33 1.42  
RUNOFF VOLUME (mm)= 77.32 36.92  
TOTAL RAINFALL (mm)= 78.32 78.32  
RUNOFF COEFFICIENT = 0.99 0.47

\*TOTALS\*

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0022)	Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 0.46	IMPERVIOUS 0.27
Dep. Storage (mm)= 1.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	
Length (m)= 69.76	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)= 146.50 134.98  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.77 (ii) 8.03 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.13  
  
PEAK FLOW (cms)= 0.09 0.07  
TIME TO PEAK (hrs)= 1.33 1.42  
RUNOFF VOLUME (mm)= 77.32 40.96  
TOTAL RAINFALL (mm)= 78.32 78.32  
RUNOFF COEFFICIENT = 0.99 0.52

\*TOTALS\*

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0023)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0013):	0.61	0.089	1.33	43.37
+ ID2= 2 ( 0022):	0.73	0.151	1.33	52.23
ID = 3 ( 0023):	1.34	0.239	1.33	48.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0014)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0012):	2.88	0.193	1.75	60.77
+ ID2= 2 ( 0023):	1.34	0.239	1.33	48.20

ID = 3 ( 0014): 4.22 0.340 1.33 56.78

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	Area (ha)= 0.73
STANDHYD ( 0002)	Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 0.31	IMPERVIOUS 0.42
Dep. Storage (mm)= 1.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	
Length (m)= 69.76	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)= 146.50 117.96  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 1.77 (ii) 8.37 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.12

\*TOTALS\*

PEAK FLOW (cms)= 0.00 0.10  
TIME TO PEAK (hrs)= 1.33 1.42  
RUNOFF VOLUME (mm)= 77.32 39.22  
TOTAL RAINFALL (mm)= 78.32 78.32  
RUNOFF COEFFICIENT = 0.99 0.50

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 3.49
STANDHYD ( 0001)	Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00
ID= 1 DT= 5.0 min	

Surface Area (ha)= 1.40	IMPERVIOUS 2.09
Dep. Storage (mm)= 9.00	PERVIOUS (i) 9.00
Average Slope (%)= 1.00	
Length (m)= 152.53	40.00
Mannings n = 0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	7.35	1.083	35.40	2.083	14.38	3.08	8.44
0.167	7.35	1.167	35.40	2.167	14.38	3.17	8.44
0.250	8.19	1.250	146.50	2.250	12.71	3.25	7.96
0.333	8.19	1.333	146.50	2.333	12.71	3.33	7.96
0.417	9.32	1.417	43.93	2.417	11.45	3.42	7.55
0.500	9.32	1.500	43.93	2.500	11.45	3.50	7.55
0.583	10.95	1.583	26.91	2.583	10.46	3.58	7.18
0.667	10.95	1.667	26.91	2.667	10.46	3.67	7.18
0.750	13.53	1.750	20.36	2.750	9.66	3.75	6.85
0.833	13.53	1.833	20.36	2.833	9.66	3.83	6.85
0.917	18.53	1.917	16.73	2.917	9.00	3.92	6.56
1.000	18.53	2.000	16.73	3.000	9.00	4.00	6.56

Max.Eff.Inten.(mm/hr)= 146.50 111.17  
over (min)= 5.00 10.00  
Storage Coeff. (min)= 2.83 (ii) 9.59 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.29 0.11

\*TOTALS\*

PEAK FLOW (cms)= 0.00 0.42  
TIME TO PEAK (hrs)= 1.33 1.42  
RUNOFF VOLUME (mm)= 69.32 38.47  
TOTAL RAINFALL (mm)= 78.32 78.32  
RUNOFF COEFFICIENT = 0.89 0.49

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

17-089 Thompson Farm Subdivision  
Visual OTTHYMO MODEL

-----				
ADD HYD ( 0003)				
1 + 2 = 3				
-----				
		AREA	QPEAK	TPEAK
		(ha)	(cms)	(hrs)
				R.V.
				(mm)
ID1= 1 ( 0001):		3.49	0.422	1.42
+ ID2= 2 ( 0002):		0.73	0.096	1.42
				39.22
=====				
ID = 3 ( 0003):		4.22	0.518	1.42
				38.59
-----				
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.				
-----				

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

**100-YEAR STORM**

```
=====
V  V  I  SSSSS  U  U  A  L          (v 6.2.2007)
V  V  I  SS     U  U  A  A  L
V  V  I  SS     U  U  AAAAA  L
V  V  I  SS     U  U  A  A  L
VV   I  SSSSS  UUUUU  A  A  LLLLL
```

```
OOO  TTTT  TTTT  H  H  Y  Y  M  M  OOO  TM
O  O  T  T  H  H  Y  Y  MM  MM  O  O
O  O  T  T  H  H  Y  Y  M  M  O  O
OOO  T  T  H  H  Y  Y  M  M  OOO
```

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\*\*\*\*\* D E T A I L E D O U T P U T \*\*\*\*\*

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voain.dat  
Output filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\95b62ad3-369d-49ec-a70d-14e02c86900d\scen  
Summary filename: C:\Users\Natalie\AppData\Local\Civica\XH5\4fe0d901-c408-4e3a-868c-21131358d8ea\95b62ad3-369d-49ec-a70d-14e02c86900d\scen

DATE: 01/20/2023                      TIME: 08:10:01

USER:

COMMENTS: \_\_\_\_\_

```
*****
** SIMULATION : 06_100-Year Norfolk **
*****
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-----
| CHICAGO STORM |
| Ptotal= 87.09 mm |
-----
```

IDF curve parameters: A= 801.041  
                          B= 1.501  
                          C= 0.657  
used in: INTENSITY = A / (t + B)^C  
  
Duration of storm = 4.00 hrs  
Storm time step = 10.00 min  
Time to peak ratio = 0.33

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	8.40	1.00	38.70	2.00	16.17	3.00	9.61
0.17	9.34	1.17	160.97	2.17	14.33	3.17	9.08
0.33	10.59	1.33	47.72	2.33	12.95	3.33	8.61
0.50	12.39	1.50	29.71	2.50	11.86	3.50	8.20
0.67	15.24	1.67	22.67	2.67	10.97	3.67	7.84
0.83	20.69	1.83	18.74	2.83	10.24	3.83	7.51

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-----
| CALIB |
| STANDHYD ( 0009) |
| ID= 1 DT= 5.0 min |
-----
```

Area (ha)= 2.88  
Total Imp(%)= 92.00    Dir. Conn.(%)= 34.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.65	0.23
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	138.56	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

```
----- TRANSFORMED HYETOGRAPH -----
TIME  RAIN | TIME  RAIN | ' TIME  RAIN | TIME  RAIN
hrs   mm/hr | hrs   mm/hr | ' hrs   mm/hr | hrs   mm/hr
0.083 8.40 | 1.083 38.70 | 2.083 16.17 | 3.08 9.61
0.167 8.40 | 1.167 38.70 | 2.167 16.17 | 3.17 9.61
0.250 9.34 | 1.250 160.97 | 2.250 14.33 | 3.25 9.08
0.333 9.34 | 1.333 160.97 | 2.333 14.33 | 3.33 9.08
0.417 10.59 | 1.417 47.72 | 2.417 12.95 | 3.42 8.61
0.500 10.59 | 1.500 47.72 | 2.500 12.95 | 3.50 8.61
0.583 12.39 | 1.583 29.71 | 2.583 11.86 | 3.58 8.20
0.667 12.39 | 1.667 29.71 | 2.667 11.86 | 3.67 8.20
0.750 15.24 | 1.750 22.67 | 2.750 10.97 | 3.75 7.84
0.833 15.24 | 1.833 22.67 | 2.833 10.97 | 3.83 7.84
0.917 20.69 | 1.917 18.74 | 2.917 10.24 | 3.92 7.51
1.000 20.69 | 2.000 18.74 | 3.000 10.24 | 4.00 7.51
```

Max.Eff.Inten.(mm/hr)= 160.97    1201.12  
                          over (min)= 5.00    10.00  
Storage Coeff.(min)= 2.57 (ii)    5.84 (ii)  
Unit Hyd. Tpeak (min)= 5.00    10.00  
Unit Hyd. peak (cms)= 0.29    0.15

PEAK FLOW (cms)= 0.43    0.57    0.988 (iii)  
TIME TO PEAK (hrs)= 1.33    1.42    1.33  
RUNOFF VOLUME (mm)= 86.09    74.56    78.48  
TOTAL RAINFALL (mm)= 87.09    87.09    87.09  
RUNOFF COEFFICIENT = 0.99    0.86    0.90

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0    Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| CHAMBER( 0010) | OUTFLOW: ON, UNDERDRAIN: OFF, INFIL: ON
| IN= 2--> OUT= 3 | CHAMBER:
| DT= 5.0 min | MAX STO VOL (cu.m.)= 1230.33 Bottom Area(m2) = 936.33
-----
```

DEPTH	STORAGE	DEPTH	STORAGE
(mm)	(cu.m.)	(mm)	(cu.m.)
0.00	0.00	1092.00	700.45
25.00	9.51	1118.00	717.91
51.00	19.02	1143.00	735.22
76.00	28.53	1168.00	752.41
102.00	38.04	1194.00	769.44
127.00	47.55	1219.00	786.33
152.00	57.07	1245.00	803.06
178.00	66.58	1270.00	819.63
203.00	76.09	1295.00	836.03
229.00	85.60	1321.00	852.25
254.00	95.11	1346.00	868.29
279.00	104.62	1372.00	884.14
305.00	114.13	1397.00	899.78
330.00	133.95	1422.00	915.22
356.00	153.71	1448.00	930.43
381.00	173.44	1473.00	945.40
406.00	193.13	1499.00	960.13
432.00	212.78	1524.00	974.58
457.00	232.39	1549.00	988.75
483.00	251.95	1575.00	1002.61
508.00	271.47	1600.00	1016.13
533.00	290.93	1626.00	1029.27
559.00	310.35	1651.00	1041.97
584.00	329.70	1676.00	1054.13
610.00	349.00	1702.00	1065.45
635.00	368.24	1727.00	1076.04
660.00	387.41	1753.00	1086.39
686.00	406.51	1778.00	1096.56
711.00	425.55	1803.00	1106.53
737.00	444.51	1829.00	1116.20
762.00	463.40	1854.00	1125.71
787.00	482.21	1880.00	1135.22
813.00	500.93	1905.00	1144.73
838.00	519.57	1930.00	1154.24
864.00	538.12	1956.00	1163.75
889.00	556.58	1981.00	1173.26
914.00	574.94	2007.00	1182.77
940.00	593.20	2032.00	1192.29
965.00	611.35	2057.00	1201.80
991.00	629.40	2083.00	1211.31
1016.00	647.34	2108.00	1220.82
1041.00	665.17	2134.00	1230.33
1067.00	682.87	0.00	0.00

DEPTH	DISCHARGE	DEPTH	DISCHARGE
(m)	(cms)	(m)	(cms)
0.000	0.000	0.919	0.132
0.005	0.002	1.021	0.150
0.106	0.007	1.122	0.166
0.208	0.010	1.224	0.180
0.310	0.012	1.326	0.193
0.411	0.014	1.427	0.206
0.513	0.016	1.529	0.217
0.614	0.041	1.630	0.228
0.716	0.086	1.732	0.239
0.818	0.112	1.834	0.249

NATIVE SOIL LAYER:  
Infiltration (m/hr) = 0.0114

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW:ID= 2	2.88	0.988	1.33	78.48
OUTFLOW:ID= 1	2.88	0.223	1.75	69.40
OVERFLOW:ID= 3	0.00	0.000	0.00	0.00

Volume Reduction Rate[(RVin-RVout)/RVin] (%)= 11.57  
Time to reach Max storage (Hr)= 1.75  
Volume of water for drawdown in LID (cu.m.)= 523.32  
Volume of maximum water storage (cu.m.)= 1070.71  
Calculated Drawdown Time (Hr)= 19.92

```
-----
| Junction Command(0011) |
-----
```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 3( 0010)	0.00	0.00	0.00	0.00
OUTFLOW: ID= 2( 0011)	0.00	0.00	0.00	0.00

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-----
| Junction Command(0012) |
-----
```

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 1( 0010)	2.88	0.22	1.75	69.40
OUTFLOW: ID= 2( 0012)	2.88	0.22	1.75	69.40

```
-----
| CALIB |
| STANDHYD ( 0013) |
| ID= 1 DT= 5.0 min |
-----
```

Area (ha)= 0.61  
Total Imp(%)= 46.00    Dir. Conn.(%)= 16.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.33
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	63.77	40.00
Mannings n =	0.013	0.250

**17-089 Thompson Farm Subdivision**  
**Visual OTTHYMO MODEL**

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 117.06  
over (min) 5.00 10.00  
Storage Coeff. (min)= 1.61 (ii) 8.24 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.13  
  
PEAK FLOW (cms)= 0.04 0.07 0.105 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 86.09 43.69 50.47  
TOTAL RAINFALL (mm)= 87.09 87.09 87.09  
RUNOFF COEFFICIENT = 0.99 0.50 0.58

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD ( 0022)	Area (ha)= 0.73
ID= 1 DT= 5.0 min	Total Imp(%)= 63.00 Dir. Conn.(%)= 31.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.46	0.27
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	69.76	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 159.07  
over (min) 5.00 10.00  
Storage Coeff. (min)= 1.70 (ii) 7.56 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.13  
  
PEAK FLOW (cms)= 0.10 0.09 0.173 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.33  
RUNOFF VOLUME (mm)= 86.09 48.12 59.88  
TOTAL RAINFALL (mm)= 87.09 87.09 87.09  
RUNOFF COEFFICIENT = 0.99 0.55 0.69

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD ( 0023)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0013):	0.61	0.105	1.33	50.47
+ ID2= 2 ( 0022):	0.73	0.173	1.33	59.88
ID = 3 ( 0023):	1.34	0.278	1.33	55.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD ( 0014)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 ( 0012):	2.88	0.223	1.75	69.40
+ ID2= 2 ( 0023):	1.34	0.278	1.33	55.60

ID = 3 ( 0014): 4.22 0.409 1.33 65.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD ( 0002)	Area (ha)= 0.73
ID= 1 DT= 5.0 min	Total Imp(%)= 42.00 Dir. Conn.(%)= 0.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.31	0.42
Dep. Storage (mm)=	1.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	69.76	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 139.60  
over (min) 5.00 10.00  
Storage Coeff. (min)= 1.70 (ii) 7.88 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.32 0.13  
  
PEAK FLOW (cms)= 0.00 0.12 0.116 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.42  
RUNOFF VOLUME (mm)= 86.09 46.22 46.22  
TOTAL RAINFALL (mm)= 87.09 87.09 87.09  
RUNOFF COEFFICIENT = 0.99 0.53 0.53

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD ( 0001)	Area (ha)= 3.49
ID= 1 DT= 5.0 min	Total Imp(%)= 40.00 Dir. Conn.(%)= 0.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.40	2.09
Dep. Storage (mm)=	9.00	9.00
Average Slope (%)=	1.00	2.00
Length (m)=	152.53	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	8.40	1.083	38.70	2.083	16.17	3.08	9.61
0.167	8.40	1.167	38.70	2.167	16.17	3.17	9.61
0.250	9.34	1.250	160.97	2.250	14.33	3.25	9.08
0.333	9.34	1.333	160.97	2.333	14.33	3.33	9.08
0.417	10.59	1.417	47.72	2.417	12.95	3.42	8.61
0.500	10.59	1.500	47.72	2.500	12.95	3.50	8.61
0.583	12.39	1.583	29.71	2.583	11.86	3.58	8.20
0.667	12.39	1.667	29.71	2.667	11.86	3.67	8.20
0.750	15.24	1.750	22.67	2.750	10.97	3.75	7.84
0.833	15.24	1.833	22.67	2.833	10.97	3.83	7.84
0.917	20.69	1.917	18.74	2.917	10.24	3.92	7.51
1.000	20.69	2.000	18.74	3.000	10.24	4.00	7.51

Max.Eff.Inten.(mm/hr)= 160.97 131.81  
over (min) 5.00 10.00  
Storage Coeff. (min)= 2.72 (ii) 9.04 (ii)  
Unit Hyd. Tpeak (min)= 5.00 10.00  
Unit Hyd. peak (cms)= 0.29 0.12  
  
PEAK FLOW (cms)= 0.00 0.51 0.512 (iii)  
TIME TO PEAK (hrs)= 1.33 1.42 1.42  
RUNOFF VOLUME (mm)= 78.09 45.39 45.39  
TOTAL RAINFALL (mm)= 87.09 87.09 87.09  
RUNOFF COEFFICIENT = 0.90 0.52 0.52

\*\*\*\*\* WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!  
\*\*\*\*\* WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%  
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:  
CN\* = 70.0 Ia = Dep. Storage (Above)  
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL  
THAN THE STORAGE COEFFICIENT.  
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.



17-089 Thompson Farm Subdivision  
Visual OTTHYMO MODEL

-----				
ADD HYD ( 0003)				
1 + 2 = 3				
-----				
		AREA	QPEAK	TPEAK
		(ha)	(cms)	(hrs)
				R.V.
				(mm)
ID1= 1 ( 0001):		3.49	0.512	1.42
+ ID2= 2 ( 0002):		0.73	0.116	1.42
				45.39
				46.22
=====				
ID = 3 ( 0003):		4.22	0.628	1.42
				45.54
-----				
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.				
-----				
FINISH				
=====				

## **APPENDIX C**

Domestic Water Demand Calculations

Fire Flow Calculation Distances

FUS Calculations

Norfolk ISMP Map

*Fire Water Infrastructure Assessment* by ARC Engineering Inc.  
dated January 14, 2022

## McCool Street Single Detached Dwellings with Accessory Dwelling Units

### Maximum Daily Demand

Units:	16 Units
Accessopry Dwelling Units:	16 Units
Total Units:	32 Units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/unit
Equiv. Population	88
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	89.10 m <sup>3</sup> /day
	1.03 l/s

### Maximum Hourly Demand

Units:	16 Units
Accessopry Dwelling Units:	16 Units
Total Units:	32 Units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/unit
Equiv. Population	88
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Hourly Demand Peaking Factor	4
Maximum Hourly Demand	6.60 m <sup>3</sup> /hour
	1.83 l/s

## Condo Development

### Maximum Daily Demand

Total Number of Units	76 units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/unit
Equiv. Population	209
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	211.61 m <sup>3</sup> /day
	2.45 l/s

### Maximum Hourly Demand

Total Number of Units	76 units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/unit
Equiv. Population	209
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Hourly Demand Peaking Factor	4
Maximum Hourly Demand	15.68 m <sup>3</sup> /hour
	4.35 l/s



## Mid-Rise Building - Residential (Level 2-8)

### Maximum Daily Demand

Total Number of Units	164 units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/unit
Equiv. Population	451
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	456.64 m <sup>3</sup> /day
	5.29 l/s

### Maximum Hourly Demand

Total Number of Units	164 units
Zoning of Land	Residential
Equiv. Population Density	2.75 ppl/ha
Equiv. Population	451
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Hourly Demand Peaking Factor	4
Maximum Hourly Demand	33.83 m <sup>3</sup> /hour
	9.40 l/s

## Mid-Rise Building - Commercial (Level 1)

### Maximum Daily Demand

Area	0.30 ha
Zoning of Land	Commercial
Equiv. Population Density	90 ppl/ha
Equiv. Population	27
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Daily Demand Peaking Factor	2.25
Maximum Daily Demand	27.34 m <sup>3</sup> /day
	0.32 l/s

### Maximum Hourly Demand

Area	0.2985 ha
Zoning of Land	Commercial
Equiv. Population Density	90 ppl/ha
Equiv. Population	27
Av. Daily Demand Per Capita	0.45 m <sup>3</sup> /capita/day
Maximum Hourly Demand Peaking Factor	2
Maximum Hourly Demand	1.01 m <sup>3</sup> /hour
	0.28 l/s

---

**Summary of Maximum Daily Demand**

McCool Street Single Detached Dwellings with Accessory Dwelling Units	1.03 L/s
Condo Development	2.45 L/s
Mid-Rise Building - Residential (Level 2-8)	5.29 L/s
Mid-Rise Building - Commercial (Level 1)	0.32 L/s

<b>Total Maximum Daily Demand:</b>	<b>9.08 L/s</b>
------------------------------------	-----------------

**Summary of Maximum Hourly Demand**

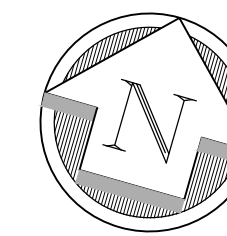
McCool Street Single Detached Dwellings with Accessory Dwelling Units	1.83 L/s
Condo Development	4.35 L/s
Mid-Rise Building - Residential (Level 2-8)	9.40 L/s
Mid-Rise Building - Commercial (Level 1)	0.28 L/s

<b>Total Maximum Hourly Demand:</b>	<b>15.86 L/s</b>
-------------------------------------	------------------






### LEGEND

 PROPOSED FIREWALL

SCALE:



HORIZONTAL : 1:500



**G. DOUGLAS VALLEE LIMITED**  
2 TALBOT STREET NORTH  
SIMCOE, ONTARIO N3Y 3W4  
(519) 426-6270

Stamp

**PRELIMINARY**  
NOT TO BE USED  
FOR CONSTRUCTION

Project Title
---------------

# SILOS OF WATERFORD

## WATERFORD, NORFOLK COUNTY

Drawing Title
---------------

### FIRE FLOW CIRCULATION DISTANCES

Designed by :	
---------------	--

Drawn By :	
NLB	NLB

Checked by :	
--------------	--

REB	
Jl	Date Started : 1/20/2023

Drawing Scale :

1/20/2023	
Drawing No.	

Project No. 20

20-128

# FIRE



### Block A

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 1.5 Construction coefficient for wood frame construction

Length= 12.5 m

Width= 7 m

A= 87.5 Floor Area m<sup>2</sup>

= Main Floor Area Building

= 175.0 Fire Area m<sup>2</sup>

= Main Floor Area Building + 2nd Floor

F<sub>1</sub>= 4365 L/min

**F<sub>1</sub>= 4000 L/min** (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$$F_2 = F_1 + (F_1 * \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 3400 L/min**

3) Sprinkler System

Sprinkler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$$F_3 = F_2 * \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 0 L/min**

4) Seperation

Location	Direction	Distance (m)	Surcharge
Front	East	> 30m	0%
Side	North	6.1	16% *Reduction per Table 6
Side	South	2.4	16% *Reduction per Table 6
Rear	West	13.5	12% *Reduction per Table 6
		Total:	44%

#### Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

$$F_4 = (\text{TOTAL}) * F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 1496 L/min**

### Total Fire Flow

$$F = F_2 - F_3 + F_4 = 4896 \text{ L/min}$$

$$= 5000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= \boxed{83.3 \text{ L/s}}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020

### Block B

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 1.5 Construction coefficient for wood frame construction

Length= 22 m

Width= 11 m

A= 242.0 Floor Area m<sup>2</sup>

= main floor area

= 484.0 Fire Area m<sup>2</sup>

= main floor area + second floor area

F<sub>1</sub>= 7260 L/min

**F<sub>1</sub>= 7000 L/min** (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$$F_2 = F_1 + (F_1 * \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 5950 L/min**

3) Sprinkler System

Sprinkler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$$F_3 = F_2 * \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 0 L/min**

4) Seperation

Location	Direction	Distance (m)	Surcharge
Front	West	23.5	2% *Reduction per Table 6
Side	North	Firewall	0%
Side	South	8.7	16% *Reduction per Table 6
Rear	East	13.5	11% *Reduction per Table 6
		Total:	29%

#### Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

$$F_4 = (\text{TOTAL}) * F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 1726 L/min**

### Total Fire Flow

$$F = F_2 - F_3 + F_4 = 7676 \text{ L/min}$$

$$= 8000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= 133.3 \text{ L/s}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020

### Block C

#### 1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 1.5 Construction coefficient for wood frame construction

Length= 12 m

Width= 12 m

A= 144.0 Floor Area m<sup>2</sup>

= main floor area

= 432.0 Fire Area m<sup>2</sup>

= main floor + second floor + third floor

F<sub>1</sub>= 6859 L/min

**F<sub>1</sub>= 7000 L/min** (Round to the nearest 1,000 l/min)

#### 2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$$F_2 = F_1 + (F_1 \cdot \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 5950 L/min**

#### 3) Sprinkler System

Sprinkler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$$F_3 = F_2 \cdot \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 0 L/min**

#### 4) Seperation

Location	Direction	Distance (m)	Surcharge
Front	South	21.3	2% *Reduction per Table 6
Side	East	3.0	21% *Reduction per Table 6
Side	West	Firewall	0%
Rear	North	14.0	11% *Reduction per Table 6
		Total:	34%

#### Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

$$F_4 = (\text{TOTAL}) \cdot F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 2023 L/min**

#### Total Fire Flow

$$F = F_2 - F_3 + F_4 = 7973 \text{ L/min}$$

$$= 8000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= \boxed{133.3 \text{ L/s}}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020

### Block D - 8-Storey Mid-Rise Building

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 0.8 Non Combustible Construction

Length= 64.5 m

Width= 21.1 m

Af= 1361 Floor Area m<sup>2</sup> = main floor area

A= 6805 Fire Area m<sup>2</sup> = two adjoining floor areas plus 50% of all floors immediately above them

F<sub>1</sub>= 14518 L/min

**F<sub>1</sub>= 15000 L/min** (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Occupancy

Reduction: 15%

Surcharge: 0%

$$F_2 = F_1 + (F_1 * \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 12750 L/min**

3) Sprinkler System

Sprinkler System: Applicable (Assumes the building is protected by a complete automatic sprinkler system, conforming to NFPA 13 and other standards)

Reduction: 50%

$$F_3 = F_2 * \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 6375 L/min**

4) Seperation

<u>Location</u>	<u>Direction</u>	<u>Distance (m)</u>	<u>Surcharge</u>
Front	East	> 30m	0%
Side	North	> 30m	0%
Side	South	17.5	11% *Reduction per Table 6
Rear	West	> 30m	0%
		Total:	11%

#### Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
Greater than 30m	0%

$$F_4 = (\text{TOTAL}) * F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 1403 L/min**

### Total Fire Flow

$$F = F_2 - F_3 + F_4 = 7778 \text{ L/min}$$

$$= 8000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= 133.3 \text{ L/s}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 2020



Water Supply for Public Fire Protection - Fire Underwriters Survey 2020  
Tables & Figures

**Method for Determining Required Fire Flows**

Fire Underwriters Survey defines **Required Fire Flow** as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

To determine the estimated amount of water required to confine and control a fire in a building or group of buildings, Fire Underwriters Survey uses the following base formula:

$$RFF = 220C\sqrt{A}$$

Where:

RFF

= the Required Fire Flow in litres per minutes (LPM)

C

= the Construction Coefficient is related to the type of construction of the building

A

= the Total Effective Floor Area (effective building area) in square metres of the building

**Construction Coefficient (C)**

Note that the construction typology used by the insurance industry and public fire protection differs from the terms of reference in the National Building Code of Canada (NBC).

The following Construction Types and Coefficients are used in the required fire flow formula:

C

=

1.5 for **Type V** Wood Frame Construction

=

0.8 for **Type IV-A** Mass Timber Construction

=

0.9 for **Type IV-B** Mass Timber Construction

=

1.0 for **Type IV-C** Mass Timber Construction

=

1.5 for **Type IV-D** Mass Timber Construction

=

1.0 for **Type III** Ordinary Construction

=

0.8 for **Type II** Noncombustible Construction

=

0.6 for **Type I** Fire Resistive Construction

Table 3 Recommended Occupancy/Contents Charges by Major Occupancy Examples <sup>1</sup>				
Group	Division	Description of Major Occupancies	Occupancy and Contents	Adjustment Factor
A	1	Assembly occupancies intended for the production and viewing of the performing arts	Combustible	0%
A	2	Assembly occupancies not elsewhere classified in Group A	Limited to Combustible	-15% to 0%
A	3	Assembly occupancies of the arena type	Limited to Combustible	-15% to 0%
A	4	Assembly occupancies in which occupants are gathered in the open air	Limited to Combustible	-15% to 0%
B	1	Detention occupancies	Noncombustible to Limited	-25% to -15%
B	2	Care and treatment occupancies	Noncombustible to Limited	-25% to -15%
B	3	Care occupancies	Limited	-15%
C	---	Residential occupancies	Limited	-15%
D	---	Business and personal services occupancies		
D	---	• Police stations without detention quarters	Non-combustible	-20%
D	---	• Banks, Barber and hairdressing shops, Beauty parlours, Dental offices, Laundries (self-service), Medical offices, Offices, Radio stations	Limited	-15%
D	---	• Dry cleaning establishments (self-service, not using flammable or explosive solvents or cleaners), Small tool and appliance rental and service establishments	Combustible	0%
E	---	Mercantile occupancies		
E	---	• Exhibition halls	Limited	-15%
E	---	• Supermarkets	Limited	-15%
E	---	• Shops/Stores	Limited to Combustible	-15% to 0%
E	---	• Markets	Combustible	0
E	---	• Department stores	Free Burning	15%
F	1	High hazard industrial occupancies	Rapid Burning	+25%
F	2	Medium hazard industrial occupancies		
F	2	• Television studios not admitting a viewing audience	Limited	-15%
F	2	• Cold storage plants	Combustible	0%
F	2	• Electrical substations	Combustible	0%
F	2	• Helicopter landing areas on roofs	Limited	-15%

<sup>1</sup> The values presented in this table are intended as a guideline and the occupancy/contents adjustment should be based on the actual severity of conditions within the risk structure.

**Exposure Adjustment Charge**

A percentage of water for the exposures should be added to the required fire flow for the subject building to provide adequate flow rates for hose streams used to reduce the spreading of fire from the subject building to exposed risks (ex. structures, stored materials, forest, etc.). The required fire flow of a subject building may be increased depending on the severity of exposed risks to the subject building and the distance between the exposed risks and the subject building. This charge considers the usage of water supplies to prevent exposed risks from igniting or being damaged during a major fire incident in the subject building.

The maximum Exposure Adjustment Charge to be applied to a subject building is 75% when summing the percentages for all sides of the building. Table 5 outlines the maximum Exposure Adjustment Charge to apply for any one side of the subject building based on the following separation distances between the subject building and the exposed risk (aka. exposure):

**Table 5 Exposure Charges**

Separation Distance	Maximum Exposure Adjustment Charge
0 m to 3 m	25%
3.1 m to 10 m	20%
10.1 m to 20 m	15%
20.1 m to 30 m	10%
Greater than 30	0%

**Occupancy and Contents Adjustment Factor**

The required fire flow may be reduced by as much as -25% for occupancies having contents with a very low fire hazard or may be increased by up to 25% for occupancies having contents with a high fire hazard. The Occupancy and Contents Adjustment Factor should not be made at greater than 25% or less than -25%.

- Noncombustible Contents** -25%
  - Includes merchandise or materials, including stock, or equipment, which in permissible quantities does not in themselves constitute an active fuel for the spread of fire.
  - May include limited or controlled amounts of combustible material, not exceeding 5% of the Total Effective Area of the occupancy. Combustible components of construction (ex. interior walls, finishes, etc.) should be included in the limit on combustible materials.
- Limited Combustible Contents** -15%
  - Includes merchandise or materials, including furniture, stock, or equipment, of low combustibility, with limited concentrations of combustible materials.
- Combustible Contents** 0% no adjustment
  - Includes merchandise or materials, including furniture, stock, or equipment, of moderate combustibility.
- Free Burning Contents** +15%
  - Includes merchandise or materials, including furniture, stock, or equipment, which burn freely, constituting an active fuel.
- Rapid Burning Contents** +25%
  - Includes merchandise or materials, including furniture, stock, or equipment, which either
    - Burn with great intensity
    - spontaneously ignite and are difficult to extinguish
    - give off flammable or explosive vapors at ordinary temperatures
    - as a result of an industrial processing, produce large quantities of dust or other finely divided debris subject to flash fire or explosion

**Total Effective Area (A)**

To determine a required fire flow for an individual building, the Total Effective Area that would be affected during the design fire must be determined. The Total Effective Area is the largest Floor Area (in square metres) plus the following percentages of the total area of the other floors:

- For a building classified with a Construction Coefficient from 1.0 to 1.5:
  - 100% of all Floor Areas are considered in determining the Total Effective Area to be used in the formula.
- For a building classified with a Construction Coefficient below 1.0:
  - if any vertical openings in the building (ex. interconnected floor spaces, atria, elevators, escalators, etc.) are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight; or
  - if all vertical openings and exterior vertical communications are properly protected in accordance with the National Building Code, consider only the single largest Floor Area plus 25% of each of the two immediately adjoining floors.

**Automatic Sprinkler Protection**

The required fire flow may be reduced by up to 50 percent for complete Automatic Sprinkler Protection depending upon adequacy of the system. Where only part of a building is protected by Automatic Sprinkler Protection, credit should be interpolated by determining the percentage of the Total Floor Area being protected by the automatic sprinkler system.

To be able to apply the full 50 percent reduction, the following areas should be reviewed to determine the appropriate level of credit for having Automatic Sprinkler Protection as per the table below:

**Table 4 Sprinkler Credits**

Automatic Sprinkler System Design	Credit	
	With complete building coverage	With partial building coverage of X%
Automatic sprinkler protection designed and installed in accordance with NFPA 13	30%	30% × Percentage of Total Floor Area Served by Sprinkler System
Water supply is standard for both the system and Fire Department hose lines	10%	10% × Percentage of Total Floor Area Served by Sprinkler System
Fully supervised system	10%	10% × Percentage of Total Floor Area Served by Sprinkler System

**Table 6 Exposure Adjustment Charges for Subject Building considering Construction type of Exposed Building Face**

Distance (m) to the Exposure	Length-height factor of exposing building face	Type				
		Type V	Type III-IV <sup>2</sup>	Type III-IV <sup>3</sup>	Type I-II <sup>2</sup>	Type I-I <sup>3</sup>
0 to 3	0-20	20%	15%	5%	10%	0%
	21-40	21%	16%	6%	11%	1%
	41-60	22%	17%	7%	12%	2%
	61-80	23%	18%	8%	13%	3%
	81-100	24%	19%	9%	14%	4%
	Over 100	25%	20%	10%	15%	5%
3.1 to 10	0-20	15%	10%	3%	6%	0%
	21-40	16%	11%	4%	7%	0%
	41-60	17%	12%	5%	8%	1%
	61-80	18%	13%	6%	9%	2%
	81-100	19%	14%	7%	10%	3%
	Over 100	20%	15%	8%	11%	4%
10.1 to 20	0-20	10%	5%	0%	3%	0%
	21-40	11%	6%	1%	4%	0%
	41-60	12%	7%	2%	5%	0%
	61-80	13%	8%	3%	6%	1%
	81-100	14%	9%	4%	7%	2%
	Over 100	15%	10%	5%	8%	3%
20.1 to 30	0-20	0%	0%	0%	0%	0%
	21-40	2%	1%	0%	0%	0%
	41-60	4%	2%	0%	1%	0%
	61-80	6%	3%	1%	2%	0%
	81-100	8%	4%	2%	3%	0%
	Over 100	10%	5%	3%	4%	0%
Over 30 m	all sizes	0%	0%	0%	0%	0%

### REQUIRED FIRE WATER STORAGE

Available Municipal Supply: 70 L/s  
4200 L/min

#### FUS METHOD

Maximum Total Fire Flow Required: 133 L/s  
8000 L/min  
Total Required minus Available Municipal Supply 3800 L/min

Table 1 Required Duration of Fire Flow

Fire Flow Required (litres per minute)	Duration(hours)
2,000 or less	1.0
3,000	1.25
4, 000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

\* Interpolate for intermediate figures

Required Duration: 2 hr  
120 min  
Total Required Storage Volume: 456000 L  
456.0 m<sup>3</sup>  
Number of Cisterns (at 114 m3 each) 4

# Fire Water Infrastructure Assessment

for



## Proposed Development 257 Church St W In Waterford Ontario

January 14, 2022  
Report



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ARC Project # 21-117-160

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## 1. Introduction

ARC engineering has been engaged by G.D. Vallee to review the Fire Underwriters Survey (FUS) calculations prepared by their office and advise on potential infrastructure requirements for a proposed development located at 257 Church St W. in Waterford, Ontario. The focus of this report is to

1. Estimate the volume of firefighting water that will be required to be stored on site.
2. Estimate the flow rate required for sprinkler and standpipe systems serving the proposed eight-story condominium building.
3. Identify requirements for equipment including cisterns, pumps, controls, standpipe, & hydrants.

## 2. Water Supply

G.D. Valle has prepared three (3) FUS calculation to identify the most demanding subject building in terms of fire fighting water requirements. Based on the attached calculations and the 1999 FUS standard, the site requires 200 L/S for a duration of 2 hours. See supporting documents in Appendix A

The Ontario Building Code (OBC) requires that the fire fighting water supply meet Ontario Fire Marshal (OFM) criteria of 150 L/s for a duration of 1 hour. Additional calculations based on OBC compliance have been provided. See calculation in Appendix B.

Since FUS is more stringent, the required fire fighting water supply for this:

<b>200 L/s for 2 Hours</b>
----------------------------

## 3. On-site Water Storage requirements

Information obtained from Norfolk County indicates the town of Waterford can provide a maximum municipal water supply of approximately 70 L/s to the proposed site with the current water main infrastructure in place.

A FUS based calculation utilizing 70 L/s of hydrant water supply from the Waterford municipal water supply system, requires 130 L/s to be provided by an alternate source. The estimated on-site fire fighting water storage capacity for the FUS prescribed duration of 2 hours is **approximately 935 m<sup>3</sup>**:

A similar OBC based calculation results in an on-site fire fighting water storage capacity of **approximately 308 m<sup>3</sup>**.

A flow test could be conducted to measure the actual flow and residual pressure provided by the municipality. This information is used to generate a flow curve to estimate the flow at 130 kPa (20 PSI), the minimum required pressure for fire fighting water as noted in NFPA 291.

We recommended a flow test be conducted to validate water supply flow estimates provided by Norfolk County to consider any resulting reductions in required storage capacities.



## 4. Sprinkler and Standpipe Requirements

As identified in the OBC building matrix provided by G.D. Valle, the proposed eight-story condo building is required to be fully sprinklered in accordance with NFPA 13. Additionally, a standpipe system with a hose connection of 65mm is required by Ontario building code (OBC) sentence 3.2.9.1 (a) for buildings greater than 3 stories, and 3.2.9.3 (b) for a building greater than 4000 m<sup>2</sup>.

The estimated water supply to the condo building is estimated by the following design areas:

### Design area 1: Underground Parking Garage

Area protected:	1500 ft <sup>2</sup> (140 m <sup>2</sup> )
Design density for	
Ordinary hazard group 1 (OH G1):	0.15 GPM/sqft
Estimated water demand unfactored:	225 GPM
Allowance for piping:	20%
Factored water demand:	270 GPM
Duration of water flow:	90 min
Hose stream allowance for OH G1:	250 GPM
<b>Total fire fighting water required by NFPA 13:</b>	<b>520 GPM</b>

### Design area 2: Standpipe

From OBC 3.2.9.7 water supply for 65mm hose connection

Fire fighting water flow:	1890 L/min (500 GPM) at 2 locations
Minimum pressure at hose connection:	450 kPa (65 PSI)

Therefore, a water service capable of providing **33L/s (520 GPM)** at required pressures must be provided for the eight-story condominium building.

As indicated from Norfolk county, the available water pressure at street level is estimated to be 310 kPa (45 PSI). A fire pump is required for the to provide adequate pressure for both sprinklers and standpipe.

A minimum **150mm diameter water main** from the municipal service is recommended for this building.

## 5. On-site Water Storage Infrastructure

The following infrastructure should be considered for the development:

### Cisterns:

In order to provide the required on-site water determined by FUS calculations, nine (9) 114m<sup>3</sup> precast fire water reservoirs or equivalent is required to be installed subgrade in the development. The cisterns will need to be connected to each other, vented, and connected to a series of dry hydrants.

For OBC compliance 308m<sup>3</sup> on-site water requirements can be provided by three (3) 114m<sup>3</sup> precast fire water reservoirs or equivalent.

#### Dry hydrants:

Dry hydrants are required to be installed in accordance with NFPA 1142 for the fire department to gain access to the stored fire fighting water. Dry hydrants must be placed such that the location of a fire truck can draft water with less than 20 ft of suction head, and within 45 m of any building face required to face a street.

#### Wet hydrants:

In addition to dry hydrants, Wet hydrants connected to the municipal water source are required. Wet hydrants are required to be placed every 90m along the fire access route, and within 45 m of the fire department connection for the eight-story condo building.

#### Fire pump:

Based on the current information, a fire pump is required for both standpipe and sprinklers serving condo building. We recommend a combination sprinkler standpipe system be installed in the building to limit the requirements for pumps to a single fire pump package. The pump is estimated to be 40 HP for this application. This system will require a test header that should discharge to the outdoors for annual testing purposes. A sprinkler room with dimension approximately 15' x 10' should be considered for the fire pump and associated sprinkler standpipe devices.

#### Standpipe system:

Fire hose cabinets are required on every floor of the condo building. Each cabinet shall contain a 38mm hose and a 65mm valve. Fire hose cabinets must be placed such that the maximum reach to all areas of the building are 33m.

As an option, an alternative solution application can be submitted to the AHJ to provide a combined standpipe/sprinkler system with 65mm valves in stairwells in lieu of fire hose cabinets adjacent to stairwells. This option can be explored at time of detailed design.

#### Emergency generator:

An emergency generator will be required to for the fire pump unless ULC listed fuel fired engine package with a fire pump is utilized.

More commonly a natural gas emergency generator would be specified for this application. The design team should consider other life safety electrical loads such as elevators and emergency lighting when sizing the generator.

#### Fire alarm panel and controls:

The sprinkler system requires supervised valves that are monitored by a fire alarm panel.

## Appendix A

### Fire Underwriters Survey calculation

### Condo Block 1 (Units 9-12)

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 1.5 Construction coefficient for wood frame construction

A= 713.0 Floor Area m<sup>2</sup> = Main Floor Area Building

= 713.0 Fire Area m<sup>2</sup> = Main Floor Area Building

F<sub>1</sub>= 8812 L/min

**F<sub>1</sub>= 9000 L/min** (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Non-Combustible

Reduction: 25%

Surcharge: 0%

$$F_2 = F_1 + (F_1 \cdot \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 6750 L/min**

3) Sprinkler System

Sprinkler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$$F_3 = F_2 \cdot \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 0 L/min**

pl

4) Seperation

<u>Location</u>	<u>Direction</u>	<u>Distance (m)</u>	<u>Surcharge</u>
Front	East	32.0	5%
Side	North	6.0	20%
Side	South	6.0	20%
Rear	West	12.0	15%
		Total:	60%

Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
30.1 to 45m	5%

$$F_4 = (\text{TOTAL}) \cdot F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 4050 L/min**

Total Fire Flow

$$F = F_2 - F_3 + F_4 = 10800 \text{ L/min}$$

$$= 11000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= 183.3 \text{ L/s}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999

2) 9999 denotes either the nearest building > 45m away or a fire wall is provided



### Block 2 Apartment Building

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 0.8 Non Combustible Construction

A= 2330.0 Floor Area m<sup>2</sup> = main floor area  
= 18640.0 Fire Area m<sup>2</sup> = 8 Floors

F<sub>1</sub>= 24029 L/min

**F<sub>1</sub>= 24000 L/min** (Round to the nearest 1,000 l/min)

2) Occupancy

Occupancy Type: Residential Non-Combustible

Reduction: 25%

Surcharge: 0%

$$F_2 = F_1 + (F_1 * \text{Reduction} / \text{Surcharge}) \quad (\text{L/min})$$

**F<sub>2</sub>= 18000 L/min**

3) Sprinkler System

Sprinkler System: Applicable (Assumes the building is protected by a complete automatic sprinkler system, conforming to NFPA 13 and other standards)

Reduction: 50%

$$F_3 = F_2 * \text{Reduction} \quad (\text{L/min})$$

**F<sub>3</sub>= 9000 L/min**

4) Seperation

<u>Location</u>	<u>Direction</u>	<u>Distance (m)</u>	<u>Surcharge</u>
Front	East	9999.0	0%
Side	North	9999.0	0%
Side	South	13.0	15%
Rear	West	9999.0	0%
		Total:	15%

Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
30.1 to 45m	5%

$$F_4 = (\text{TOTAL}) * F_2 \quad (\text{L/min})$$

**F<sub>4</sub>= 2700 L/min**

Total Fire Flow

$$F = F_2 - F_3 + F_4 = 11700 \text{ L/min}$$

$$= 12000 \text{ L/min} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= 200.0 \text{ L/s}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999

2) 9999 denotes either the nearest building > 45m away or a fire wall is provided

### Condo Block 3 (Units 21-24)

1) Fire Flow Requirement

$$F_1 = 220C(A^{1/2}) \quad (\text{L/min})$$

C= 1.5 Construction coefficient for wood frame construction

A= 484.0 Floor Area m<sup>2</sup> = main floor area  
= 968.0 Fire Area m<sup>2</sup> = main floor area + second floor area

$$F_1 = 10267 \text{ L/min}$$

$$F_1 = \mathbf{10000 \text{ L/min}} \quad (\text{Round to the nearest 1,000 l/min})$$

2) Occupancy

Occupancy Type: Residential Non-Combustible

Reduction: 25%

Surcharge: 0%

$$F_2 = F_1 + (F_1 * \text{Reduction/Surcharge}) \quad (\text{L/min})$$

$$F_2 = \mathbf{7500 \text{ L/min}}$$

3) Sprinkler System

Sprinkler System: Not Applicable (assumed no sprinkler system in service)

Reduction: 0%

$$F_3 = F_2 * \text{Reduction} \quad (\text{L/min})$$

$$F_3 = \mathbf{0 \text{ L/min}}$$

4) Seperation

<u>Location</u>	<u>Direction</u>	<u>Distance (m)</u>	<u>Surcharge</u>
Front	West	23.0	10%
Side	North	8.0	20%
Side	South	8.0	20%
Rear	East	12.0	15%
		Total:	65%

#### Separation Surcharges

0 to 3m	25%
3.1m to 10m	20%
10.1m to 20m	15%
20.1 to 30m	10%
30.1 to 45m	5%

$$F_4 = (\text{TOTAL}) * F_2 \quad (\text{L/min})$$

$$F_4 = \mathbf{4875 \text{ L/min}}$$

### Total Fire Flow

$$F = F_2 - F_3 + F_4 = 12375 \text{ L/min}$$

$$= \mathbf{12000 \text{ L/min}} \quad (\text{Round to the nearest 1,000 l/min})$$

$$= \mathbf{200.0 \text{ L/s}}$$

Notes: 1) All calculations and factors from Part 2 "Water Supply for Public Fire Protection" by the Fire Underwriters Survey, 1999  
2) 9999 denotes either the nearest building > 45m away or a fire wall is provided

## Appendix B

### Ontario Fire Marshal calculation

Calculation based on Ontario Fire Marshall Guideline OFM-TG-03-1999  
 $Q=K \cdot V \cdot S$

Critical parameter->	Building Construction	Non-combustible, FRR	3 (See Table 1 of OGM-TG-03-1999)
For Context	Kmin	10	
For Context	Kmax	53	
Critical parameter->	Code Class	C	5 (From Building Code Matrix)
Critical parameter->	Kdesign	10	(See Table 1 of OGM-TG-03-1999)
Critical parameter->	V	57784 m^3	
	Sbase	1	(Refer to Figure 1 of OGM-TG-03-1999)
	+ S1	0	New Townhouse, 53m separation
	+ S2	0	New Townhouse, 13m separation
	+ S3	0	No exposure
	+ S4	0	No exposure
Critical parameter->	S	1	

<b>Q=KVS</b>	<b>577840 L</b>	<b>152649 usgal</b>
--------------	-----------------	---------------------



**ARC Engineering**

Waterford Development

Storage Capacity

Project Number: 21-117-160

**Fire Underwriters Survey Path**

Required Flow (FUS)	200	L/s
Water provided by Waterford	70	L/s
Total water flow required from private source	130	L/s
	2061	GPM

Sprinkler Demand	270	GPM
	17	L/s
Standpipe Demand	500	GPM
	32	L/s
Total inside Building Demand	520	GPM
	33	L/s

demand on private water source	Flow	Duration	Volume
Sprinklers	33 L/s	120 Min	236215 L
Hydrants	97 L/s	120 Min	698400 L
			934615 L
			935 M3

**Ontario Fire Marshal Path**

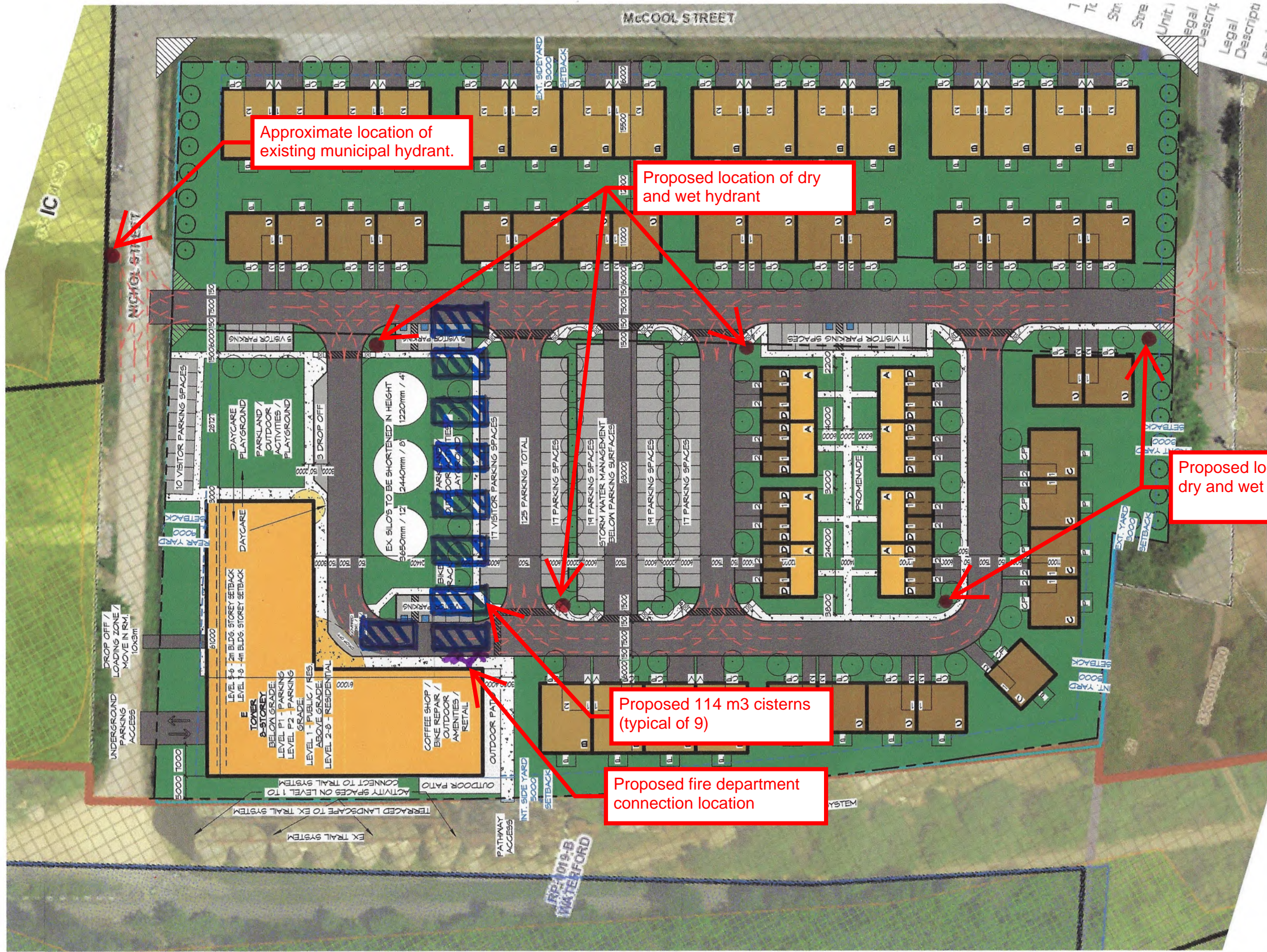
Required Flow (OFM)	150	L/s
	2378	GPM
Storage Required (OFM)	577840	L
Duration	64	min

Water provided by Waterford	70	L/s
Total water flow required from alt source	80	L/s
	1268	GPM
Storage factor= (OFM Required Duration * alterantive source flow)	308181	L
	308	M3

## Appendix C

### Conceptual Sketch





1 SITE PLAN ZONING AMENDMENT / PRECON MTG  
SCALE 1:600

Project Title

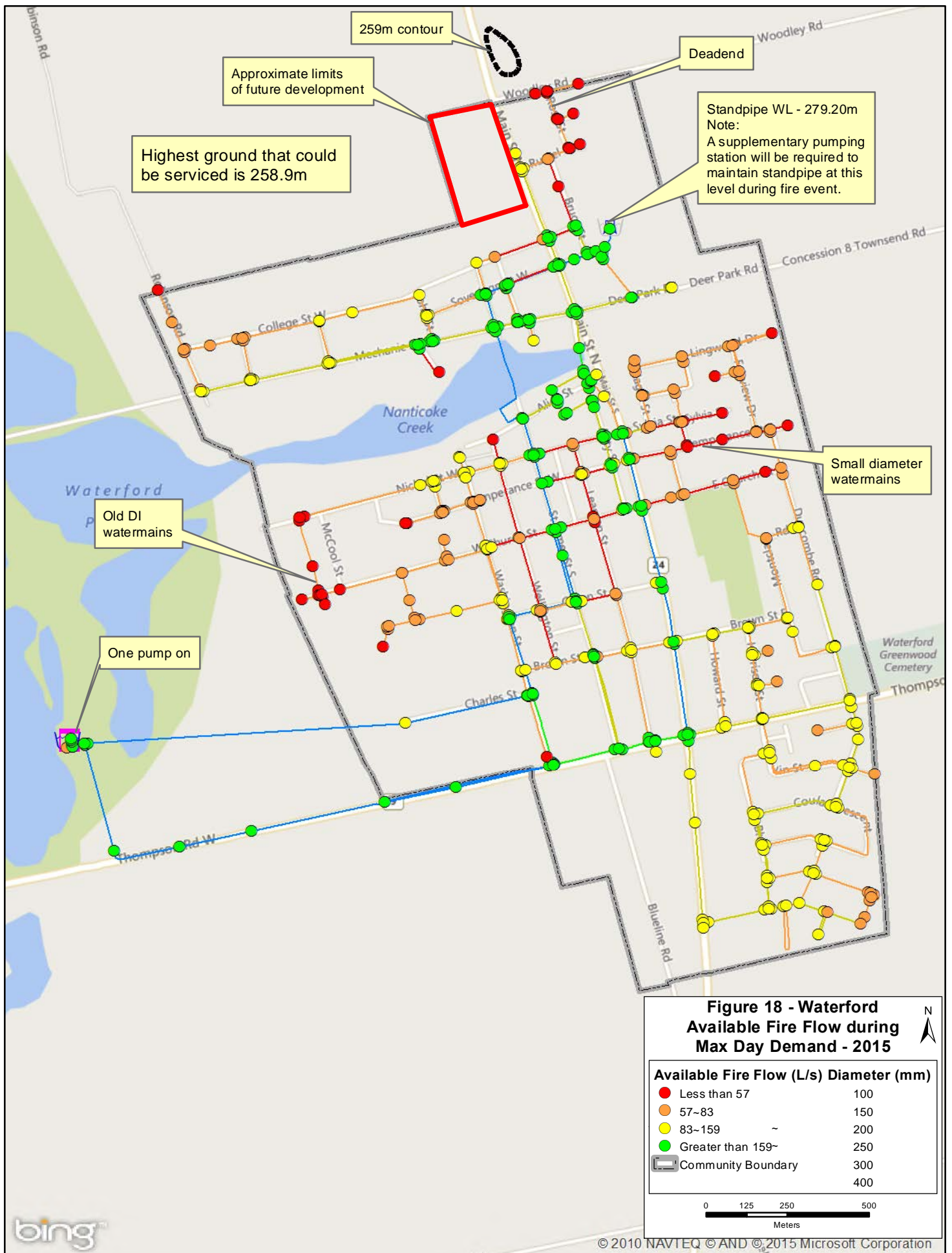
# SILOS OF WATERFORD

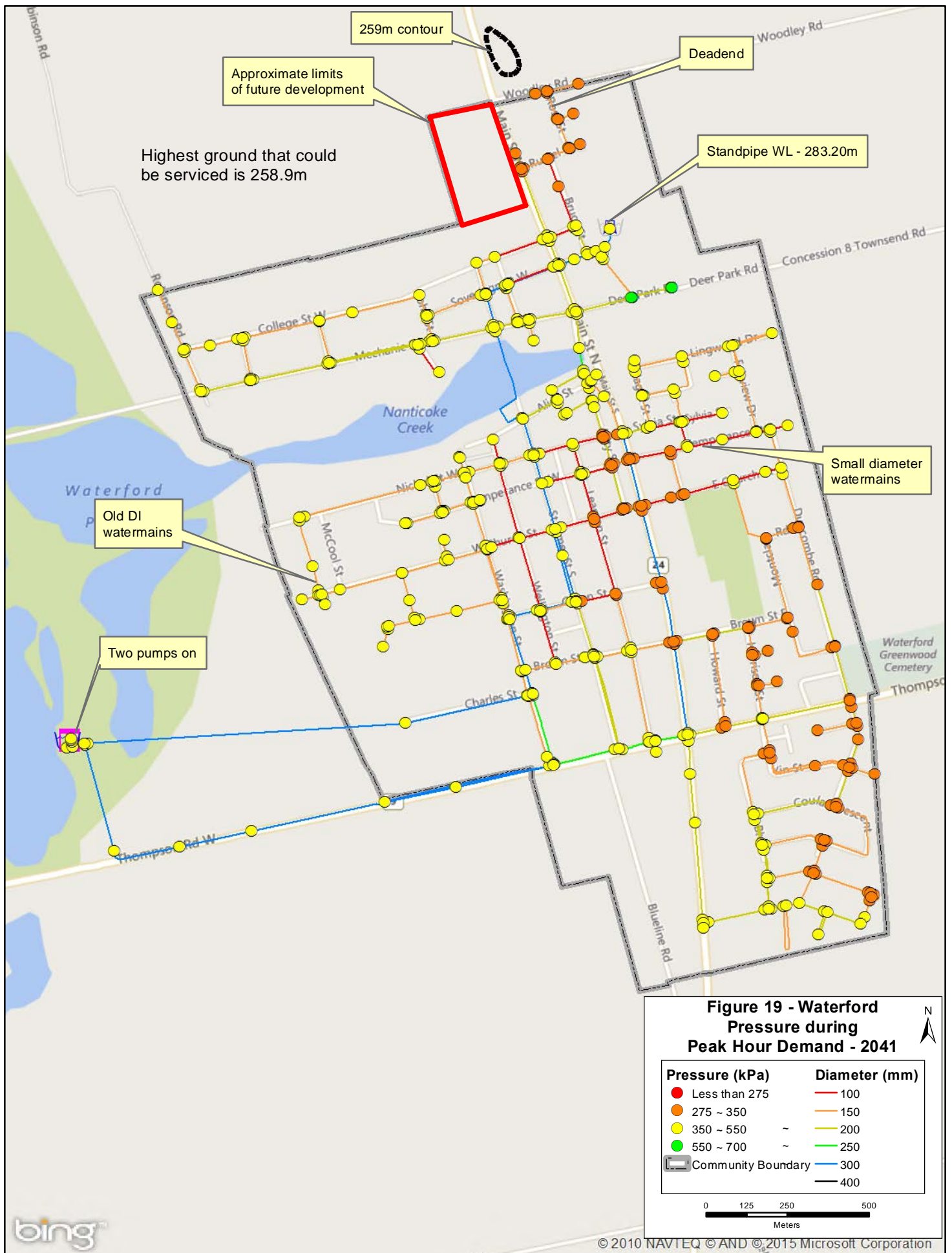
257 CHURCH ST. W,  
WATERFORD, ONTARIO, CANADA,  
NOE 1Y0











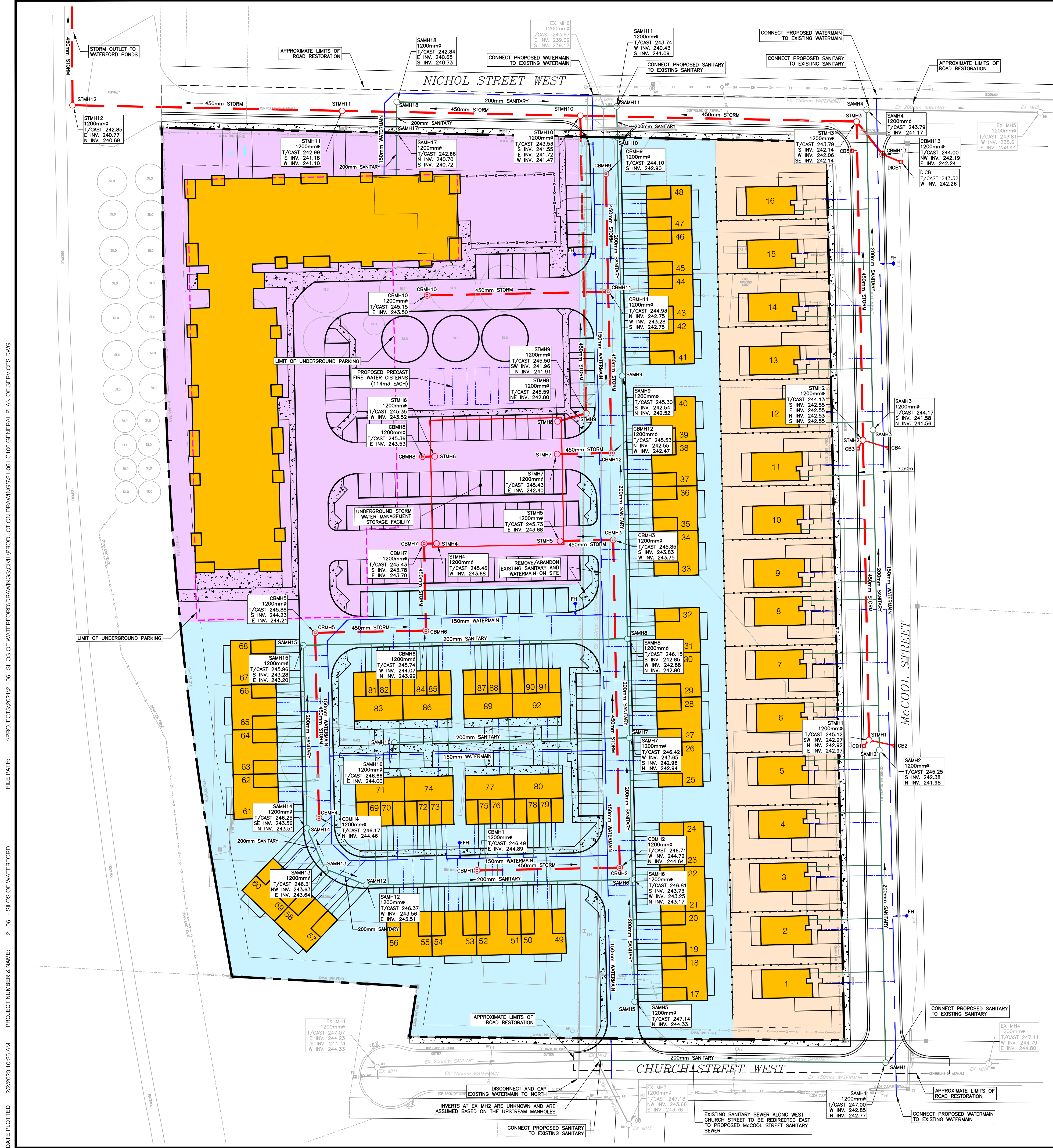




## **APPENDIX D**

DWG C100 – General Plan of Services





#### LEGEND

- STM#5 PROPOSED STORM MANHOLE & SEWER
- SAM#3 PROPOSED SANITARY MANHOLE & SEWER
- PROPOSED SANITARY SERVICE
- PROPOSED WATERMAIN
- PROPOSED WATER SERVICE
- PROPERTY LINE

#### NOTES

- STORM AND SANITARY SEWER SIZES HAVE NOT BE SIZED.
- T/C ELEVATIONS AND STORM AND SANITARY INVERTS ARE PRELIMINARY TO DEMONSTRATE THE PROPOSED SERVICES ARE FUNCTIONAL.

#### PROPOSED ZONING LIMITS


- ZONE R1
- ZONE R4
- ZONE R6

REV. No.	DATE	REVISION
0	JAN 19/23	ISSUED FOR FUNCTIONAL SERVICING

SCALE: 10 20  
HORIZONTAL : 1:500

DO NOT SCALE DRAWINGS. CALL FOR ANY CLARIFICATIONS THAT ARE REQUIRED. FIELD VERIFY AT ALL BUILT CONDITIONS

ALL DRAWINGS ARE TO BE READ IN COLOUR  
ORIGINAL PAGE SIZE ARCH D - 24" x 36"



**vallee**  
Consulting Engineers,  
Architects & Planners

**G. DOUGLAS VALLEE LIMITED**  
2 TALBOT STREET NORTH  
SIMCOE, ONTARIO N3Y 3W4  
(519) 426-6270

Stamp

**PRELIMINARY**  
NOT TO BE USED  
FOR CONSTRUCTION

Project Title  
**SILOS OF WATERFORD**  
257 CHURCH STREET WEST  
WATERFORD - NORFOLK COUNTY

Drawing Title  
**GENERAL PLAN OF SERVICES**

Designed by :	NLB	Drawn By :	NLB
Checked by :	JL	Date Started :	JAN 2023
Drawing Scale :	1:500	Drawing No.	C100
Project No.	21-061		



**From:** John Iezzi

**Sent:** Wednesday, January 18, 2023 9:55 AM

**To:** 'Tim Dickhout' <[Tim.Dickhout@norfolkcounty.ca](mailto:Tim.Dickhout@norfolkcounty.ca)>

**Cc:** 'Mike King' <[Mike.King@norfolkcounty.ca](mailto:Mike.King@norfolkcounty.ca)>; 'Brandon Sloan' <[Brandon.Sloan@norfolkcounty.ca](mailto:Brandon.Sloan@norfolkcounty.ca)>; 'DCS Developments' <[developmentengineering@norfolkcounty.ca](mailto:developmentengineering@norfolkcounty.ca)>; John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>

**Subject:** RE: 21-061 Silos of Waterford - 257 West Church Street, Roll Number: 33503002300

**Importance:** High

Hi Tim,

Following up on this conversation from quite some time ago.

We requested water and wastewater modeling be done in advance of our formal development application for this file. In the thread below there was a bit of discussion on the available water supply but I don't have any correspondence past this nor have received anything from RVA to date. **Can you confirm if this was ever passed on to RVA for their modeling?** If not, could you please initiate this immediately.

Note – the development concept has changed from what is outlined in the attached memo. If modeling was done, please provide the reports. If not, we will update this memo for circulation.

Thank you,

*John Iezzi, P.Eng.*

**G. DOUGLAS VALLEE LIMITED**

Consulting Engineers, Architects and Planner

2 Talbot Street North Simcoe Ontario N3Y 3W4

Office: 519 426 6270

Cell: 519 732 5513

[www.gdvallee.ca](http://www.gdvallee.ca)



**From:** John Iezzi

**Sent:** Wednesday, March 2, 2022 4:31 PM

**To:** Tim Dickhout <[Tim.Dickhout@norfolkcounty.ca](mailto:Tim.Dickhout@norfolkcounty.ca)>

**Cc:** Mike King <[Mike.King@norfolkcounty.ca](mailto:Mike.King@norfolkcounty.ca)>; Brandon Sloan <[Brandon.Sloan@norfolkcounty.ca](mailto:Brandon.Sloan@norfolkcounty.ca)>; DCS Developments <[developmentengineering@norfolkcounty.ca](mailto:developmentengineering@norfolkcounty.ca)>

**Subject:** RE: 21-061 Silos of Waterford - 257 West Church Street, Roll Number: 33503002300

Hi Tim,

Thank you for the reply.

We do intend on using the available County supply but will need to supplement it with additional on-site measures. This is because the ISMP shows no municipal watermain near the property that has 200L/s available. The municipal system does not appear to be designed to provide this flow. The closest municipal main note which can provide "greater than 159L/s" is ~700m away at St. James Street – attached for reference. How else are we to meet the stringent FUS requirements when the system can not provide?

I would like to have a meeting or phone call to discuss further so I'm sure I understand you are advising. If you could, please give me a call or let me know when is best to reach you.

Thanks again,

*John Iezzi, P.Eng.*

**G. DOUGLAS VALLEE LIMITED**

Consulting Engineers, Architects and Planner

2 Talbot Street North Simcoe Ontario N3Y 3W4

Office: 519 426 6270

Cell: 519 732 5513

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**From:** Tim Dickhout <[Tim.Dickhout@norfolkcounty.ca](mailto:Tim.Dickhout@norfolkcounty.ca)>

**Sent:** Monday, February 28, 2022 10:55 AM

**To:** John Iezzi <[johniezzi@gdvallee.ca](mailto:johniezzi@gdvallee.ca)>

**Cc:** Mike King <[Mike.King@norfolkcounty.ca](mailto:Mike.King@norfolkcounty.ca)>; Brandon Sloan <[Brandon.Sloan@norfolkcounty.ca](mailto:Brandon.Sloan@norfolkcounty.ca)>; DCS Developments <[developmentengineering@norfolkcounty.ca](mailto:developmentengineering@norfolkcounty.ca)>

**Subject:** RE: 21-061 Silos of Waterford - 257 West Church Street, Roll Number: 33503002300

Good Day,

After reviewing the attached concept and servicing demand brief, it is the opinion of the county that fire flow capacity should be constructed within the county systems, not within the private development.

This opinion is based on the Official Plan that states all developments within the urban boundary shall be constructed with full municipal services. The proposed development could not be exempt from this requirement, as the lands are already fully serviced. Also, it is stated in the ISMP that the county would include fire protection as part of the water infrastructure, as such the fire flows should be accommodated within the county's infrastructure.

Please advise the county if you would still like to go forward with the design and servicing memo as provided, but without the onsite fire protection, with the max day water as calculated and the FUS calculation of 200 l/s as recommended by ARC Consulting. The OBC Fire Marshall Calculation is not supported in our design criteria, as such, will not be considered. Any recommendation of upgrades would be the responsibility of the developer.

Please also be advised, proceeding with the modelling prior to any official planning application does not guarantee or shall be perceived as any approvals. There could be other factors that could limit the ultimate design of the development.

**Mr. Tim Dickhout**

Project Manager, Development

Engineering  
Environmental and Infrastructure Services Division  
185 Robinson St.  
Suite 200, Simcoe, Ontario, N3Y 5L6  
519-426-5870 x. 1700



Working together with our community

**From:** John Iezzi <[johniezzi@gdvallee.ca](mailto:johniezzi@gdvallee.ca)>  
**Sent:** Monday, January 24, 2022 4:39 PM  
**To:** Stephen Gradish <[Stephen.Gradish@norfolkcounty.ca](mailto:Stephen.Gradish@norfolkcounty.ca)>  
**Cc:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>; Eldon Darbyson <[eldondarbyson@gdvallee.ca](mailto:eldondarbyson@gdvallee.ca)>; Tim Dickhout <[Tim.Dickhout@norfolkcounty.ca](mailto:Tim.Dickhout@norfolkcounty.ca)>; Zeel Joshi <[Zeel.Joshi@norfolkcounty.ca](mailto:Zeel.Joshi@norfolkcounty.ca)>  
**Subject:** 21-061 Silos of Waterford - 257 West Church Street, Roll Number: 33503002300

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Hi Stephen,

As discussed during the pre-consultation meeting on 2021-08-25, on behalf of our Client, we would like to request water and waste water modeling by the County's consultant in **advance of** proceeding with our development application.

Find attached our servicing demand memo outlining the anticipated demands for the development. Please provide the quote for the modeling for the Owner's approval so we can proceed with this as quickly as possible.

Thank you,

*John Iezzi, P.Eng.*

**G. DOUGLAS VALLEE LIMITED**

Consulting Engineers, Architects and Planner

2 Talbot Street North Simcoe Ontario N3Y 3W4

Effective Friday Dec 16, our firm has returned to **"work at home"** due to the Omicron Variant.

Please contact me on my cell at **519-732-5513**

[www.gdvallee.ca](http://www.gdvallee.ca)





## John Vallee

---

**From:** John Vallee  
**Sent:** Thursday, November 18, 2021 2:29 PM  
**To:** Kelly, Rita (IO)  
**Cc:** Tom O'Hara; Angie O'Hara; John Iezzi; Melissa Stickl Stewart; Donna Kerr; Joanne Houghton  
**Subject:** RE: Silos of Waterford Storm Sewer Outlet

Rita:

In the email below, Joanne has referred our file to you and therefore I am following up with you.

I assume that you have the full information package from Joanne.

Would you please reply and confirm to me what the next steps are, and what information you require from us.

Thanks so much!

*John D. Vallee, P.Eng., President*  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects and Planner  
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[www.gdvallee.ca](http://www.gdvallee.ca)



---

**From:** Joanne Houghton <jhoughton@dmsproperty.com>  
**Sent:** Thursday, November 18, 2021 2:24 PM  
**To:** John Vallee <Johnvallee@gdvallee.ca>  
**Cc:** Tom O'Hara <tom@teamohara.com>; Angie O'Hara <angie@teamohara.com>; Kelly, Rita (IO) <Rita.Kelly@infrastructureontario.ca>; John Iezzi <johniezzi@gdvallee.ca>; Melissa Stickl Stewart <melissastickl@gdvallee.ca>; Donna Kerr <dkerr@dmsproperty.com>  
**Subject:** RE: Silos of Waterford Storm Sewer Outlet

John;  
We have consulted with the Infrastructure Ontario (IO) real estate department. We have been instructed to provide you with the contact information for Rita Kelly who will be your point of contact for obtaining an easement for the requested storm sewer servicing corridor.

Once the project progresses to the point where a due diligence agreement is needed we will be looped back in to facilitate the necessary access and co-ordinate with the trail tenant.

Rita Kelly  
**Infrastructure Ontario**  
Real Estate Transaction Manager

647 264 3804

416-433-0737

[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)

Thank you,  
Joanne

Joanne Houghton | Property Manager  
CBRE Land Bank Management Team  
IO Property and Land Management Services  
659 Exeter Road  
London, Ontario N6E 1L3  
T 519-452-6815 | C 226-234-5123  
Email [jhoughton@dmsproperty.com](mailto:jhoughton@dmsproperty.com)

---

**From:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>

**Sent:** November 5, 2021 8:31 AM

**To:** Joanne Houghton <[jhoughton@dmsproperty.com](mailto:jhoughton@dmsproperty.com)>

**Cc:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>; Angie O'Hara <[angie@teamohara.com](mailto:angie@teamohara.com)>; John Iezzi <[johniezzi@gdvallee.ca](mailto:johniezzi@gdvallee.ca)>;  
Melissa Stickl Stewart <[melissastickl@gdvallee.ca](mailto:melissastickl@gdvallee.ca)>

**Subject:** Silos of Waterford Storm Sewer Outlet

You don't often get email from [johnvallee@gdvallee.ca](mailto:johnvallee@gdvallee.ca). [Learn why this is important](#)

Joanne.

Thank you so much for your help on the phone a few weeks ago.

You will recall that we talked about using the former rail corridor in Waterford as a servicing corridor for a storm sewer outlet to facilitate our development.

The image below shows the proposal that we discussed.

The red shaded area is our client's land for a proposed residential development.

The blue shaded area is the former railway land which we understand is owned by the Province of Ontario and used by Norfolk County as a rail trail.

The orange heavy line shows the schematic alignment of the proposed storm sewer on the Province's land. This proposed storm sewer will convey storm water from the development land, along the Province's land, across Norfolk County's road, and then discharge to the existing water body.

It is our intention to avoid any impact on the Waterford Trail. We plan to install the storm sewer beside the trail as your corridor is very wide.

Our client would be responsible for all construction costs including restoration of the Province's lands to a condition equal to existing conditions.

We anticipate that the storm sewer would be owned by the proposed residential condominium and therefore the condominium corporation would be responsible for maintenance of the storm sewer.

We anticipate that an easement would be required from the Province in favour of the developer for installation and the condominium corporation for maintenance.

We ask that you confirm to us that this is acceptable in principal to the Province, and that you advise us of the next steps and process to complete this agreement.

Thank you for your cooperation in this regard.



*John D. Vallee, P.Eng., President*  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects and Planner  
2 Talbot Street North Simcoe Ontario N3Y 3W4  
519.426.6270  
[www.gdvallee.ca](http://www.gdvallee.ca)



## John Vallee

---

**From:** Kelly, Rita (IO) <Rita.Kelly@infrastructureontario.ca>  
**Sent:** Wednesday, January 12, 2022 11:13 AM  
**To:** Tom O'Hara  
**Cc:** John Vallee; Angie O'Hara; Chang, David (IO); Brunton, Miranda (IO); Gulsoy, Chris; Joanne Houghton  
**Subject:** File E1090811: Easement for storm water pipe - Waterford Trail N71207-P71207

Hi Tom,

As previously confirmed the application to acquire an easement over a portion of the MGCS owned parcel has been successfully circulated to IO stakeholders without objection.

Kindly reference IO's Project File No. E1090811 when corresponding with IO.

When you are ready to commence required due diligence, please contact the following IO staff for assistance.

David Chang, Environmental Specialist 437-371-5328

Chris Gulsoy, Appraiser 647-264-3692

Chris will provide you with IO's terms of reference to ensure that the appraisal meets IO's requirements and can assist you with any questions you may have regarding the valuation.

Miranda Brunton, Heritage Specialist 647-264-2745

There is one impacted stakeholder noted below, please contact Joanne Houghton, Property Manager @ 519-452-6815 at DMS Group for assistance

1. Waterford Heritage Trail Association (M71068).

If you have any questions, please give me a call. I look forward to working with you.

Thanks

Rita

Rita Kelly  
Infrastructure Ontario  
Real Estate Transaction Manager  
647 264 3804  
416-433-0737

---

**From:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>  
**Sent:** December 20, 2021 10:38 AM  
**To:** Kelly, Rita (IO) <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>  
**Cc:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>; Angie O'Hara <[angie@teamohara.com](mailto:angie@teamohara.com)>  
**Subject:** Re: IO's Public Work Application - Easement for storm water - Waterford Trail N71207-P71207



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Hi Rita:

This is fabulous news. Thank you again for your assistance.

Cheers,

Tom

Tom O'Hara  
Villages of Waterford  
Box 1152, 26 Main St. South  
Waterford, ON N0E 1Y0  
705.205.3235 - Cell  
1.866.781.7653 – Toll Free

---

**From:** "Kelly, Rita (IO)" <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>  
**Date:** Monday, December 20, 2021 at 10:37 AM  
**To:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>  
**Cc:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>, Angie O'Hara <[angie@teamohara.com](mailto:angie@teamohara.com)>  
**Subject:** RE: IO's Public Work Application - Easement for storm water - Waterford Trail N71207-P71207

Hi Tom,

Yes, your application has been successfully circulated to IO stakeholders without objection and IO will proceed to work with you to acquire an easement.

I will send you an email first week of January outlining the next steps.

Merry Christmas and have a wonderful holiday season too!

Rita

---

**From:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>  
**Sent:** December 20, 2021 10:29 AM  
**To:** Kelly, Rita (IO) <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>  
**Cc:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>; Angie O'Hara <[angie@teamohara.com](mailto:angie@teamohara.com)>  
**Subject:** Re: IO's Public Work Application - Easement for storm water - Waterford Trail N71207-P71207

**CAUTION:** This email originated from outside of Infrastructure Ontario. Do not click links or open attachment(s) unless you recognize the sender and know the content is safe.

I am touching base to see if you have a status report on our Property Interest Application – Easement for Storm Water Pipe - Waterford, Ontario. Being so close to Christmas, should we expect this to be completed in the New Year?

We hope you have a wonderful Holiday season.

Thank you for your ongoing assistance.

Cheers,

Tom

Tom O'Hara  
Villages of Waterford  
Box 1152, 26 Main St. South  
Waterford, ON N0E 1Y0  
705.205.3235 - Cell  
1.866.781.7653 – Toll Free

---

**From:** "Kelly, Rita (IO)" <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>

**Date:** Tuesday, November 23, 2021 at 9:14 AM

**To:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>

**Subject:** RE: IO's Public Work Application - Easement for storm water - Waterford Trail N71207-P71207

Hi Tom,

Thank you for your email and all attachments. I don't see the completed application attached. Can you please resend the application to me.

Regards

Rita

---

**From:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>

**Sent:** November 22, 2021 1:41 PM

**To:** Kelly, Rita (IO) <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>

**Cc:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>; 'Angie O'Hara' <[angie@teamohara.com](mailto:angie@teamohara.com)>

**Subject:** Re: IO's Public Work Application - Easement for storm water - Waterford Trail N71207-P71207

**CAUTION:** This email originated from outside of Infrastructure Ontario. Do not click links or open attachment(s) unless you recognize the sender and know the content is safe.

Dear Rita:

Please let me know if you require any additional information.

**Subject: Property Interest Application – Easement for Storm Water Pipe - Waterford, Ontario**

Attached is the following:

1. Completed Application.
2. GeoWarehouse – Identifying PIN and Legal Address
3. Title to Property (Taranet)
4. Details / Rationale – explanation of request.
5. Map of Waterford
6. The \$1,000 plus HST (\$1,130) has been paid and the receipt of payment attached.

Cheers,

Tom

Tom O'Hara  
Villages of Waterford  
Box 1152, 26 Main St. South  
Waterford, ON N0E 1Y0  
705.205.3235 - Cell  
1.866.781.7653 – Toll Free

---

**From:** "Kelly, Rita (IO)" <[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)>  
**Date:** Friday, November 19, 2021 at 10:51 AM  
**To:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>, "[tom@teamohara.com](mailto:tom@teamohara.com)" <[tom@teamohara.com](mailto:tom@teamohara.com)>  
**Subject:** IO's Public Work Application - Easement for storm sewer - Waterford Trail N71207-P71207

Hello John and Tom,

It was a pleasure meeting you both today.

Attached please find IO's form of application together with letter outlining our process for acquiring property rights over Ministry of Government and Consumers Services (MGCS) lands. Upon receipt of your completed application together with the application fee, your proposal will be circulated internally to IO stakeholders for review and comment. If there are no objections, IO will proceed to work with you to complete your request to acquire an easement. I have also attached IO's banking information for your use.

If you have any questions or would like to discuss our process and due diligence requirements please give me a call.

I look forward to working with you.

Thank you  
Rita

**Rita Kelly**  
Real Estate Transaction Manager  
647 264 3804  
416-433-0737

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# **257 West Church Street Waterford Transportation Impact Study**

Paradigm Transportation Solutions Limited

June 2022  
210699



# Project Summary



**Project Number**  
210699

**Date: June 2022**  
Version 1.0.0

**Client**  
**Villages of Waterford**  
Tom O'Hara  
Box 1152, 26 Main St. South  
Waterford, ON N0E 1Y0

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Eldon Darbyson  
G. Douglas Vallee Limited

**Consultant Project Team**  
Rajan Philips, M.Sc. (PI), P.Eng.  
Patrick Neal, EIT

## 257 West Church Street, Waterford Transportation Impact Study

<< Original Signed By >>

Rajan Philips, P.Eng.

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# Executive Summary

## Content

Paradigm Transportation Solutions Limited (Paradigm) has been retained to conduct this Transportation Impact Study (TIS) for a proposed mixed-use development located at 257 West Church Street in the Community of Waterford, Norfolk County.

This TIS includes an analysis of existing traffic conditions; a description of the proposed development; and traffic forecasts for the anticipated year of development opening (2026), five years after development (2031), and ten years after development (2036).

## Development Concept

The subject site is located on the west side of McCool Street between West Church Street and Nichol Street in the Community of Waterford. The development is proposed to include 92 townhouse units and a mid-rise apartment building comprising 98 apartment units.

Vehicular access is proposed via direct driveway connections to McCool Street as well as three common access points: one on West Church Street and two on Nichol Street. The western access on Nichol Street provides access to an underground parking garage for the mid-rise building.

The development will be completed in three phases: Phase 1 includes 16 townhouses and will be completed by 2024; Phase 2 includes 76 townhouses and will be completed by 2025; and Phase 3 includes the mid-rise mixed-use building and will be completed by 2026.

## TIS Scope

The scope of the Transportation Impact Study for the proposed development includes:

► **Study Area intersections:**

- Nichol Street and McCool Street;
- West Church Street and McCool Street;
- Nichol Street and Washington Street;
- West Church Street and Washington Street;
- two access intersections on West Church Street; and
- access intersection on Nichol Street.



- ▶ **Analysis Periods:** Weekday AM and PM peak hours.
- ▶ **Traffic Conditions:** Existing (2021), development opening (2026) and five (2031) and 10 years (2036) after development.

## Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating at LOS A.
- ▶ **Development Trip Generation:** The development is forecast to generate 74 and 90 trips during the AM and PM peak hours, respectively.
- ▶ **Background Traffic Conditions:** All study area intersections are forecast to operate at LOS A under 2026, 2031, and 2036 traffic conditions.
- ▶ **Total Traffic Conditions:** All study area intersections and all site access intersections are forecast to operate at LOS A under 2026, 2031, and 2036 traffic conditions.

## Recommendations

Based on the findings of this study, it is recommended that the subject development be considered for approval as proposed.





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# 1 Introduction

## 1.1 Overview

Paradigm Transportation Solutions Limited (Paradigm) has been retained to conduct this Transportation Impact Study (TIS) for a proposed mixed-use development located at 257 West Church Street in the Community of Waterford, Norfolk County. **Figure 1.1** details the subject development location.

The subject site is located on the west side of McCool Street between West Church Street and Nichol Street in the Community of Waterford. The development is proposed to include 92 townhouse units and a mid-rise apartment building comprising 98 apartment units.

Vehicular access is proposed via direct driveway connections to McCool Street as well as three common access points: one on West Church Street and two on Nichol Street. The western access on Nichol Street provides access to an underground parking garage for the mid-rise building.

The development will be completed in three phases: Phase 1 includes 16 townhouses and will be completed by 2024; Phase 2 includes 76 townhouses and will be completed by 2025; and Phase 3 includes the mid-rise mixed-use building and will be completed by 2026.

## 1.2 Purpose and Scope

The purpose of this report is to identify and assess the potential traffic impact resulting from the proposed development. The scope of the study, shared with Norfolk County staff via e-mail in November 2021, includes:

- ▶ Assessment of the current traffic and site conditions within the study area;
- ▶ Estimates of background traffic growth for year of development opening (2026) and five (2031) and 10 years (2036) after development;
- ▶ Estimates of additional traffic generated by the subject site;
- ▶ Analyses of the impact of the future traffic on the surrounding road network, including the following study area intersections:
  - Nichol Street and McCool Street;
  - West Church Street and McCool Street;
  - Nichol Street and Washington Street;



- West Church Street and Washington Street;
- Two access intersections on West Church Street; and
- Access intersection on Nichol Street.

**Appendix A** contains the pre-study consultation material.

This study has been prepared in accordance with the requirements detailed by the Norfolk County TIS Guidelines<sup>1</sup>.

---

<sup>1</sup> Norfolk County Integrated Sustainable Master Plan (ISMP), Appendix J: TIS Guidelines, September 2016.







## Study Area and Subject Development Location

257 W Church Street TIS  
210699

Figure 1.1

## 2 Existing Conditions

### 2.1 Existing Roadways

The main roadways near the subject site considered in assessing the traffic impacts of the development include:

- ▶ **Washington Street** is a north-south collector road<sup>2</sup> with a two-lane cross section and an assumed speed limit of 50 km/h. Sidewalks are provided on the west side of the roadway between Nichol Street and Temperance Street as well as on the east side of the roadway south of Nichol Street.
- ▶ **West Church Street** is an east-west collector road with a two-lane cross section and a posted speed limit of 50 km/h. Sidewalks are provided on the north side of the roadway.
- ▶ **Nichol Street West** is an east-west local road with a two-lane cross section and an assumed speed limit of 50 km/h. Sidewalks are provided on the north side of Nichol Street between McCool Street and approximately 50 metres west of Washington Street. Sidewalks are also provided on the south side of Nichol Street east of Wesley Street.
- ▶ **McCool Street** is a north-west local road with a two-lane cross section and an assumed speed limit of 50 km/h. McCool Street connects Nichol Street West and West Church Street and terminates at both roadways. It traverses the frontage of the subject site.

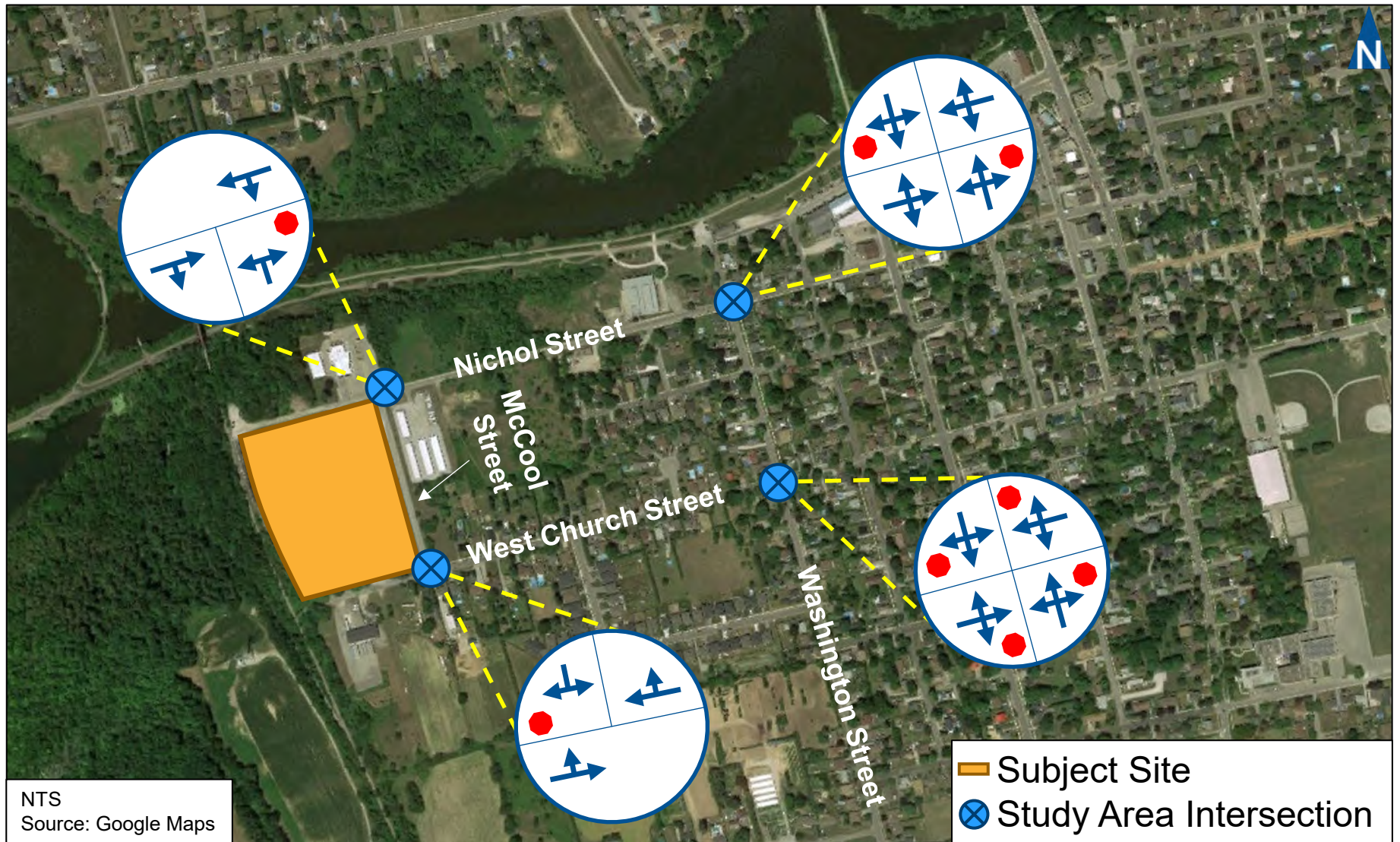
**Figure 2.1** displays the traffic control and lane configuration at the study area intersections.

---

<sup>2</sup> Norfolk County Official Plan, Schedule E-5: Waterford Transportation, Revised October 2018.







## 2.2 Transit Service

Norfolk County operates Ride Norfolk Transit, which provides fixed route transit service in Waterford via the Brantford route on weekdays and the Delhi and Waterford route on Mondays. The stop in Waterford for the Brantford route includes the Waterford Library, while the Waterford stops for the Delhi and Waterford route include the Waterford Medical on Sovereign Street, Waterford Library, and Waterford Plaza.

The Brantford route operates three times per day Monday through Friday and departs the Simcoe Library at 9:15 AM, 1:15 PM, and 3:20 PM. The Delhi and Waterford route operates five times every Monday to Delhi.

The service costs \$2.50 to travel within Waterford and \$6.00 to travel to other towns in Norfolk County.

The nearest transit stops to the subject site are located approximately 1.2 kilometres east of the subject site.

**Figure 2.2** illustrates the location of the Brantford transit route in the Community of Waterford.

## 2.3 Traffic Volumes

**Figure 2.3** illustrates the existing AM and PM weekday peak hour turning movement traffic volumes collected by Paradigm in December 2021.

It is noted that turning movement counts were recorded only at the Washington Street intersections with Nichol Street and West Church Street. Due to the low traffic volumes at the McCool Street intersections at Nichol Street and at West Church Street, the turning movements have been interpolated based on the traffic volumes at the Washington Street intersections. As noted, McCool Street terminates north and south at Nichol Street and West Church Street, respectively.

**Table 2.1** summarizes the peak hours at each intersection.



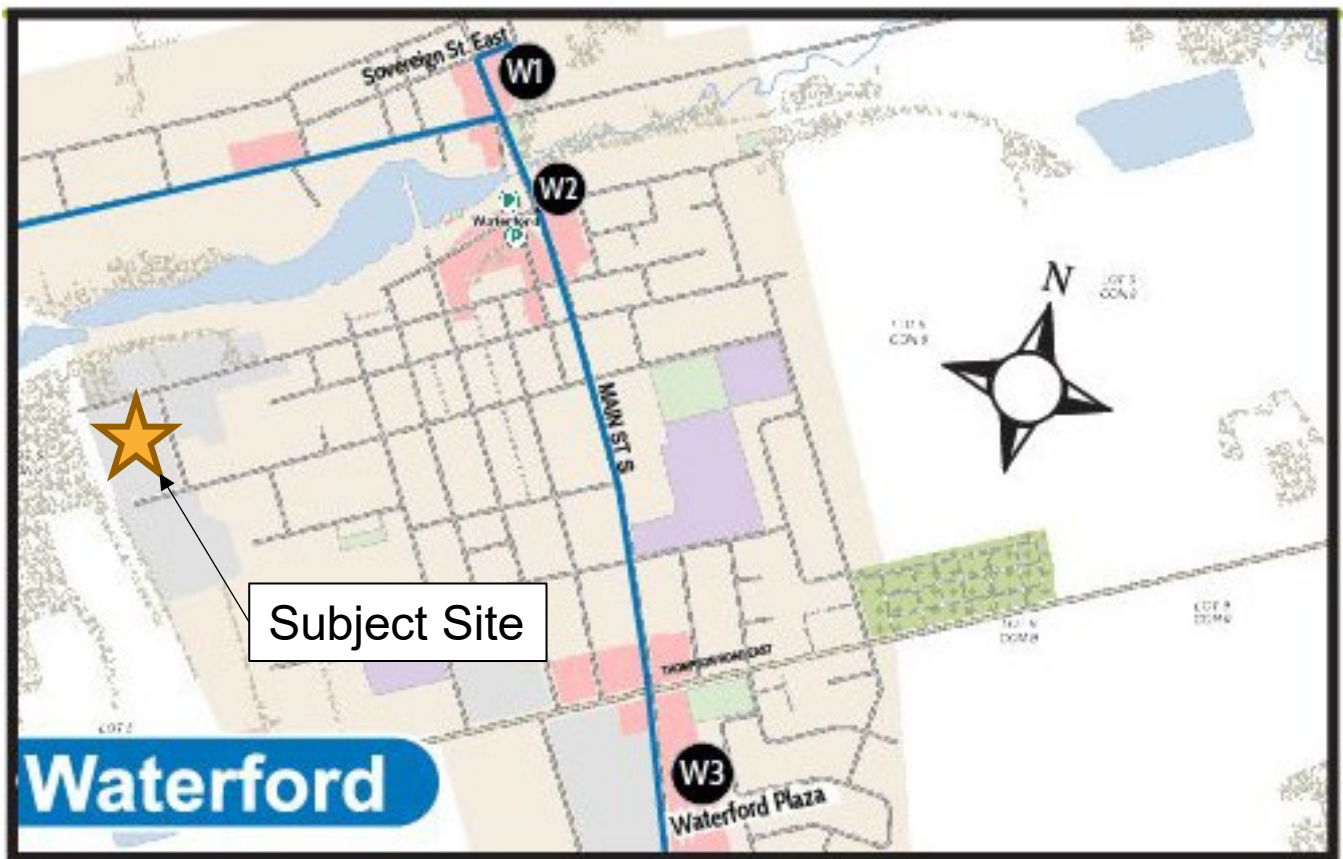


**TABLE 2.1: INTERSECTION PEAK HOURS**

Intersection	AM Peak Hour	PM Peak Hour
Washington Street and West Church Street	8:30 AM – 9:30 AM	4:15 PM – 5:15 PM
Nichol Street and Washington Street	8:30 AM – 9:30 AM	4:15 PM – 5:15 PM

**Appendix B** contains the detailed traffic counts for the study area intersections.



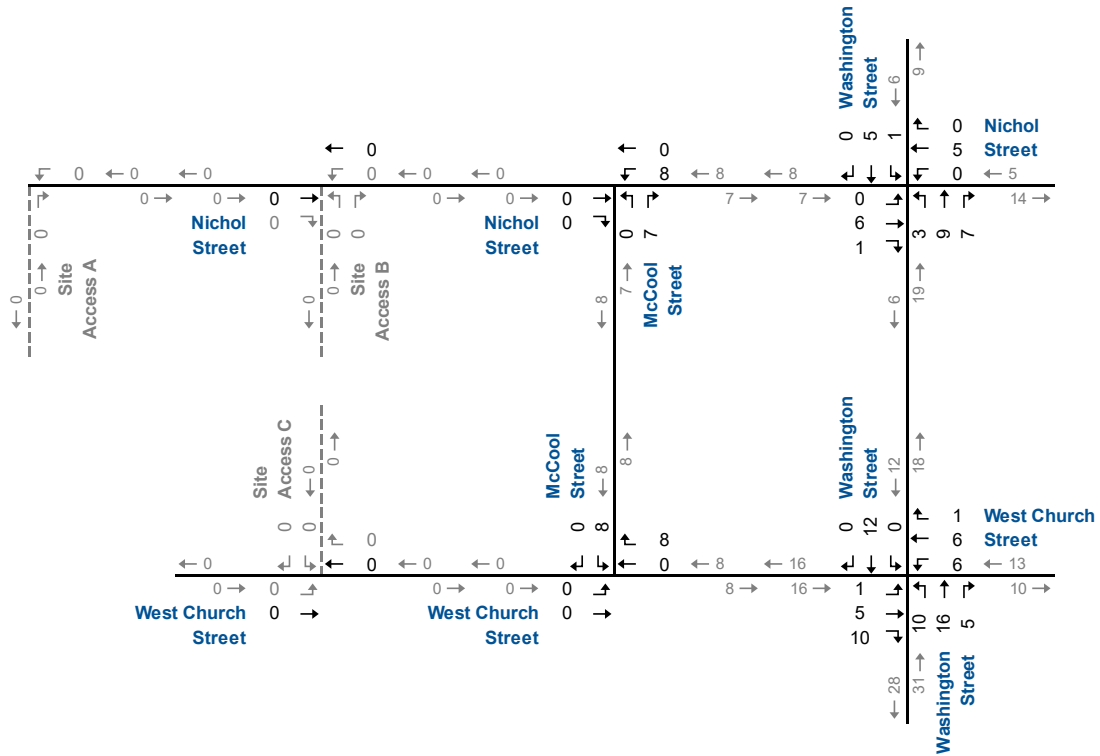


NTS  
Source: Ride Norfolk Transit

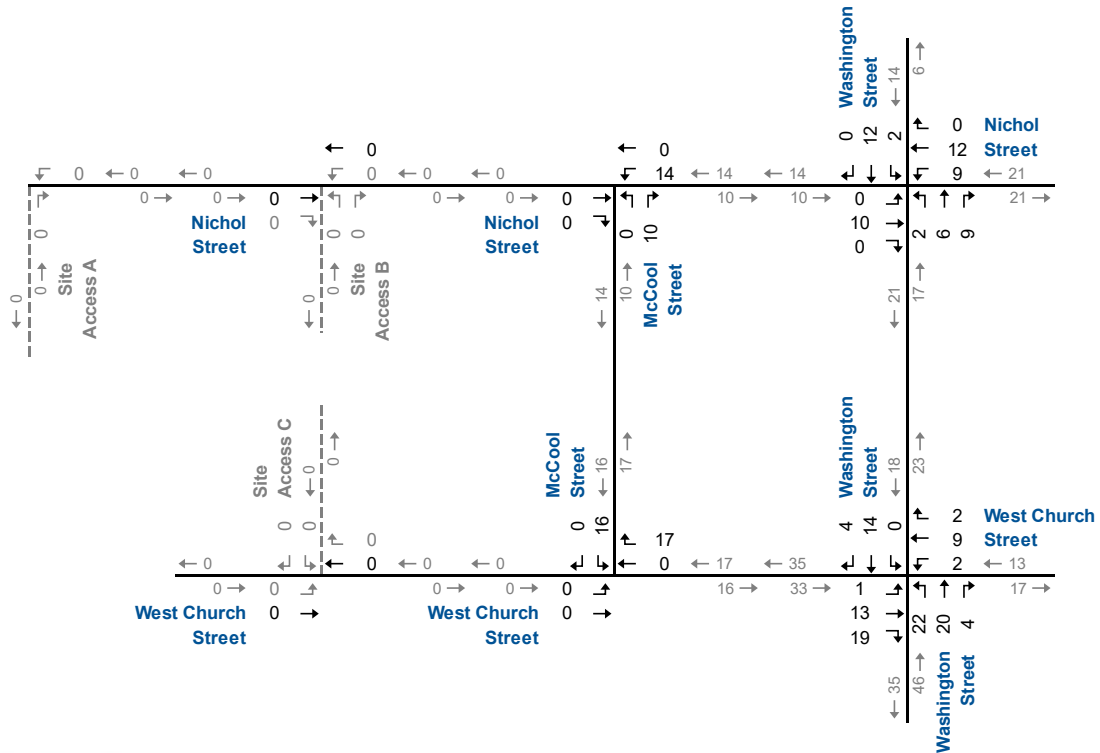


## Existing Transit Network

AM Peak Hour



PM Peak Hour



## 2.4 Traffic Operations

The level of service conditions at the study area intersections have been assessed through intersection operational analysis using Synchro 10. As per the County's TIS guidelines, movements at signalized intersections with a volume to capacity (v/c) ratio greater than 0.85 is considered critical. As the TIS guidelines do not specify a threshold for unsignalized intersections, it is assumed that movements with Level of Service (LOS) 'F' are deemed critical.

Intersection LOS is a recognized method of quantifying the average delay experienced by drivers at intersections. It is based on the delay experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles intending to make a particular movement, compared to the estimated capacity for that movement. The capacity is based on several criteria related to the opposing traffic flows and intersection geometry.

The highest possible rating is LOS A, under which the average total delay is equal or less than 10.0 seconds per vehicle. When the average delay exceeds 80 seconds for signalized intersections, 50 seconds for unsignalized intersections or when the volume to capacity ratio is greater than 1.00, the movement is classed as LOS F and remedial measures are usually implemented if they are feasible. LOS E is usually used as a guideline for the determination of road improvement needs on through lanes, while LOS F may be acceptable for left-turn movements at peak times, depending on delays.

**Table 2.2** summarizes the results of the intersection operational analysis under existing conditions, including the AM and PM peak hour LOS, v/c ratios, and 95th percentile queues experienced.

The results indicate that the study area intersections are operating at LOS A, and with no problem movements.

**Appendix C** contains the detailed Synchro 10 reports.





**TABLE 2.2: EXISTING TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0		A 7	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.03 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.02 1	> > >	A 7	< < <	A 7 0.02 1	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	< < <	A 7 0.01 0	> > >	A 7	
PM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 3	< < <	A 9 0.02 1	> > >	A 9	< < <	A 9 0.02 1	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.02 1		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.04 1	> > >	A 7	< < <	A 7 0.02 1	> > >	A 7	< < <	A 8 0.07 2	> > >	A 8	< < <	A 7 0.03 1	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement



## 3 Development Concept

### 3.1 Development Description

The subject site is located on the west side of McCool Street between West Church Street and Nichol Street in the Community of Waterford. The development is proposed to include 92 townhouse units and a mid-rise apartment building comprising 98 apartment units.

As shown on the Site Plan, the apartment will also include a day care, a coffee shop, an office/retail area, and a bike repair shop.

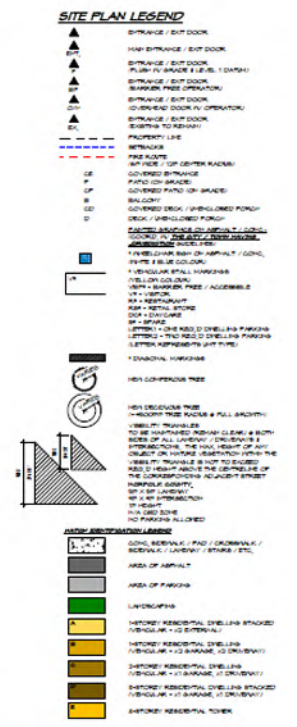
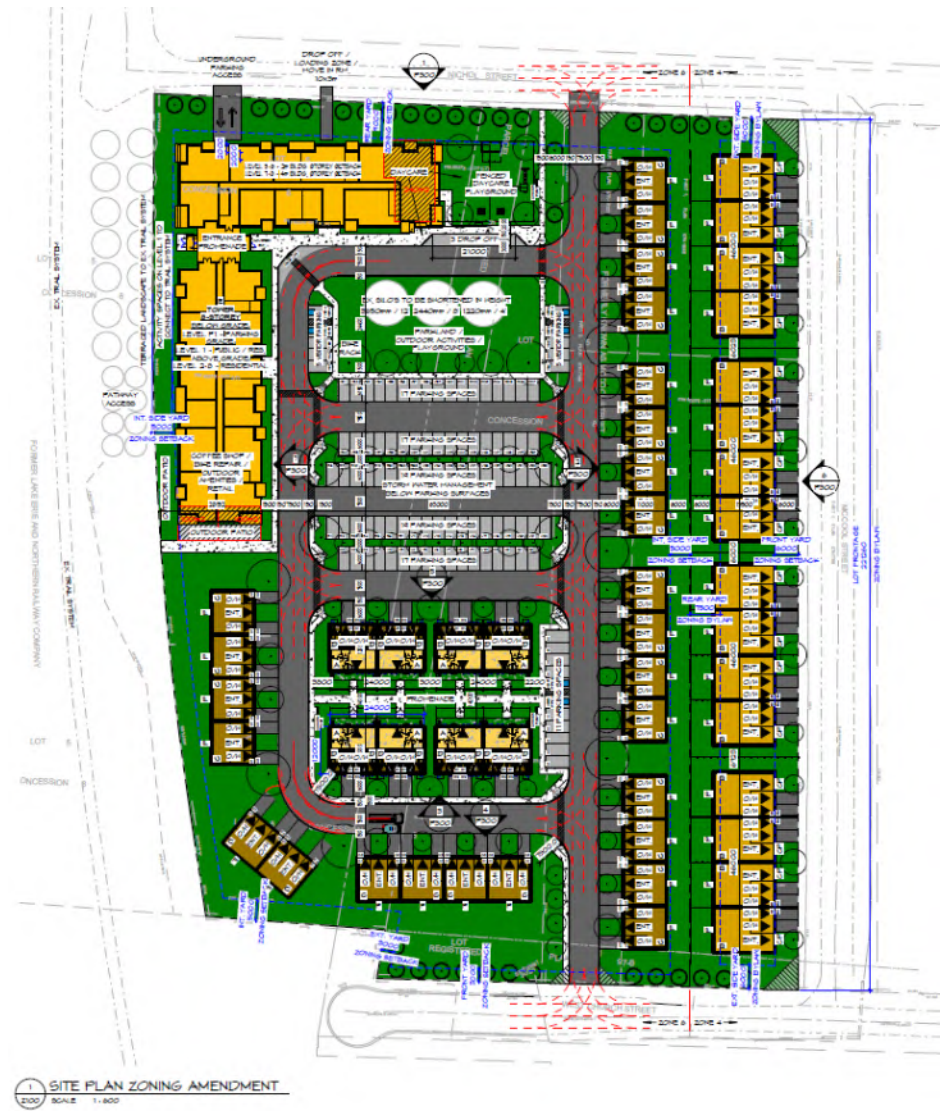
The above ancillary facilities are intended for the use of residents and tenants in the development and are not included in estimating development traffic volumes.

Vehicular access is proposed via direct driveway connections to McCool Street as well as three common access points: one on West Church Street and two on Nichol Street. The westerly access on Nichol Street provides access to a two-storey underground parking garage for the mid-rise building.

The development will be completed in three phases: Phase 1 includes 16 townhouses and will be completed by 2024; Phase 2 includes 76 townhouses and will be completed by 2025; and Phase 3 includes the mid-rise mixed-use building and will be completed by 2026.

**Figure 3.1** shows the development concept.





# Preliminary Site Plan

257 W Church Street TIS  
210699

Figure 3.1

### 3.2 Development Trip Generation

The Institute of Transportation Engineers (ITE) Trip Generation Manual<sup>3</sup> rates and equations were used to estimate the peak hour traffic volumes generated by the subject development.

The estimates are based on the following ITE Land Use Codes (LUC):

- ▶ Townhouses (LUC 215); and
- ▶ Apartment units (LUC 221).

**Table 3.1** summarizes the forecast number of net new trips generated by the proposed development.

**TABLE 3.1: TRIP GENERATION**

Land Use	Units	AM Peak Hour				PM Peak Hour			
		Rate	In	Out	Total	Rate	In	Out	Total
Townhouses - LUC 215 (Single-Family Attached Housing)	92	Eq <sup>1</sup>	13	29	42	Eq <sup>2</sup>	29	22	51
Mid-Rise Apartments - LUC 221 (Multifamily Housing (Mid-Rise))	98	Eq <sup>3</sup>	7	25	32	Eq <sup>4</sup>	24	15	39
<b>Total Trip Generation</b>			<b>20</b>	<b>54</b>	<b>74</b>		<b>53</b>	<b>37</b>	<b>90</b>

$$^1T = 0.52(X) - 5.70$$

$$^3T = 0.44(X) - 11.61$$

$$^2T = 0.60(X) - 3.93$$

$$^4T = 0.39(X) + 0.34$$

### 3.3 Development Trip Distribution and Assignment

The trip distribution was determined based on existing travel patterns at the Washington Street intersections with Nichol Street and West Church Street. **Table 3.2** displays the breakdown of trip distributions used in this study.

**TABLE 3.2: ESTIMATED TRIP DISTRIBUTION**

To/From	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
North via Washington Street	11%	15%	15%	8%
South via Washington Street	56%	46%	49%	44%
East via Nichol Street	9%	23%	22%	27%
East via Church Street	24%	16%	14%	22%
<b>Total</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>	<b>100%</b>

**Figure 3.2** illustrates the site-generated traffic volumes for the AM and PM peak hours.

<sup>3</sup> Institute of Transportation Engineers, Trip Generation Manual 11<sup>th</sup> Edition, September 2021.

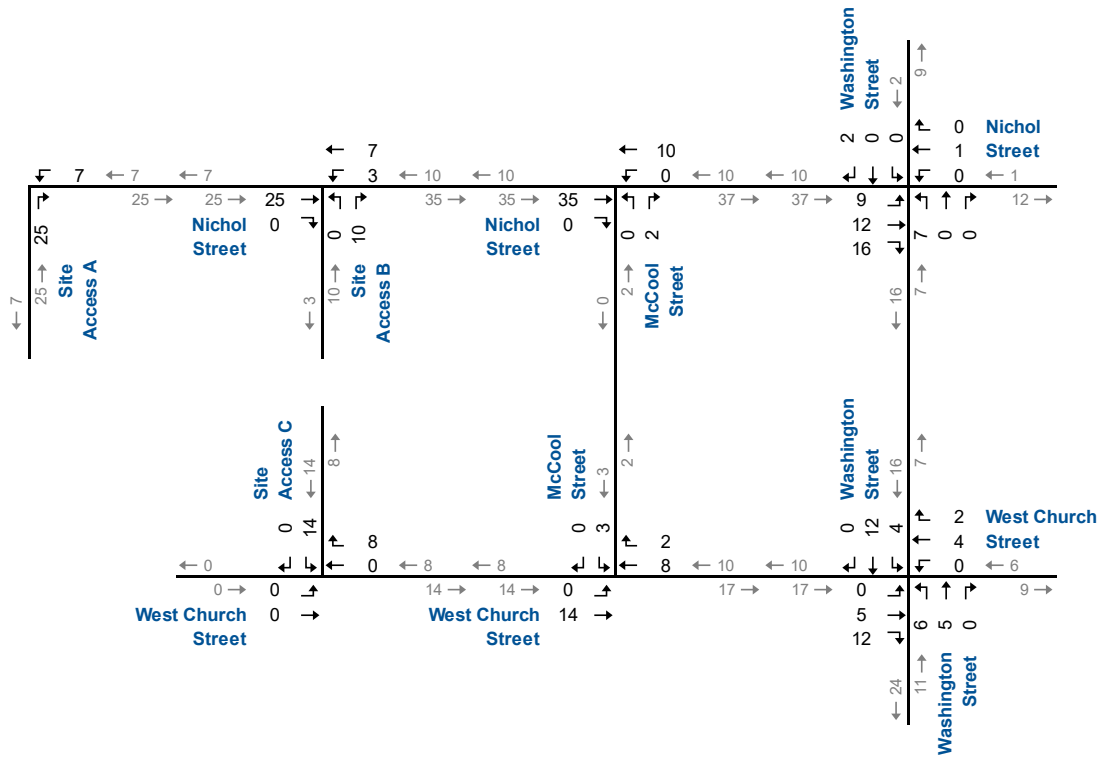




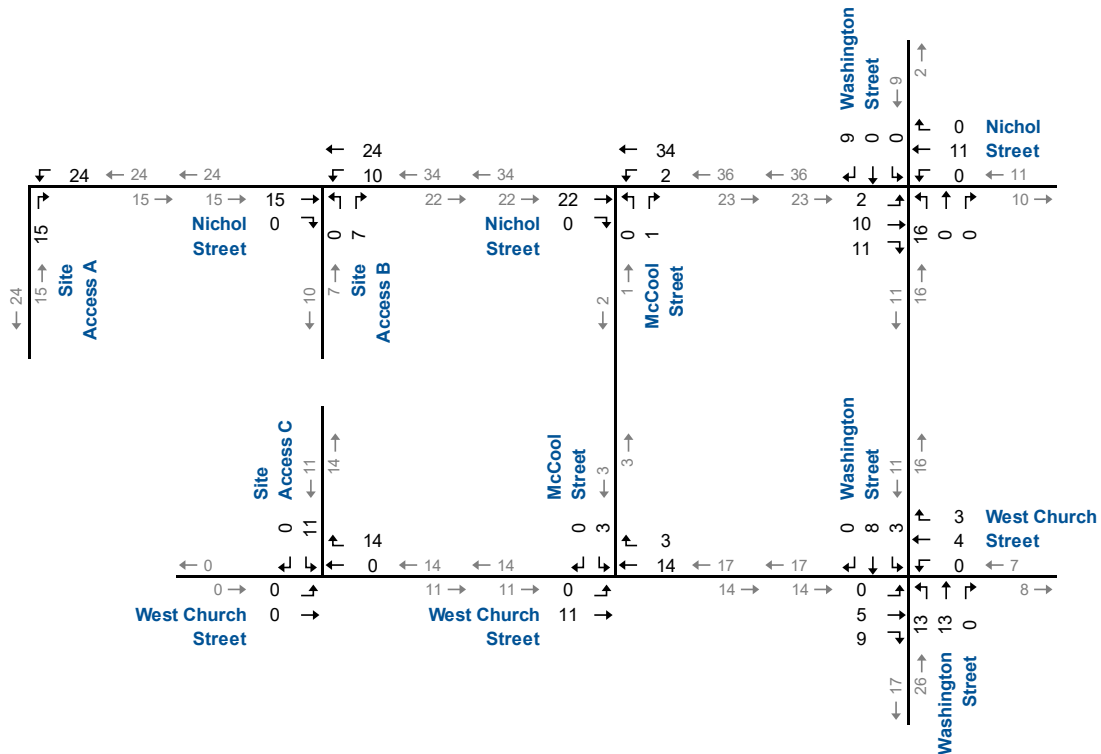
As can be seen in **Figure 3.2**, the two intersections on Washington Street facilitate the distribution of development traffic along four roadway sections and avoid the overloading of any single roadway section. The section of Washington Street south of Church Street carries the largest proportion of development traffic, but peak hour direction volumes are well within the roadway capacity.



AM Peak Hour



PM Peak Hour



## Site-Generated Traffic Volumes

## 4 Evaluation of Future Traffic Conditions

The assessment of future traffic conditions contained in this section includes estimates of future background and total traffic volumes, and the analyses for the year of development opening (2026), five years after development (2031), and 10 years after development (2036).

### 4.1 Background Traffic Forecasts

In order to derive the generalized background traffic volumes, a growth rate of 1.5% per annum was applied to the existing roadway traffic volumes.

### 4.2 2026 Background Traffic Operations

**Figure 4.1** illustrates the 2026 background traffic volumes, including road traffic growth.

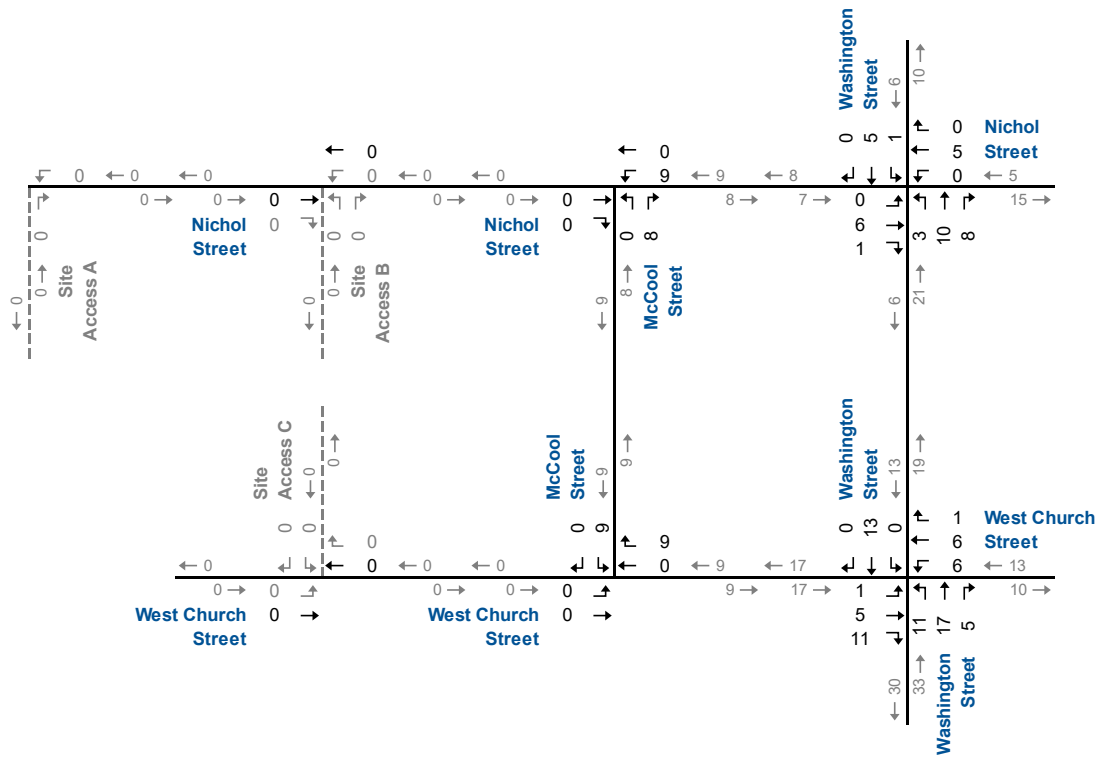
The 2026 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

**Table 4.1** summarizes the results of the 2026 background traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

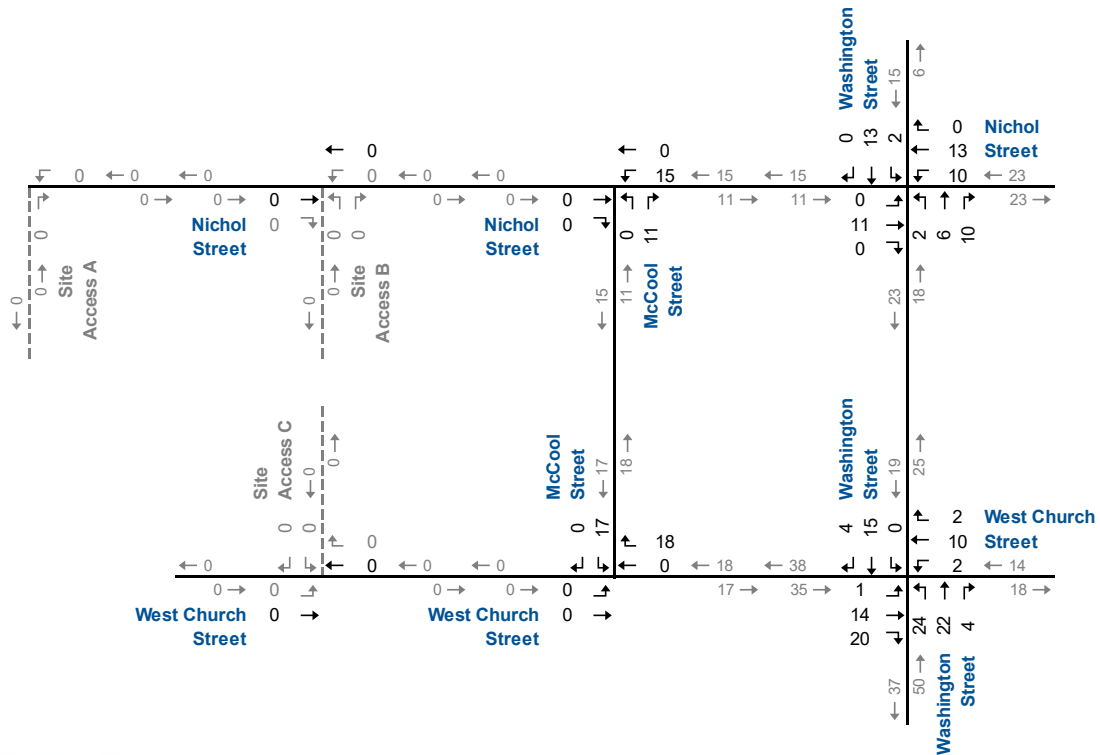
**Appendix D** contains the supporting detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



## 2026 Background Traffic Volumes



**TABLE 4.1: 2026 BACKGROUND TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0		A 7	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.03 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.02 1	> > >	A 7	< < <	A 7 0.02 1	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	< < <	A 7 0.02 0	> > >	A 7	
PM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 3	< < <	A 9 0.02 1	> > >	A 9	< < <	A 9 0.02 1	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.02 1		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.05 1	> > >	A 7	< < <	A 7 0.02 1	> > >	A 7	< < <	A 8 0.08 2	> > >	A 8	< < <	A 7 0.03 1	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement



### 4.3 2026 Total Traffic Operations

**Figure 4.2** illustrates the 2026 total traffic volumes, including trips generated by the proposed development.

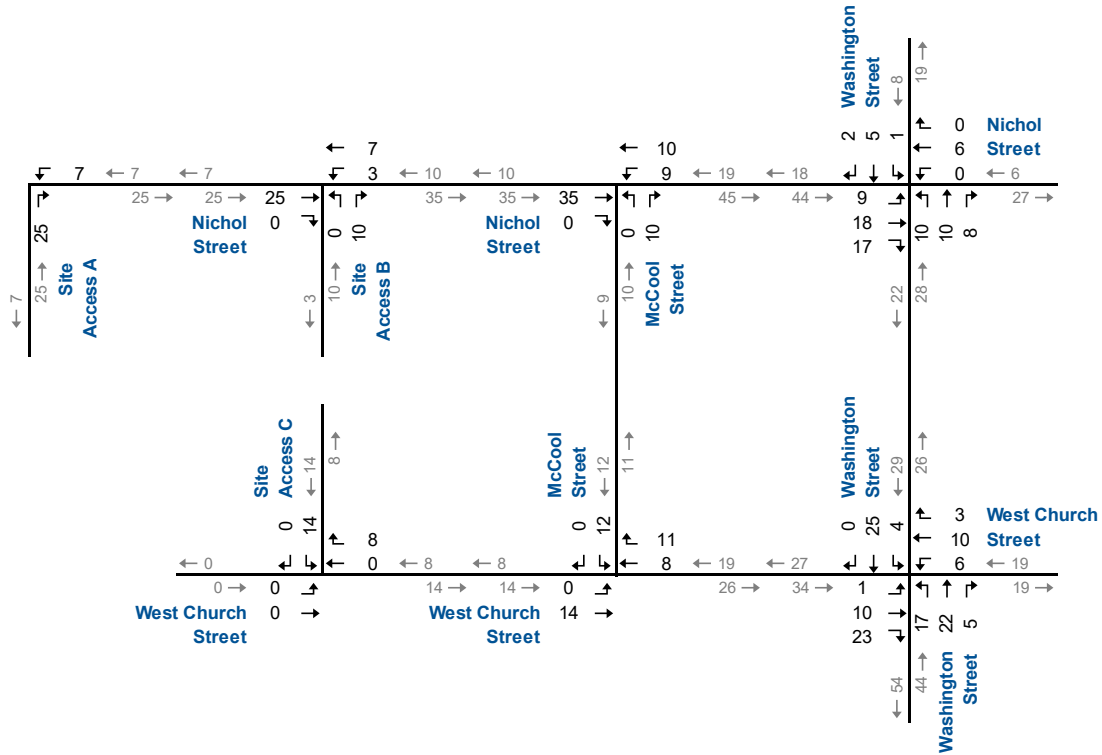
The 2026 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

**Table 4.2** summarizes the results of the 2026 total traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

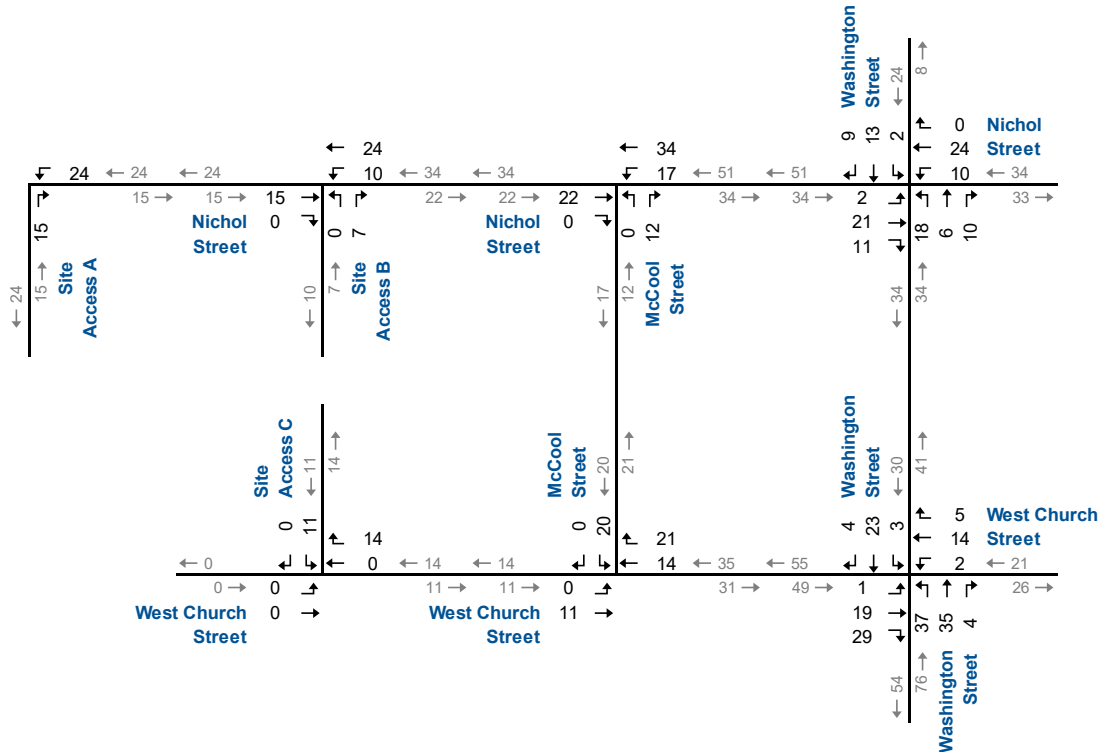
**Appendix E** contains the supporting detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



## 2026 Total Traffic Volumes

**TABLE 4.2: 2026 TOTAL TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 7	A 8 0.03 1	> > >	A 8						
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0.00 0	> > >	A 2	A 8 0.01 0	> > >	A 8						
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 4	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.01 0	> > >	A 2	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.04 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0	> > >	A 9		
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0	> > >	A 9		
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.04 1	> > >	A 7	< < <	A 8 0.03 1	> > >	A 8	< < <	A 7 0.06 2	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	
PM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.02 0	> > >	A 7	A 8 0.01 0	> > >	A 8						
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 2	A 8 0.01 0	> > >	A 8						
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 2	A 8 0.01 0	> > >	A 8						
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 2	< < <	A 9 0.05 2	> > >	A 9	< < <	A 9 0.04 1	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0	> > >	A 9		
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.02 1	> > >	A 9		
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.07 2	> > >	A 7	< < <	A 7 0.03 1	> > >	A 7	< < <	A 8 0.12 3	> > >	A 8	< < <	A 7 0.04 1	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement





## 4.4 2031 Background Traffic Operations

**Figure 4.3** illustrates the 2031 background traffic volumes, including road traffic growth.

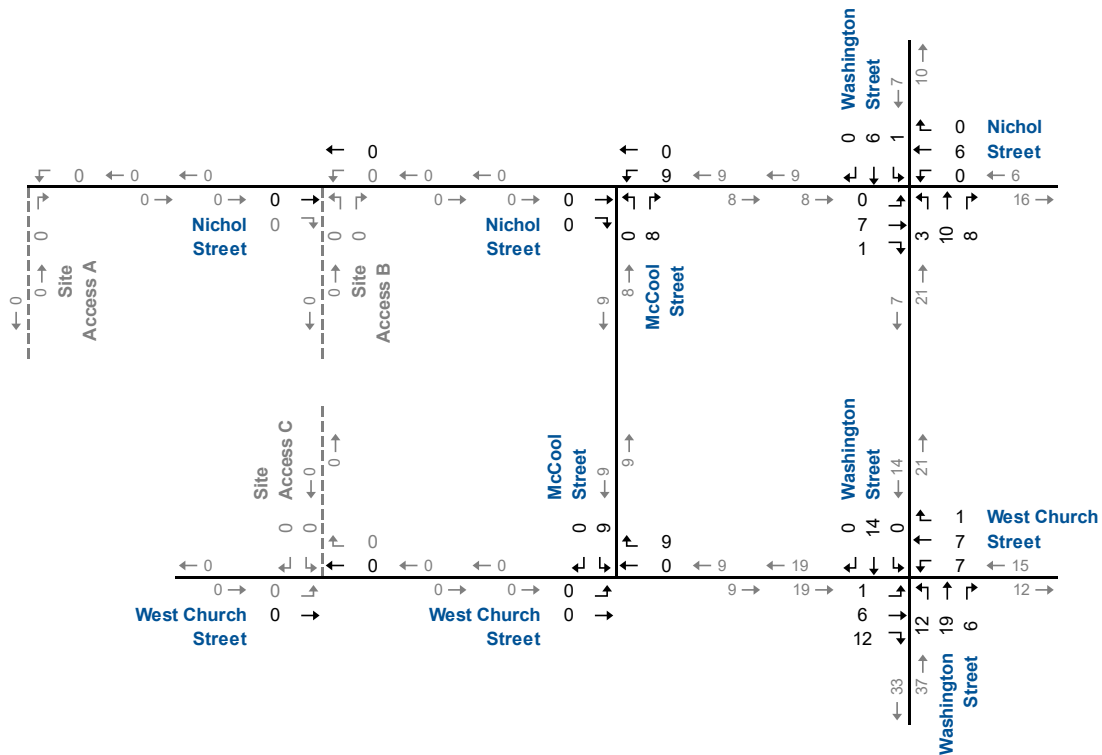
The 2031 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

**Table 4.3** summarizes the results of the 2031 background traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

**Appendix F** contains the supporting detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour

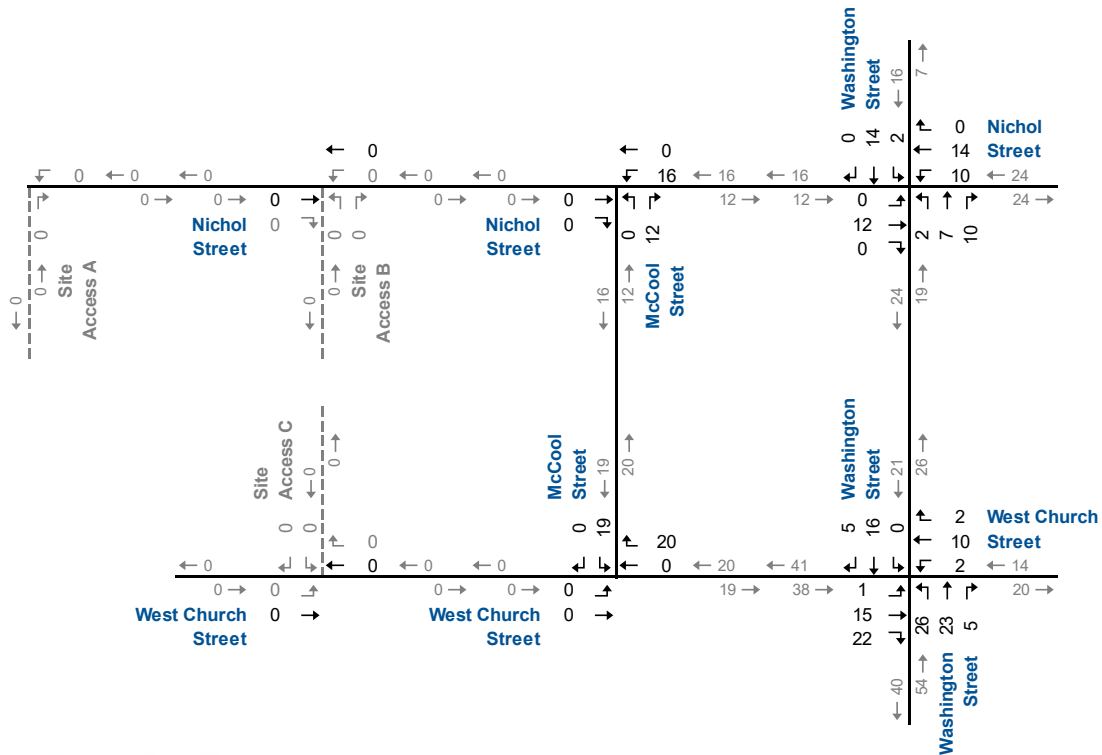


TABLE 4.3: 2031 BACKGROUND TRAFFIC OPERATIONS

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > > >	A 0	< < < <	A 7 0.01 0		A 7	A 8 0.01 0		> > > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < < <	A 0 0.00 0	> > > >	A 0	< < < <	A 0 0.00 0	> > > >	A 0	< < < <	A 9 0.03 1	> > > >	A 9	< < < <	A 9 0.01 0	> > > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < < <	A 0 0.00 0		A 0		A 0 0.00 0	> > > >	A 0					A 9 0.01 0		> > > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < < <	A 7 0.02 1	> > > >	A 7	< < < <	A 8 0.02 1	> > > >	A 8	< < < <	A 7 0.04 1	> > > >	A 7	< < < <	A 7 0.02 1	> > > >	A 7	
PM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > > >	A 0	< < < <	A 7 0.01 0		A 7	A 8 0.01 0		> > > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < < <	A 0 0.00 0	> > > >	A 0	< < < <	A 7 0.01 0	> > > >	A 3	< < < <	A 9 0.03 1	> > > >	A 9	< < < <	A 9 0.02 1	> > > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < < <	A 0 0.00 0		A 0		A 0 0.00 0	> > > >	A 0					A 9 0.02 1		> > > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < < <	A 7 0.05 2	> > > >	A 7	< < < <	A 7 0.02 1	> > > >	A 7	< < < <	A 8 0.08 2	> > > >	A 8	< < < <	A 7 0.03 1	> > > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement



## 4.5 2031 Total Traffic Operations

**Figure 4.4** illustrates the 2031 total traffic volumes, including trips generated by the proposed development.

The 2031 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

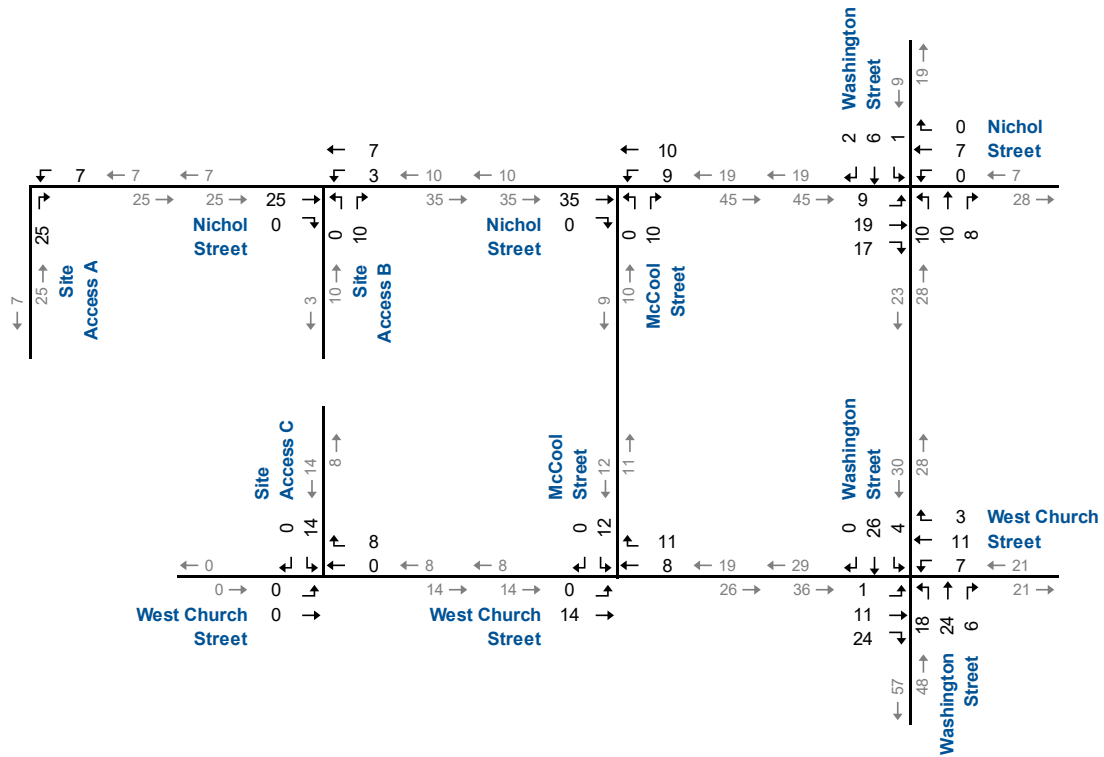
**Table 4.4** summarizes the results of the 2031 total traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

**Appendix G** contains the supporting detailed Synchro 10 reports.

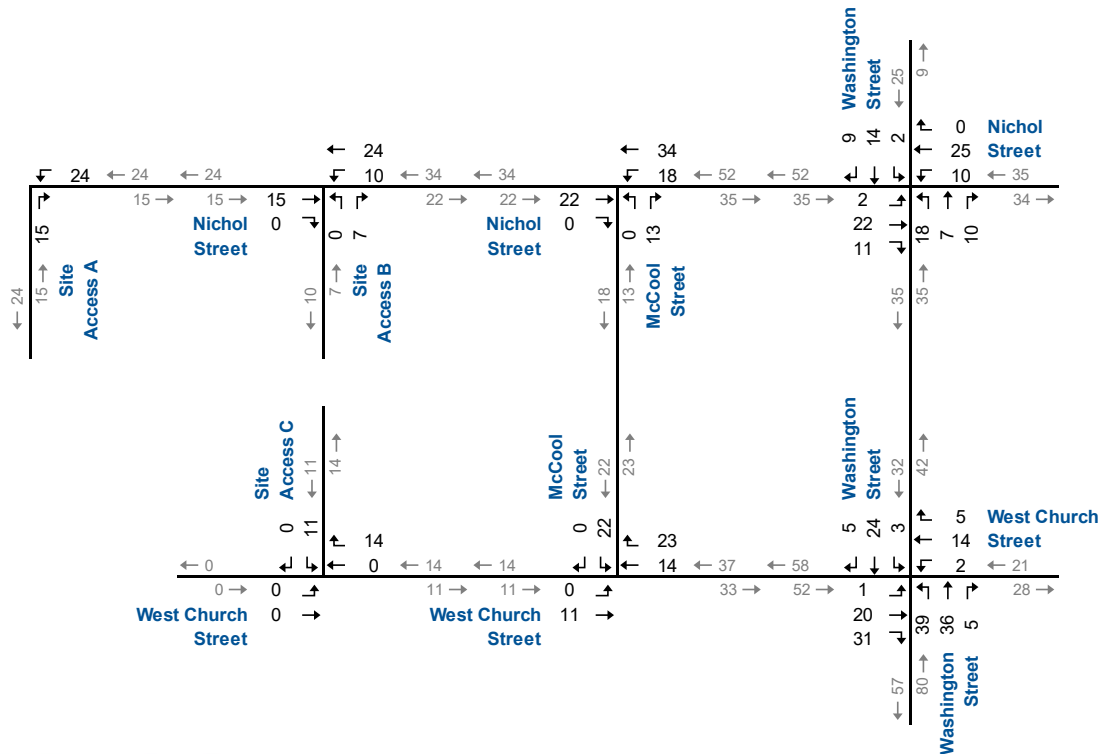




AM Peak Hour



PM Peak Hour



## 2031 Total Traffic Volumes

**TABLE 4.4: 2031 TOTAL TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.03 1		> > >	A 8					
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.00 0		A 2	A 8 0.01 0		> > >	A 8					
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 4	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.01 0	> > >	A 1	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.04 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.04 1	> > >	A 7	< < <	A 8 0.03 1	> > >	A 8	< < <	A 7 0.06 2	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	
PM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.02 0		A 7	A 8 0.01 0		> > >	A 8					
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 2	A 8 0.01 0		> > >	A 8					
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 2	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 2	< < <	A 9 0.05 2	> > >	A 9	< < <	A 9 0.04 1	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.03 1		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.07 2	> > >	A 7	< < <	A 7 0.03 1	> > >	A 7	< < <	A 8 0.13 3	> > >	A 8	< < <	A 7 0.05 1	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement



## 4.6 2036 Background Traffic Operations

**Figure 4.5** illustrates the 2036 background traffic volumes, including road traffic growth.

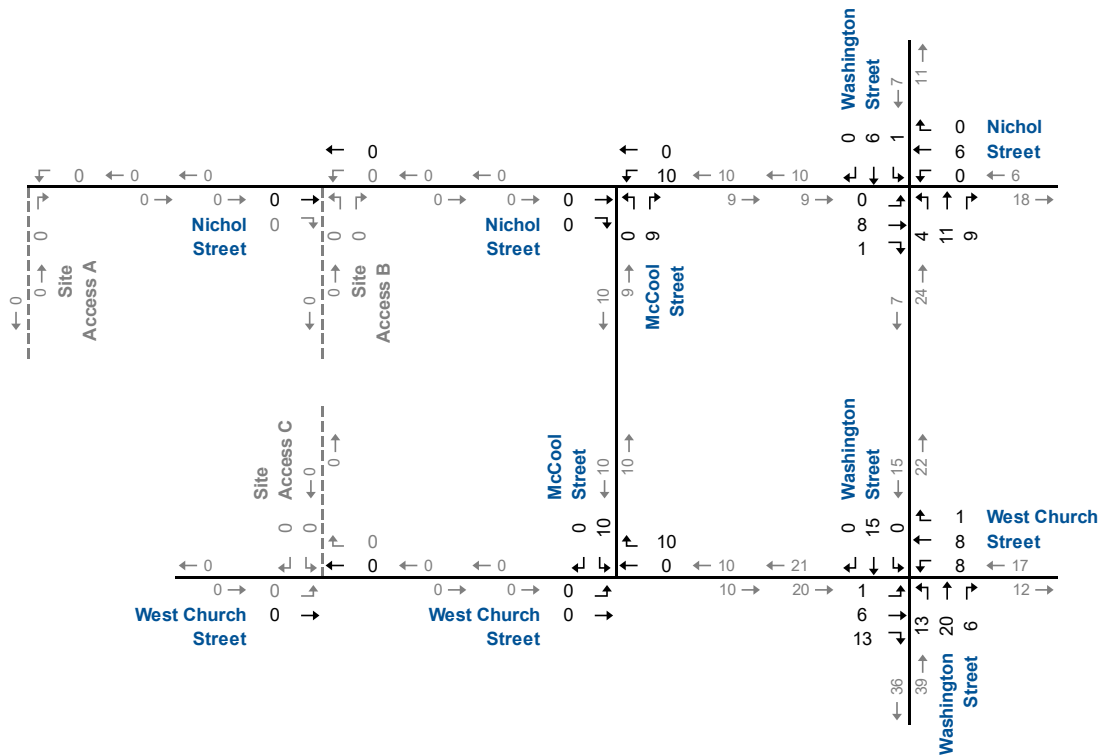
The 2036 background traffic volumes have been analyzed using the same methodology as under existing traffic conditions.

**Table 4.5** summarizes the results of the 2036 background traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

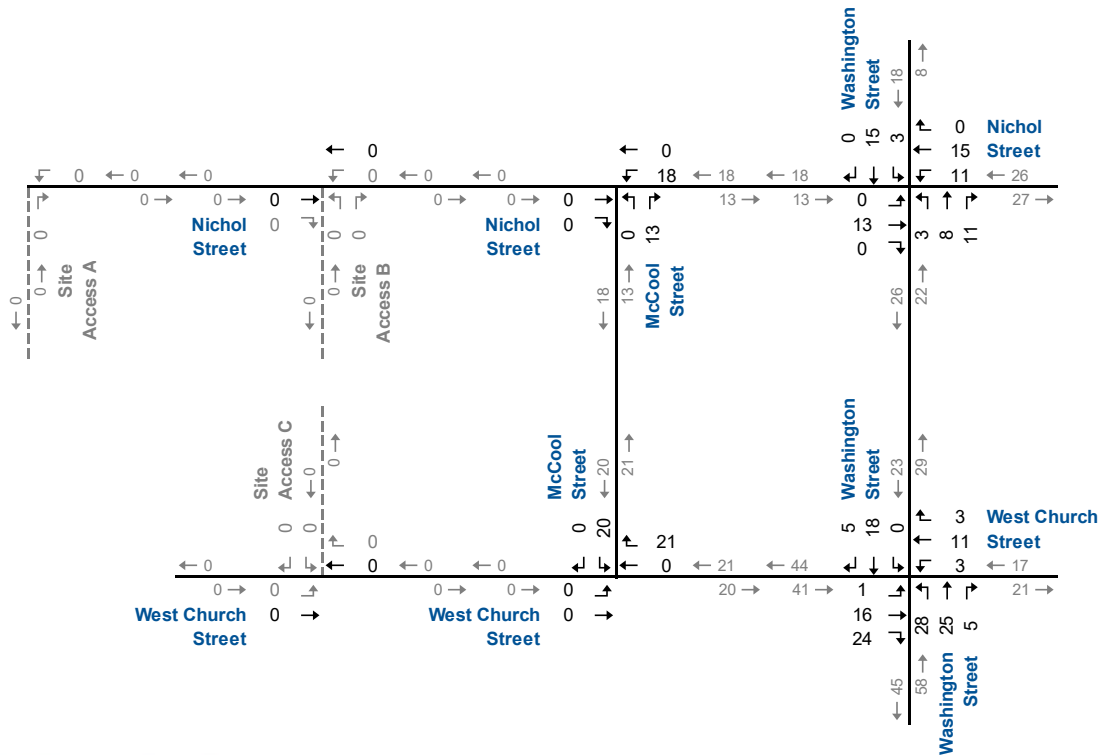
**Appendix H** contains the supporting detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour





**TABLE 4.5: 2036 BACKGROUND TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																
				Eastbound				Westbound				Northbound				Southbound				Overall
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.03 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.02 1	> > >	A 7	< < <	A 8 0.02 1	> > >	A 8	< < <	A 7 0.05 2	> > >	A 7	< < <	A 7 0.02 1	> > >	A 7	
PM Peak Hour	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 3	< < <	A 9 0.03 1	> > >	A 9	< < <	A 9 0.03 1	> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.02 1		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.06 2	> > >	A 7	< < <	A 7 0.03 1	> > >	A 7	< < <	A 8 0.09 2	> > >	A 8	< < <	A 7 0.03 1	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement



## 4.7 2036 Total Traffic Operations

**Figure 4.6** illustrates the 2036 total traffic volumes, including trips generated by the proposed development.

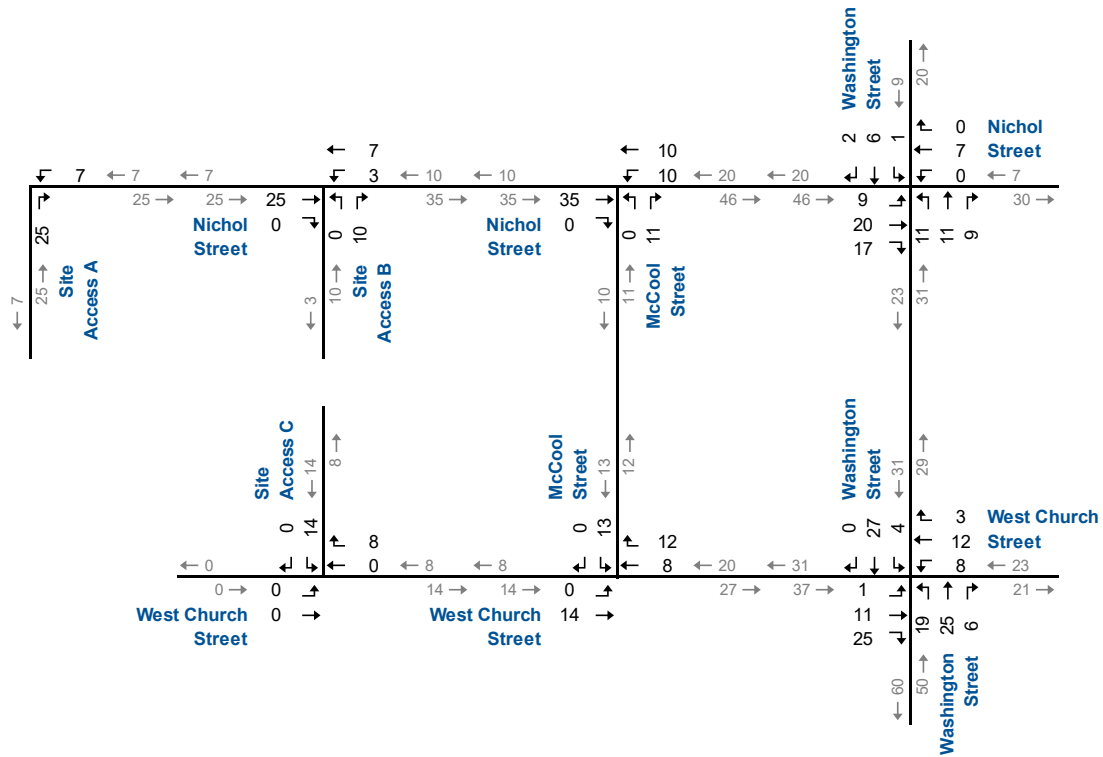
The 2036 total traffic volumes have been analyzed using the same methodology as under existing and background traffic conditions.

**Table 4.6** summarizes the results of the 2036 total traffic operations. The results indicate that the study area intersections are forecast to operate at LOS A during the AM and PM peak hours.

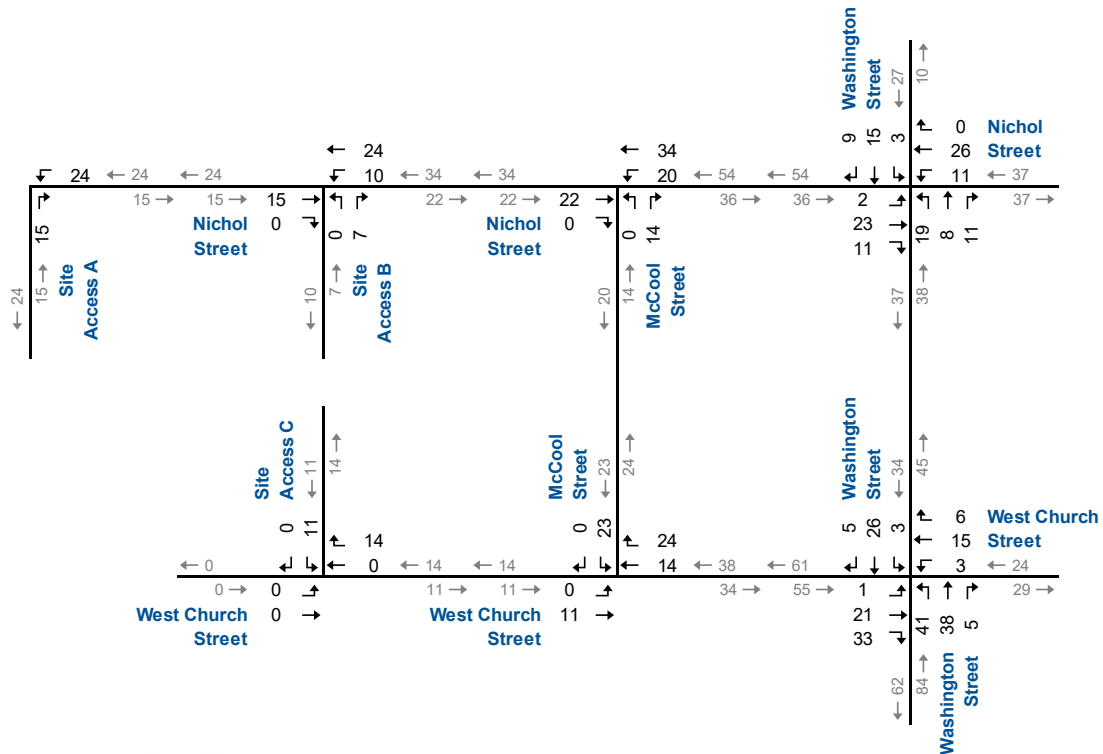
**Appendix I** contains the supporting detailed Synchro 10 reports.



AM Peak Hour



PM Peak Hour



## 2036 Total Traffic Volumes

**TABLE 4.6: 2036 TOTAL TRAFFIC OPERATIONS**

Analysis Period	Intersection	Control Type	MOE	Direction/Movement/Approach																Overall
				Eastbound				Westbound				Northbound				Southbound				
				Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	Left	Through	Right	Approach	
AM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 7	A 8 0.03 1		> > >	A 8					
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.00 0		A 2	A 8 0.01 0		> > >	A 8					
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 4	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.01 0	> > >	A 1	< < <	A 0 0.00 0	> > >	A 0	< < <	A 9 0.04 1	> > >	A 9	< < <	A 9 0.01 0	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.04 1	> > >	A 7	< < <	A 8 0.03 1	> > >	A 8	< < <	A 7 0.06 2	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	
PM Peak Hour	Access A & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.02 0		A 7	A 8 0.01 0		> > >	A 8					
	Access B & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 2	A 8 0.01 0		> > >	A 8					
	McCool Street & Nichol Street	TWSC	LOS Delay V/C Q		A 0 0.00 0	> > >	A 0	< < <	A 7 0.01 0		A 3	A 8 0.01 0		> > >	A 8					
	Washington Street & Nichol Street	TWSC	LOS Delay V/C Q	< < <	A 7 0.00 0	> > >	A 0	< < <	A 7 0.01 0	> > >	A 2	< < <	A 9 0.06 2	> > >	A 9	< < <	A 9 0.04 1	> > >	A 9	
	West Church Street & Access C	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.01 0		> > >	A 9	
	West Church Street & McCool Street	TWSC	LOS Delay V/C Q	< < <	A 0 0.00 0		A 0		A 0 0.00 0	> > >	A 0					A 9 0.03 1		> > >	A 9	
	Washington Street & West Church Street	AWSC	LOS Delay V/C Q	< < <	A 7 0.08 2	> > >	A 7	< < <	A 7 0.04 1	> > >	A 7	< < <	A 8 0.13 4	> > >	A 8	< < <	A 7 0.05 2	> > >	A 7	

MOE - Measure of Effectiveness

LOS - Level of Service

Delay - Average Delay per Vehicle in Seconds

V/C - Volume to Capacity Ratio

Q - 95th Percentile Queue Length (m)

TWSC - Two-Way Stop Control

AWSC - All-Way Stop Control

&lt;/&gt; - Shared with through movement





## 4.8 Left-turn Lanes

The need for auxiliary left-turn turning lanes at the proposed site accesses were reviewed. It is noted that the site is located at the termini of both Nichol Street and West Church Street with little to no through traffic on both roadways at Access A and Access C. Therefore, left-turn lanes will not be required on Nichol Street at Access A, or on West Church Street at Access C.

The need for an auxiliary left-turn turning lane on Nichol Street at Access B was assessed based on the requirements and procedures detailed in the Ministry of Transportation Design Supplement for the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads<sup>4</sup>. The warrant requirements were assessed using the nomographs for left-turn lanes on a two-lane undivided highway at an unsignalized intersection with a design speed of 10 kilometres per hour over the posted speed limit (60 km/h).

Based on these criteria, a westbound left-turn lane on Nichol Street at Access B is not warranted under 2036 total traffic conditions.

**Appendix J** contains the warrant nomographs.

---

<sup>4</sup> MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017.



## 5 Conclusions and Recommendations

### 5.1 Conclusions

Based on the investigations carried out, it is concluded that:

- ▶ **Existing Traffic Conditions:** The study area intersections are currently operating at LOS A.
- ▶ **Development Trip Generation:** The development is forecast to generate 74 and 90 trips during the AM and PM peak hours, respectively.
- ▶ **Background Traffic Conditions:** All study area intersections are forecast to operate at LOS A under 2026, 2031, and 2036 traffic conditions.
- ▶ **Total Traffic Conditions:** All study area intersections and all site access intersections are forecast to operate at LOS A under 2026, 2031, and 2036 traffic conditions.

### 5.2 Recommendations

Based on the findings of this study, it is recommended that the subject development be considered for approval as proposed.



# Appendix A

## Pre-Study Consultation



**From:** [Patrick Neal](#)  
**To:** [Stephen Gradish](#)  
**Cc:** [Rajan Philips](#); [tom@teamohara.com](mailto:tom@teamohara.com); [Scottpuillandre@gdvallee.ca](mailto:Scottpuillandre@gdvallee.ca)  
**Subject:** (210699) 257 West Church St, Waterford TIS Pre-Study Consultation  
**Date:** November 23, 2021 11:37:00 AM  
**Attachments:** [image001.png](#)  
[2021.06.18\\_21-061\\_Silos of Waterford\\_Schematic Design\\_Site & Tower \(1\).pdf](#)

---

Hi Stephen,

Paradigm has been retained to undertake a Traffic Impact Study (TIS) for the proposed residential development on the west side of McCool Street between Church Street (to the south) and Nichol Street (to the north) in the Town of Waterford, Norfolk County. The proposed development provides for a mix of apartment and townhouse dwelling units, with two common access points on Church Street and Nichol Street, as well as direct driveway connections to McCool Street. The preliminary site concept plan is attached.

Based on Norfolk County's (Appendix J) TIS Guidelines, we are proposing the following TIS scope of work, for your review and approval:

- Weekday AM and PM peak hour analysis of adjacent roadways.
- Study area intersections:
  - Nichol Street and McCool Street;
  - West Church Street and McCool Street;
  - Nichol Street and Washington Street;
  - West Church Street and Washington Street;
  - Access intersection on Nichol Street; and
  - Access intersection on West Church Street.
- Traffic Data: we will undertake weekday traffic counts at the intersections of Nichol Street/Washington Street and Church Street/Washington Street.
- Horizon Years: (1) Year of development opening, (2) five years after development opening, and (3) 10 years after development opening.
- Background Growth Rate: 1.5% per annum.
- Trip Generation: ITE Trip Generation Manual 11<sup>th</sup> Edition.
- Site traffic distribution will be based on the existing traffic volumes at the above intersections.
- If necessary, recommendations will be provided to mitigate the impact of the proposed development on the surrounding road network.

Please let us know if you have any comments or questions.

Regards,

**Patrick Neal, BCE**  
*Transportation Consultant*



**Paradigm Transportation Solutions Limited**

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# Appendix B

## Existing Traffic Data





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsll.com

Count Name: Nichol Street W & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 1

## Turning Movement Data

Start Time	Nichol Street West Eastbound						Nichol Street West Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	2	3
7:15 AM	0	1	1	0	0	2	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	5
7:30 AM	0	1	0	0	0	1	0	1	0	0	1	1	0	2	2	0	0	4	0	0	1	0	0	1	7
7:45 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1	1	0	1	0	0	0	1	3
Hourly Total	0	2	1	0	0	3	1	2	0	0	1	3	0	4	2	0	1	6	0	4	2	0	0	6	18
8:00 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	2	0	0	0	0	0	0	3
8:15 AM	0	0	0	0	0	0	0	3	0	0	0	3	0	1	0	0	1	1	0	1	0	0	0	1	5
8:30 AM	0	0	1	0	0	1	0	2	0	0	0	2	0	3	3	0	0	6	0	0	0	0	0	0	9
8:45 AM	0	3	0	0	0	3	0	1	0	0	1	1	2	3	0	0	0	5	0	3	0	0	0	3	12
Hourly Total	0	3	1	0	0	4	0	7	0	0	1	7	2	8	4	0	1	14	0	4	0	0	0	4	29
9:00 AM	0	0	0	0	1	0	0	1	0	0	0	1	0	1	1	0	0	2	0	2	0	0	1	2	5
9:15 AM	0	3	0	0	0	3	0	1	0	0	2	1	1	2	3	0	0	6	1	0	0	0	0	1	11
9:30 AM	1	1	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	0	1	2	0	1	3	6
9:45 AM	1	1	0	0	2	2	0	3	0	0	0	3	3	2	0	0	0	5	0	1	0	0	0	1	11
Hourly Total	2	5	0	0	3	7	0	5	0	0	2	5	4	5	5	0	0	14	1	4	2	0	2	7	33
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	0	2	0	0	0	2	0	1	0	0	2	1	0	1	1	0	0	2	1	2	0	0	0	3	8
11:45 AM	0	3	0	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	6
Hourly Total	0	5	0	0	0	5	0	2	0	0	2	2	0	1	1	0	0	2	1	4	0	0	0	5	14
12:00 PM	0	0	0	0	0	0	0	3	0	0	0	3	1	1	1	0	0	3	1	3	0	0	0	4	10
12:15 PM	0	2	0	0	2	2	1	2	0	0	0	3	0	2	1	0	2	3	1	0	1	0	2	2	10
12:30 PM	0	0	0	0	0	0	1	1	0	0	0	2	1	3	1	0	0	5	0	0	0	0	0	0	7
12:45 PM	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	1	0	2	0	0	0	2	4
Hourly Total	0	2	0	0	2	2	3	6	0	0	0	9	2	7	3	0	2	12	2	5	1	0	2	8	31
1:00 PM	0	2	0	0	0	2	1	0	0	0	1	1	0	2	2	0	0	4	0	1	0	0	0	1	8
1:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	3	0	0	0	0	0	0	3
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	2	0	0	0	2	1	0	0	0	1	1	1	3	3	0	0	7	0	1	0	0	0	1	11
4:00 PM	0	6	0	0	0	6	1	3	0	0	0	4	0	1	1	0	1	2	0	2	0	0	0	2	14
4:15 PM	0	1	0	0	0	1	4	3	0	0	0	7	0	2	5	0	0	7	2	2	0	0	0	4	19
4:30 PM	0	4	0	0	0	4	2	1	0	0	0	3	0	3	1	0	0	4	0	1	0	0	0	1	12
4:45 PM	0	2	0	0	0	2	0	4	0	0	0	4	0	0	2	0	0	2	0	3	0	0	0	3	11
Hourly Total	0	13	0	0	0	13	7	11	0	0	0	18	0	6	9	0	1	15	2	8	0	0	0	10	56
5:00 PM	0	3	0	0	0	3	3	4	0	0	0	7	2	1	1	0	0	4	0	6	0	0	0	6	20
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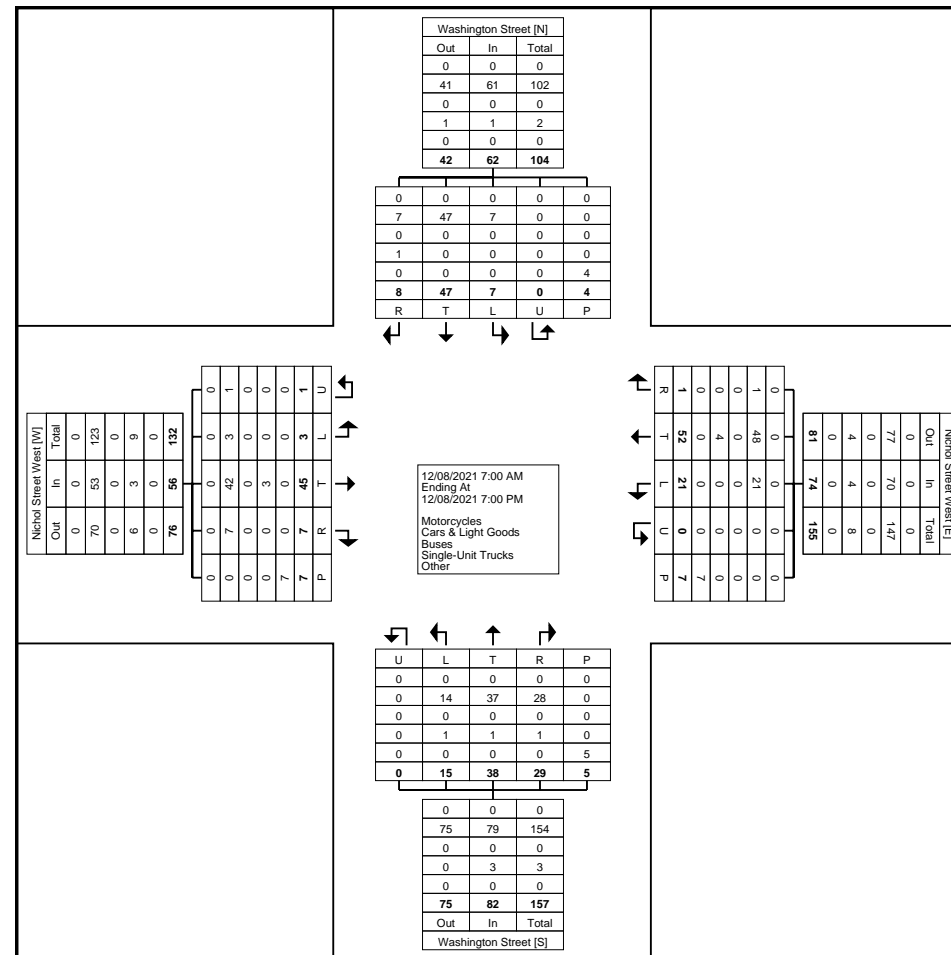
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Hourly Total	0	12	3	1	2	16	4	16	0	0	0	20	6	2	2	0	0	10	1	11	1	0	0	13	59
6:00 PM	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	3
6:15 PM	0	1	0	0	0	1	2	1	0	0	0	3	0	1	0	0	0	1	0	3	0	0	0	3	8
6:30 PM	1	0	1	0	0	2	2	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	1	5
6:45 PM	0	0	0	0	0	0	0	2	1	0	0	3	0	1	0	0	0	1	0	2	1	0	0	3	7
Hourly Total	1	1	2	0	0	4	5	3	1	0	0	9	0	2	0	0	0	2	0	6	2	0	0	8	23
Grand Total	3	45	7	1	7	56	21	52	1	0	7	74	15	38	29	0	5	82	7	47	8	0	4	62	274
Approach %	5.4	80.4	12.5	1.8	-	-	28.4	70.3	1.4	0.0	-	-	18.3	46.3	35.4	0.0	-	-	11.3	75.8	12.9	0.0	-	-	-
Total %	1.1	16.4	2.6	0.4	-	20.4	7.7	19.0	0.4	0.0	-	27.0	5.5	13.9	10.6	0.0	-	29.9	2.6	17.2	2.9	0.0	-	22.6	-
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	3	42	7	1	-	53	21	48	1	0	-	70	14	37	28	0	-	79	7	47	7	0	-	61	263
% Cars & Light Goods	100.0	93.3	100.0	100.0	-	94.6	100.0	92.3	100.0	-	-	94.6	93.3	97.4	96.6	-	-	96.3	100.0	100.0	87.5	-	-	98.4	96.0
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	0	3	0	0	-	3	0	4	0	0	-	4	1	1	1	0	-	3	0	0	1	0	-	1	11
% Single-Unit Trucks	0.0	6.7	0.0	0.0	-	5.4	0.0	7.7	0.0	-	-	5.4	6.7	2.6	3.4	-	-	3.7	0.0	0.0	12.5	-	-	1.6	4.0
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	7	-	-	-	-	-	7	-	-	-	-	-	5	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
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Cambridge, Ontario, Canada N1R 8J8  
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Count Name: Nichol Street W & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 3







Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsl.com

Count Name: Nichol Street W & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 4

### Turning Movement Peak Hour Data (8:30 AM)

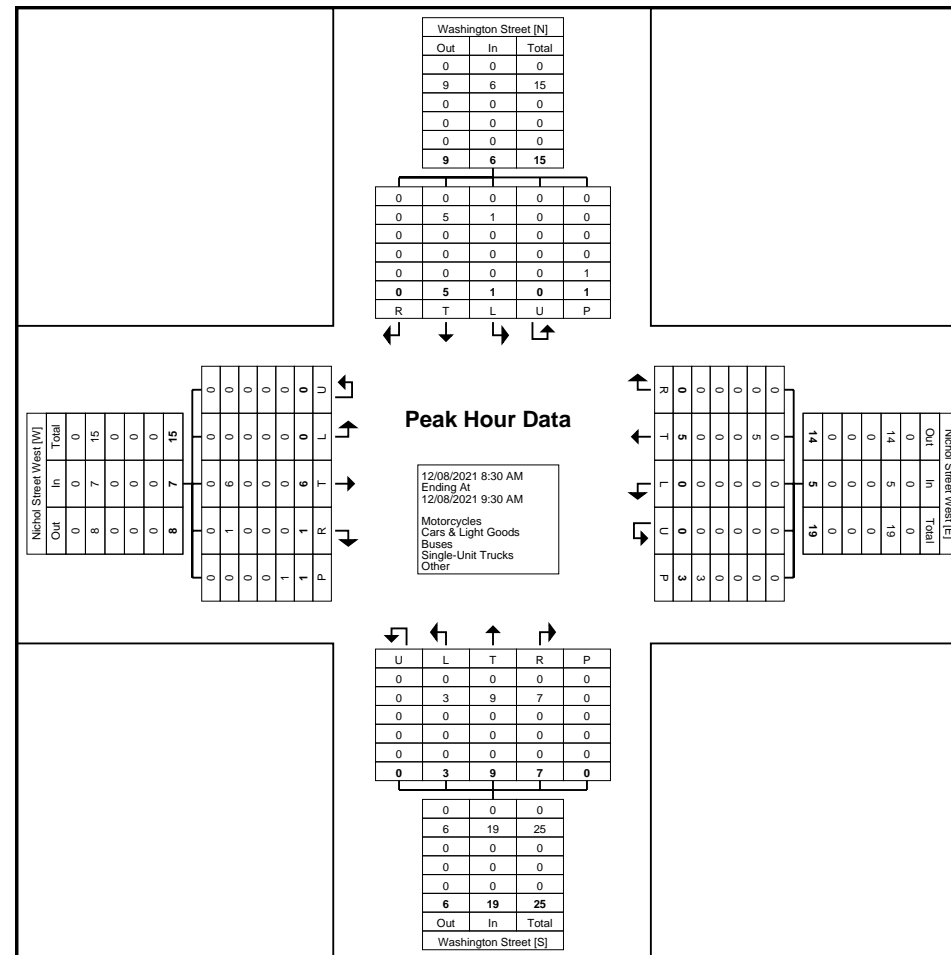
Start Time	Nichol Street West Eastbound						Nichol Street West Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:30 AM	0	0	1	0	0	1	0	2	0	0	0	2	0	3	3	0	0	6	0	0	0	0	0	0	9
8:45 AM	0	3	0	0	0	3	0	1	0	0	1	1	2	3	0	0	0	5	0	3	0	0	0	3	12
9:00 AM	0	0	0	0	1	0	0	1	0	0	0	1	0	1	1	0	0	2	0	2	0	0	1	2	5
9:15 AM	0	3	0	0	0	3	0	1	0	0	2	1	1	2	3	0	0	6	1	0	0	0	0	1	11
Total	0	6	1	0	1	7	0	5	0	0	3	5	3	9	7	0	0	19	1	5	0	0	1	6	37
Approach %	0.0	85.7	14.3	0.0	-	-	0.0	100.0	0.0	0.0	-	-	15.8	47.4	36.8	0.0	-	-	16.7	83.3	0.0	0.0	-	-	-
Total %	0.0	16.2	2.7	0.0	-	18.9	0.0	13.5	0.0	0.0	-	13.5	8.1	24.3	18.9	0.0	-	51.4	2.7	13.5	0.0	0.0	-	16.2	-
PHF	0.000	0.500	0.250	0.000	-	0.583	0.000	0.625	0.000	0.000	-	0.625	0.375	0.750	0.583	0.000	-	0.792	0.250	0.417	0.000	0.000	-	0.500	0.771
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Cars & Light Goods	0	6	1	0	-	7	0	5	0	0	-	5	3	9	7	0	-	19	1	5	0	0	-	6	37
% Cars & Light Goods	-	100.0	100.0	-	-	100.0	-	100.0	-	-	-	100.0	100.0	100.0	100.0	-	-	100.0	100.0	100.0	-	-	-	100.0	100.0
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Single-Unit Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Single-Unit Trucks	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
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Count Name: Nichol Street W & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 5



Turning Movement Peak Hour Data Plot (8:30 AM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsl.com

Count Name: Nichol Street W & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 6

### Turning Movement Peak Hour Data (11:30 AM)

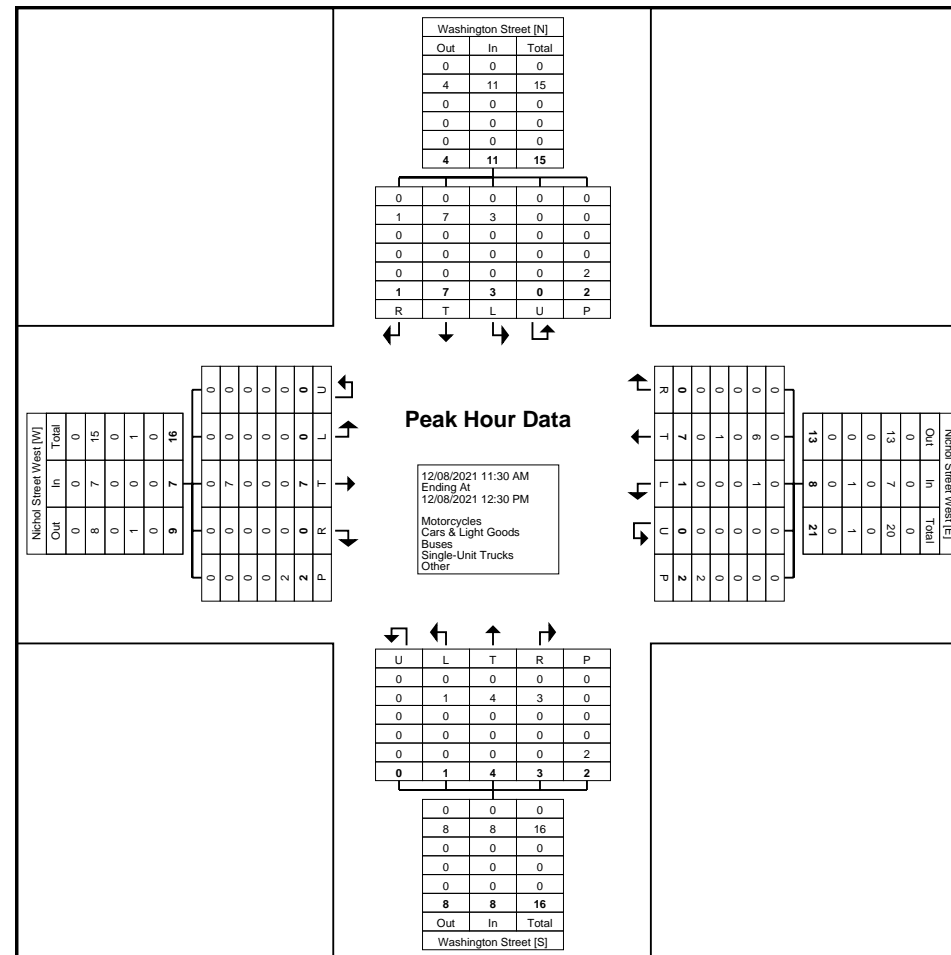
Start Time	Nichol Street West Eastbound						Nichol Street West Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
11:30 AM	0	2	0	0	0	2	0	1	0	0	2	1	0	1	1	0	0	2	1	2	0	0	0	3	8
11:45 AM	0	3	0	0	0	3	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	6
12:00 PM	0	0	0	0	0	0	0	3	0	0	0	3	1	1	1	0	0	3	1	3	0	0	0	4	10
12:15 PM	0	2	0	0	2	2	1	2	0	0	0	3	0	2	1	0	2	3	1	0	1	0	2	2	10
Total	0	7	0	0	2	7	1	7	0	0	2	8	1	4	3	0	2	8	3	7	1	0	2	11	34
Approach %	0.0	100.0	0.0	0.0	-	-	12.5	87.5	0.0	0.0	-	-	12.5	50.0	37.5	0.0	-	-	27.3	63.6	9.1	0.0	-	-	-
Total %	0.0	20.6	0.0	0.0	-	20.6	2.9	20.6	0.0	0.0	-	23.5	2.9	11.8	8.8	0.0	-	23.5	8.8	20.6	2.9	0.0	-	32.4	-
PHF	0.000	0.583	0.000	0.000	-	0.583	0.250	0.583	0.000	0.000	-	0.667	0.250	0.500	0.750	0.000	-	0.667	0.750	0.583	0.250	0.000	-	0.688	0.850
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	0	7	0	0	-	7	1	6	0	0	-	7	1	4	3	0	-	8	3	7	1	0	-	11	33
% Cars & Light Goods	-	100.0	-	-	-	100.0	100.0	85.7	-	-	-	87.5	100.0	100.0	100.0	-	-	100.0	100.0	100.0	100.0	-	-	100.0	97.1
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Single-Unit Trucks	0	0	0	0	-	0	0	1	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	1
% Single-Unit Trucks	-	0.0	-	-	-	0.0	0.0	14.3	-	-	-	12.5	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	2.9
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@pts1.com

Count Name: Nichol Street W & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 7



Turning Movement Peak Hour Data Plot (11:30 AM)



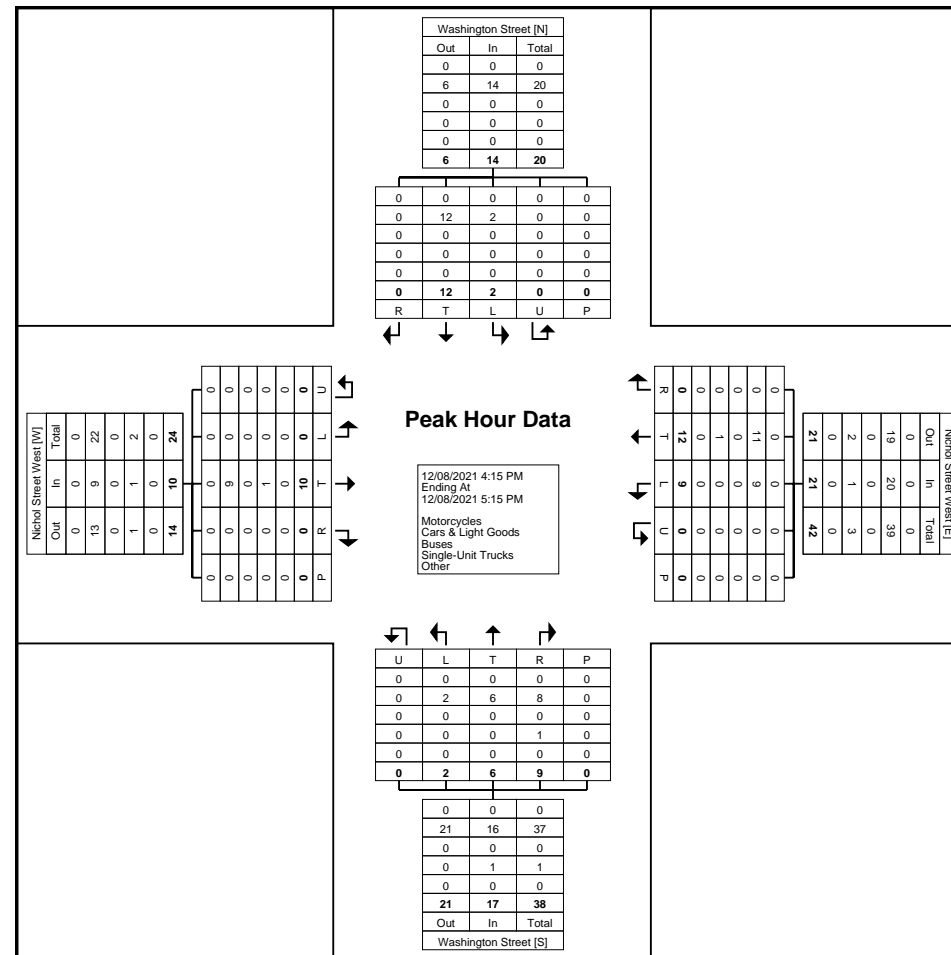
Start Time	Nichol Street West Eastbound						Nichol Street West Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	0	1	0	0	0	1	4	3	0	0	0	7	0	2	5	0	0	7	2	2	0	0	0	4	19
4:30 PM	0	4	0	0	0	4	2	1	0	0	0	3	0	3	1	0	0	4	0	1	0	0	0	1	12
4:45 PM	0	2	0	0	0	2	0	4	0	0	0	4	0	0	2	0	0	2	0	3	0	0	0	3	11
5:00 PM	0	3	0	0	0	3	3	4	0	0	0	7	2	1	1	0	0	4	0	6	0	0	0	6	20
Total	0	10	0	0	0	10	9	12	0	0	0	21	2	6	9	0	0	17	2	12	0	0	0	14	62
Approach %	0.0	100.0	0.0	0.0	-	-	42.9	57.1	0.0	0.0	-	-	11.8	35.3	52.9	0.0	-	-	14.3	85.7	0.0	0.0	-	-	-
Total %	0.0	16.1	0.0	0.0	-	16.1	14.5	19.4	0.0	0.0	-	33.9	3.2	9.7	14.5	0.0	-	27.4	3.2	19.4	0.0	0.0	-	22.6	-
PHF	0.000	0.625	0.000	0.000	-	0.625	0.563	0.750	0.000	0.000	-	0.750	0.250	0.500	0.450	0.000	-	0.607	0.250	0.500	0.000	0.000	-	0.583	0.775
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Cars & Light Goods	0	9	0	0	-	9	9	11	0	0	-	20	2	6	8	0	-	16	2	12	0	0	-	14	59
% Cars & Light Goods	-	90.0	-	-	-	90.0	100.0	91.7	-	-	-	95.2	100.0	100.0	88.9	-	-	94.1	100.0	100.0	-	-	-	100.0	95.2
Buses	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Buses	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Single-Unit Trucks	0	1	0	0	-	1	0	1	0	0	-	1	0	0	1	0	-	1	0	0	0	0	-	0	3
% Single-Unit Trucks	-	10.0	-	-	-	10.0	0.0	8.3	-	-	-	4.8	0.0	0.0	11.1	-	-	5.9	0.0	0.0	-	-	-	0.0	4.8
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	-	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
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Count Name: Nichol Street W & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 9



Turning Movement Peak Hour Data Plot (4:15 PM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@pts1.com

Count Name: W Church Street & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 1

## Turning Movement Data

Start Time	W Church Street Eastbound						W Church Street Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
7:00 AM	0	0	3	0	0	3	0	3	0	0	0	3	3	1	0	0	0	4	0	0	0	0	0	0	10
7:15 AM	0	4	3	0	0	7	0	0	0	0	0	0	2	0	1	0	0	3	0	4	0	0	0	4	14
7:30 AM	0	3	6	0	0	9	0	0	0	0	0	0	0	3	2	0	0	5	0	2	0	0	0	2	16
7:45 AM	1	2	1	0	0	4	1	0	0	0	0	1	0	1	0	0	0	1	2	2	0	0	0	4	10
Hourly Total	1	9	13	0	0	23	1	3	0	0	0	4	5	5	3	0	0	13	2	8	0	0	0	10	50
8:00 AM	0	2	2	0	0	4	0	0	0	0	1	0	2	3	1	0	0	6	0	2	0	0	1	2	12
8:15 AM	0	1	6	0	0	7	2	2	0	0	1	4	3	0	0	0	0	3	0	1	0	0	1	1	15
8:30 AM	0	2	3	0	0	5	2	0	0	0	2	2	2	5	2	0	0	9	0	4	0	0	6	4	20
8:45 AM	0	1	1	0	0	2	1	2	1	0	1	4	0	6	1	0	0	7	0	4	0	0	0	4	17
Hourly Total	0	6	12	0	0	18	5	4	1	0	5	10	7	14	4	0	0	25	0	11	0	0	8	11	64
9:00 AM	1	1	1	0	0	3	2	3	0	0	2	5	4	2	1	0	0	7	0	2	0	0	0	2	17
9:15 AM	0	1	5	0	0	6	1	1	0	0	1	2	4	3	1	0	0	8	0	2	0	0	1	2	18
9:30 AM	0	1	2	0	0	3	0	3	0	0	2	3	3	0	1	0	0	4	0	2	0	0	0	2	12
9:45 AM	0	2	2	0	0	4	0	2	0	0	0	2	0	5	4	0	0	9	1	2	0	0	0	3	18
Hourly Total	1	5	10	0	0	16	3	9	0	0	5	12	11	10	7	0	0	28	1	8	0	0	1	9	65
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11:30 AM	1	4	1	0	0	6	0	3	0	0	2	3	1	0	0	0	0	1	0	0	0	0	0	0	10
11:45 AM	0	1	2	0	0	3	0	1	0	0	0	1	1	2	0	0	0	3	0	3	0	0	0	3	10
Hourly Total	1	5	3	0	0	9	0	4	0	0	2	4	2	2	0	0	0	4	0	3	0	0	0	3	20
12:00 PM	0	2	4	0	0	6	1	0	0	0	0	1	1	2	3	0	1	6	0	5	0	0	0	5	18
12:15 PM	3	2	2	0	0	7	0	0	0	0	0	0	3	0	0	0	0	3	0	1	0	0	0	1	11
12:30 PM	0	0	1	0	0	1	0	3	0	0	0	3	4	5	0	0	0	9	0	2	0	0	1	2	15
12:45 PM	0	3	2	0	0	5	1	4	0	0	0	5	1	1	1	0	0	3	0	3	0	0	0	3	16
Hourly Total	3	7	9	0	0	19	2	7	0	0	0	9	9	8	4	0	1	21	0	11	0	0	1	11	60
1:00 PM	2	2	3	0	0	7	0	0	0	0	1	0	2	1	1	0	0	4	0	3	1	0	0	4	15
1:15 PM	0	1	4	0	0	5	0	2	0	0	0	2	4	4	0	0	1	8	0	0	1	0	0	1	16
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	2	3	7	0	0	12	0	2	0	0	1	2	6	5	1	0	1	12	0	3	2	0	0	5	31
4:00 PM	1	2	2	0	0	5	2	3	1	0	0	6	0	1	1	0	0	2	0	3	1	0	0	4	17
4:15 PM	1	6	7	0	1	14	0	2	0	0	0	2	7	5	1	0	0	13	0	4	2	0	1	6	35
4:30 PM	0	3	5	0	0	8	1	1	2	0	1	4	2	7	2	0	0	11	0	1	1	0	1	2	25
4:45 PM	0	2	7	0	0	9	1	4	0	0	0	5	11	2	0	0	0	13	0	4	0	0	2	4	31
Hourly Total	2	13	21	0	1	36	4	10	3	0	1	17	20	15	4	0	0	39	0	12	4	0	4	16	108
5:00 PM	0	2	0	0	1	2	0	2	0	0	1	2	2	6	1	0	0	9	0	5	1	0	2	6	19
5:15 PM	0	3	5	0	0	8	0	4	0	0	0	4	3	4	0	0	0	7	0	0	2	0	2	2	21

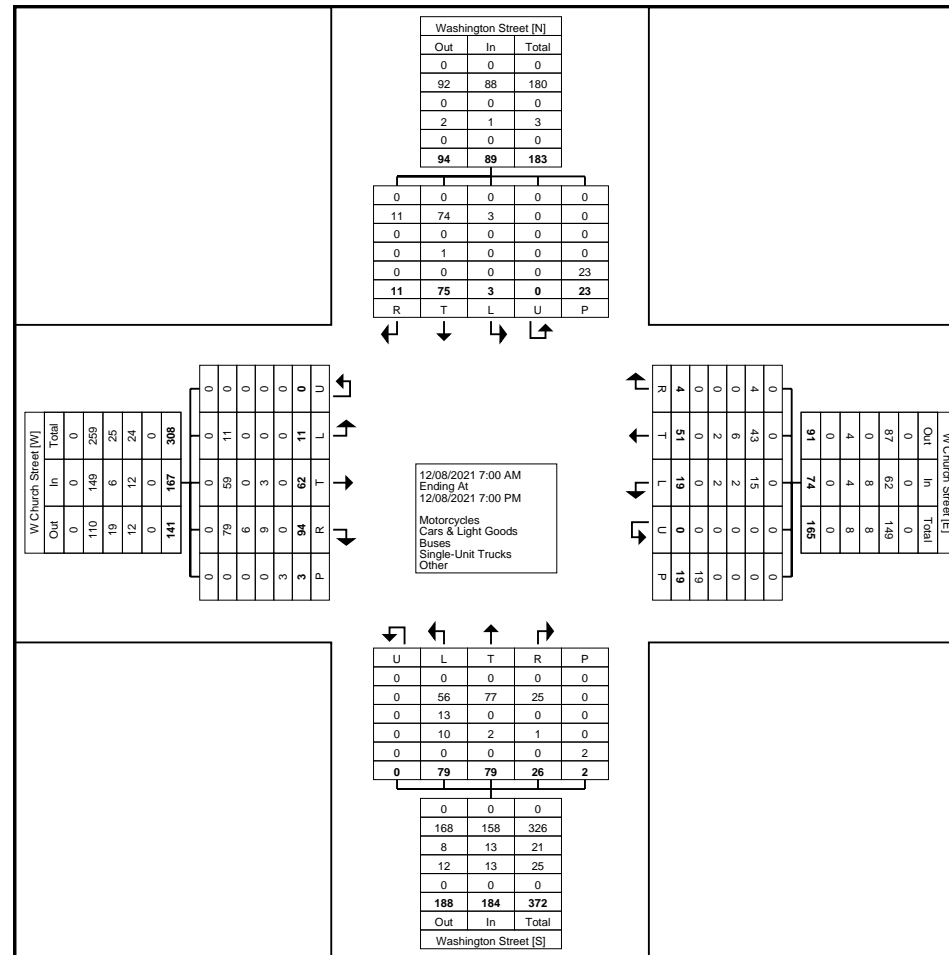
5:30 PM	0	3	4	0	1	7	3	2	0	0	0	5	4	5	1	0	0	10	0	2	0	0	1	2	24
5:45 PM	0	0	2	0	0	2	0	0	0	0	0	0	2	1	0	0	0	3	0	1	1	0	2	2	7
Hourly Total	0	8	11	0	2	19	3	8	0	0	1	11	11	16	2	0	0	29	0	8	4	0	7	12	71
6:00 PM	0	1	2	0	0	3	1	2	0	0	0	3	5	1	1	0	0	7	0	1	0	0	0	1	14
6:15 PM	0	1	2	0	0	3	0	1	0	0	1	1	2	2	0	0	0	4	0	3	1	0	0	4	12
6:30 PM	0	3	2	0	0	5	0	0	0	0	3	0	1	1	0	0	0	2	0	3	0	0	0	3	10
6:45 PM	1	1	2	0	0	4	0	1	0	0	0	1	0	0	0	0	0	0	0	4	0	0	2	4	9
Hourly Total	1	6	8	0	0	15	1	4	0	0	4	5	8	4	1	0	0	13	0	11	1	0	2	12	45
Grand Total	11	62	94	0	3	167	19	51	4	0	19	74	79	79	26	0	2	184	3	75	11	0	23	89	514
Approach %	6.6	37.1	56.3	0.0	-	-	25.7	68.9	5.4	0.0	-	-	42.9	42.9	14.1	0.0	-	-	3.4	84.3	12.4	0.0	-	-	-
Total %	2.1	12.1	18.3	0.0	-	32.5	3.7	9.9	0.8	0.0	-	14.4	15.4	15.4	5.1	0.0	-	35.8	0.6	14.6	2.1	0.0	-	17.3	-
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	11	59	79	0	-	149	15	43	4	0	-	62	56	77	25	0	-	158	3	74	11	0	-	88	457
% Cars & Light Goods	100.0	95.2	84.0	-	-	89.2	78.9	84.3	100.0	-	-	83.8	70.9	97.5	96.2	-	-	85.9	100.0	98.7	100.0	-	-	98.9	88.9
Buses	0	0	6	0	-	6	2	6	0	0	-	8	13	0	0	0	-	13	0	0	0	0	-	0	27
% Buses	0.0	0.0	6.4	-	-	3.6	10.5	11.8	0.0	-	-	10.8	16.5	0.0	0.0	-	-	7.1	0.0	0.0	0.0	-	-	0.0	5.3
Single-Unit Trucks	0	3	9	0	-	12	2	2	0	0	-	4	10	2	1	0	-	13	0	1	0	0	-	1	30
% Single-Unit Trucks	0.0	4.8	9.6	-	-	7.2	10.5	3.9	0.0	-	-	5.4	12.7	2.5	3.8	-	-	7.1	0.0	1.3	0.0	-	-	1.1	5.8
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	19	-	-	-	-	-	2	-	-	-	-	-	23	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsl.com

Count Name: W Church Street & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 3



Turning Movement Data Plot





Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsl.com

Count Name: W Church Street & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 4

### Turning Movement Peak Hour Data (8:30 AM)

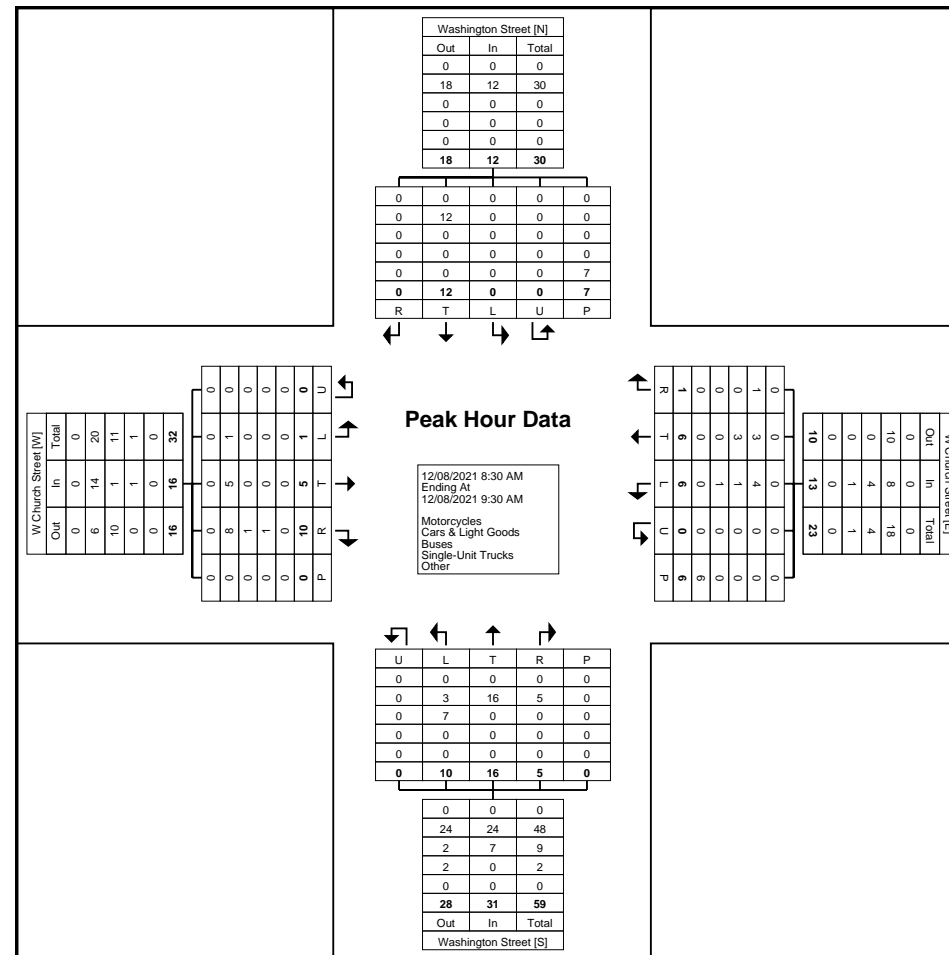
Start Time	W Church Street Eastbound						W Church Street Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
8:30 AM	0	2	3	0	0	5	2	0	0	0	2	2	2	5	2	0	0	9	0	4	0	0	6	4	20
8:45 AM	0	1	1	0	0	2	1	2	1	0	1	4	0	6	1	0	0	7	0	4	0	0	0	4	17
9:00 AM	1	1	1	0	0	3	2	3	0	0	2	5	4	2	1	0	0	7	0	2	0	0	0	2	17
9:15 AM	0	1	5	0	0	6	1	1	0	0	1	2	4	3	1	0	0	8	0	2	0	0	1	2	18
Total	1	5	10	0	0	16	6	6	1	0	6	13	10	16	5	0	0	31	0	12	0	0	7	12	72
Approach %	6.3	31.3	62.5	0.0	-	-	46.2	46.2	7.7	0.0	-	-	32.3	51.6	16.1	0.0	-	-	0.0	100.0	0.0	0.0	-	-	-
Total %	1.4	6.9	13.9	0.0	-	22.2	8.3	8.3	1.4	0.0	-	18.1	13.9	22.2	6.9	0.0	-	43.1	0.0	16.7	0.0	0.0	-	16.7	-
PHF	0.250	0.625	0.500	0.000	-	0.667	0.750	0.500	0.250	0.000	-	0.650	0.625	0.667	0.625	0.000	-	0.861	0.000	0.750	0.000	0.000	-	0.750	0.900
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Cars & Light Goods	1	5	8	0	-	14	4	3	1	0	-	8	3	16	5	0	-	24	0	12	0	0	-	12	58
% Cars & Light Goods	100.0	100.0	80.0	-	-	87.5	66.7	50.0	100.0	-	-	61.5	30.0	100.0	100.0	-	-	77.4	-	100.0	-	-	-	100.0	80.6
Buses	0	0	1	0	-	1	1	3	0	0	-	4	7	0	0	0	-	7	0	0	0	0	-	0	12
% Buses	0.0	0.0	10.0	-	-	6.3	16.7	50.0	0.0	-	-	30.8	70.0	0.0	0.0	-	-	22.6	-	0.0	-	-	-	0.0	16.7
Single-Unit Trucks	0	0	1	0	-	1	1	0	0	0	-	1	0	0	0	0	-	0	0	0	0	0	-	0	2
% Single-Unit Trucks	0.0	0.0	10.0	-	-	6.3	16.7	0.0	0.0	-	-	7.7	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	2.8
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	7	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsI.com

Count Name: W Church Street & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 5



Turning Movement Peak Hour Data Plot (8:30 AM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@pts1.com

Count Name: W Church Street & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 6

### Turning Movement Peak Hour Data (12:30 PM)

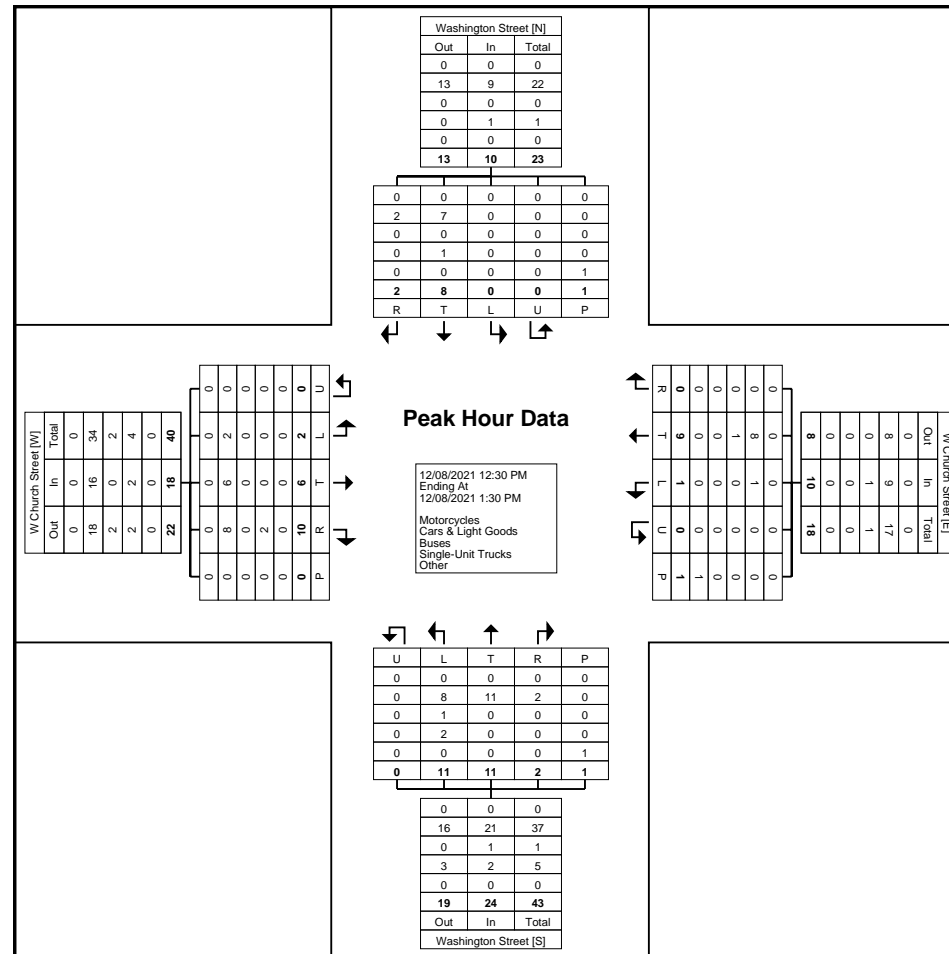
Start Time	W Church Street Eastbound						W Church Street Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
12:30 PM	0	0	1	0	0	1	0	3	0	0	0	3	4	5	0	0	0	9	0	2	0	0	1	2	15
12:45 PM	0	3	2	0	0	5	1	4	0	0	0	5	1	1	1	0	0	3	0	3	0	0	0	3	16
1:00 PM	2	2	3	0	0	7	0	0	0	0	1	0	2	1	1	0	0	4	0	3	1	0	0	4	15
1:15 PM	0	1	4	0	0	5	0	2	0	0	0	2	4	4	0	0	1	8	0	0	1	0	0	1	16
Total	2	6	10	0	0	18	1	9	0	0	1	10	11	11	2	0	1	24	0	8	2	0	1	10	62
Approach %	11.1	33.3	55.6	0.0	-	-	10.0	90.0	0.0	0.0	-	-	45.8	45.8	8.3	0.0	-	-	0.0	80.0	20.0	0.0	-	-	-
Total %	3.2	9.7	16.1	0.0	-	29.0	1.6	14.5	0.0	0.0	-	16.1	17.7	17.7	3.2	0.0	-	38.7	0.0	12.9	3.2	0.0	-	16.1	-
PHF	0.250	0.500	0.625	0.000	-	0.643	0.250	0.563	0.000	0.000	-	0.500	0.688	0.550	0.500	0.000	-	0.667	0.000	0.667	0.500	0.000	-	0.625	0.969
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	2	6	8	0	-	16	1	8	0	0	-	9	8	11	2	0	-	21	0	7	2	0	-	9	55
% Cars & Light Goods	100.0	100.0	80.0	-	-	88.9	100.0	88.9	-	-	-	90.0	72.7	100.0	100.0	-	-	87.5	-	87.5	100.0	-	-	90.0	88.7
Buses	0	0	0	0	-	0	0	1	0	0	-	1	1	0	0	0	-	1	0	0	0	0	-	0	2
% Buses	0.0	0.0	0.0	-	-	0.0	0.0	11.1	-	-	-	10.0	9.1	0.0	0.0	-	-	4.2	-	0.0	0.0	-	-	0.0	3.2
Single-Unit Trucks	0	0	2	0	-	2	0	0	0	0	-	0	2	0	0	0	-	2	0	1	0	0	-	1	5
% Single-Unit Trucks	0.0	0.0	20.0	-	-	11.1	0.0	0.0	-	-	-	0.0	18.2	0.0	0.0	-	-	8.3	-	12.5	0.0	-	-	10.0	8.1
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

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Count Name: W Church Street & Washington  
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Site Code: 210699  
Start Date: 12/08/2021  
Page No: 7



Turning Movement Peak Hour Data Plot (12:30 PM)



Paradigm Transportation Solutions Limited  
5A-150 Pinebush Rd

Cambridge, Ontario, Canada N1R 8J8  
519-896-3163 cbowness@ptsl.com

Count Name: W Church Street & Washington Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 8

### Turning Movement Peak Hour Data (4:15 PM)

Start Time	W Church Street Eastbound						W Church Street Westbound						Washington Street Northbound						Washington Street Southbound						Int. Total
	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	Left	Thru	Right	U-Turn	Peds	App. Total	
4:15 PM	1	6	7	0	1	14	0	2	0	0	0	2	7	5	1	0	0	13	0	4	2	0	1	6	35
4:30 PM	0	3	5	0	0	8	1	1	2	0	1	4	2	7	2	0	0	11	0	1	1	0	1	2	25
4:45 PM	0	2	7	0	0	9	1	4	0	0	0	5	11	2	0	0	0	13	0	4	0	0	2	4	31
5:00 PM	0	2	0	0	1	2	0	2	0	0	1	2	2	6	1	0	0	9	0	5	1	0	2	6	19
Total	1	13	19	0	2	33	2	9	2	0	2	13	22	20	4	0	0	46	0	14	4	0	6	18	110
Approach %	3.0	39.4	57.6	0.0	-	-	15.4	69.2	15.4	0.0	-	-	47.8	43.5	8.7	0.0	-	-	0.0	77.8	22.2	0.0	-	-	-
Total %	0.9	11.8	17.3	0.0	-	30.0	1.8	8.2	1.8	0.0	-	11.8	20.0	18.2	3.6	0.0	-	41.8	0.0	12.7	3.6	0.0	-	16.4	-
PHF	0.250	0.542	0.679	0.000	-	0.589	0.500	0.563	0.250	0.000	-	0.650	0.500	0.714	0.500	0.000	-	0.885	0.000	0.700	0.500	0.000	-	0.750	0.786
Motorcycles	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Cars & Light Goods	1	13	18	0	-	32	2	7	2	0	-	11	15	19	4	0	-	38	0	14	4	0	-	18	99
% Cars & Light Goods	100.0	100.0	94.7	-	-	97.0	100.0	77.8	100.0	-	-	84.6	68.2	95.0	100.0	-	-	82.6	-	100.0	100.0	-	-	100.0	90.0
Buses	0	0	1	0	-	1	0	2	0	0	-	2	3	0	0	0	-	3	0	0	0	0	-	0	6
% Buses	0.0	0.0	5.3	-	-	3.0	0.0	22.2	0.0	-	-	15.4	13.6	0.0	0.0	-	-	6.5	-	0.0	0.0	-	-	0.0	5.5
Single-Unit Trucks	0	0	0	0	-	0	0	0	0	0	-	0	4	1	0	0	-	5	0	0	0	0	-	0	5
% Single-Unit Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	18.2	5.0	0.0	-	-	10.9	-	0.0	0.0	-	-	0.0	4.5
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.0	-	-	0.0	-	0.0	0.0	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	6	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

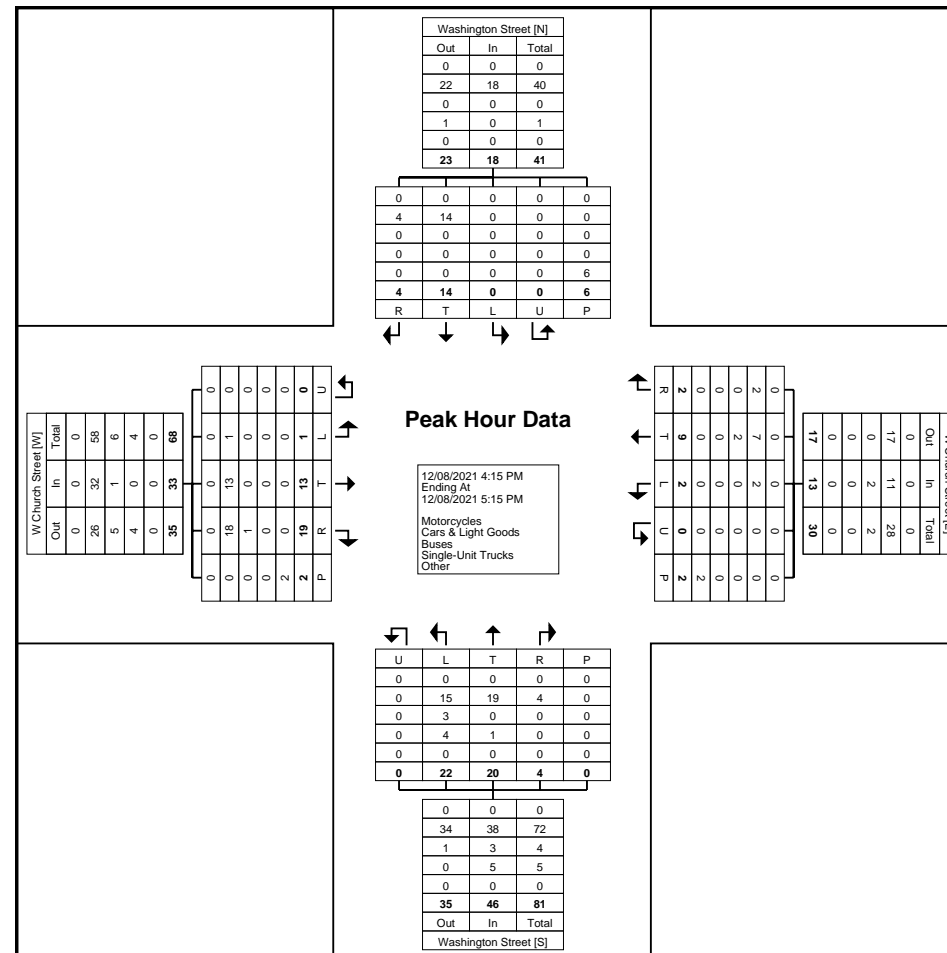




Paradigm Transportation Solutions Limited  
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Count Name: W Church Street & Washington  
Street  
Site Code: 210699  
Start Date: 12/08/2021  
Page No: 9



Turning Movement Peak Hour Data Plot (4:15 PM)

# Appendix C

## Existing Traffic Operations Reports



Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

Existing AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	8	0	0	7
Future Volume (vph)	0	0	8	0	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	9	0	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	9	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

Existing AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	8	0	0	7
Future Vol, veh/h	0	0	8	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	9	0	0	8

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	1	0	19
Stage 1	-	-	-	-	1
Stage 2	-	-	-	-	18
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1622	-	998
Stage 1	-	-	-	-	1022
Stage 2	-	-	-	-	1005
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1622	-	992
Mov Cap-2 Maneuver	-	-	-	-	992
Stage 1	-	-	-	-	1022
Stage 2	-	-	-	-	999

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.007	-	-	0.005	-
HCM Control Delay (s)	8.3	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

Existing AM Peak Hour  
257 West Church Street TIS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	6	1	0	5	0	3	9	7	1	5	0
Future Volume (vph)	0	6	1	0	5	0	3	9	7	1	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.985						0.951				
Flt Protected								0.992			0.993	
Satd. Flow (prot)	0	1872	0	0	1900	0	0	1792	0	0	1887	0
Flt Permitted								0.992			0.993	
Satd. Flow (perm)	0	1872	0	0	1900	0	0	1792	0	0	1887	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	8	1	0	6	0	4	12	9	1	6	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	0	0	6	0	0	25	0	0	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization	14.6%											
Analysis Period (min)	15											
	ICU Level of Service A											

HCM 6th TWSC  
4: Washington Street & Nichol Street

Existing AM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	6	1	0	5	0	3	9	7	1	5	0
Future Vol, veh/h	0	6	1	0	5	0	3	9	7	1	5	0
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	8	1	0	6	0	4	12	9	1	6	0










Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	7	0	0	9
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.1	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2
Pot Cap-1 Maneuver	1627	-	-	1624
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1626	-	-	1624
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.8	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	961	1626	-	-	1624	-	-	894
HCM Lane V/C Ratio	0.026	-	-	-	-	-	-	0.009
HCM Control Delay (s)	8.8	0	-	-	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

Existing AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	8	8	0
Future Volume (vph)	0	0	0	8	8	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	9	9	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	9	0	9	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

Existing AM Peak Hour  
257 West Church Street TIS

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	8	8	0
Future Vol, veh/h	0	0	0	8	8	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	9	9	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	9	0	5
Stage 1	-	-	5
Stage 2	-	-	0
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1611	-	1017
Stage 1	-	-	1018
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1611	-	1017
Mov Cap-2 Maneuver	-	-	1017
Stage 1	-	-	1018
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1611	-	-	-	1017
HCM Lane V/C Ratio	-	-	-	-	0.009
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0



# Lanes, Volumes, Timings

## 7: Washington Street & West Church Street

# Existing AM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	5	10	6	6	1	10	16	5	0	12	0
Future Volume (vph)	1	5	10	6	6	1	10	16	5	0	12	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.917			0.991			0.977				
Flt Protected		0.997			0.977			0.985				
Satd. Flow (prot)	0	1637	0	0	1704	0	0	1828	0	0	1900	0
Flt Permitted		0.997			0.977			0.985				
Satd. Flow (perm)	0	1637	0	0	1704	0	0	1828	0	0	1900	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	6	11	7	7	1	11	18	6	0	13	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	18	0	0	15	0	0	35	0	0	13	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.4%

ICU Level of Service A

Analysis Period (min) 15

# HCM 6th AWSC

## 7: Washington Street & West Church Street

# Existing AM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.1											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	5	10	6	6	1	10	16	5	0	12	0
Future Vol, veh/h	1	5	10	6	6	1	10	16	5	0	12	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	6	11	7	7	1	11	18	6	0	13	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.7			7.4			7.1			7.1		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	32%	6%	46%	0%
Vol Thru, %	52%	31%	46%	100%
Vol Right, %	16%	62%	8%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	31	16	13	12
LT Vol	10	1	6	0
Through Vol	16	5	6	12
RT Vol	5	10	1	0
Lane Flow Rate	34	18	14	13
Geometry Grp	1	1	1	1
Degree of Util (X)	0.038	0.018	0.017	0.015
Departure Headway (Hd)	3.935	3.632	4.333	3.983
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	912	985	827	900
Service Time	1.949	1.655	2.354	2.001
HCM Lane V/C Ratio	0.037	0.018	0.017	0.014
HCM Control Delay	7.1	6.7	7.4	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

Existing PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	14	0	0	10
Future Volume (vph)	0	0	14	0	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	15	0	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	15	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

Existing PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	14	0	0	10
Future Vol, veh/h	0	0	14	0	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	15	0	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.01	-	-	0.009	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

Existing PM Peak Hour  
257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	10	0	9	12	0	2	6	9	2	12	0
Future Volume (vph)	0	10	0	9	12	0	2	6	9	2	12	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt								0.930				
Flt Protected					0.978			0.994			0.992	
Satd. Flow (prot)	0	1727	0	0	1779	0	0	1661	0	0	1885	0
Flt Permitted					0.978			0.994			0.992	
Satd. Flow (perm)	0	1727	0	0	1779	0	0	1661	0	0	1885	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	0	13	0	12	15	0	3	8	12	3	15	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	13	0	0	27	0	0	23	0	0	18	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 17.8% ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC  
4: Washington Street & Nichol Street

Existing PM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	10	0	9	12	0	2	6	9	2	12	0
Future Vol, veh/h	0	10	0	9	12	0	2	6	9	2	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	0	11	0	0
Mvmt Flow	0	13	0	12	15	0	3	8	12	3	15	0

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	15	0	0	13	0	0	60	52	13	62	52	15
Stage 1	-	-	-	-	-	13	13	-	39	39	-	-
Stage 2	-	-	-	-	-	47	39	-	23	13	-	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1616	-	-	1619	-	-	941	843	1042	938	843	1070
Stage 1	-	-	-	-	-	1013	889	-	981	866	-	-
Stage 2	-	-	-	-	-	972	866	-	1000	889	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1616	-	-	1619	-	-	923	837	1042	916	837	1070
Mov Cap-2 Maneuver	-	-	-	-	-	923	837	-	916	837	-	-
Stage 1	-	-	-	-	-	1013	889	-	981	860	-	-
Stage 2	-	-	-	-	-	948	860	-	980	889	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	3.1	8.9	9.3
HCM LOS			A	A










Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	946	1616	-	-	1619	-	-	847
HCM Lane V/C Ratio	0.023	-	-	-	0.007	-	-	0.021
HCM Control Delay (s)	8.9	0	-	-	7.2	0	-	9.3
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

## Lanes, Volumes, Timings

## 6: West Church Street &amp; McCool Street

## Existing PM Peak Hour

257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	17	16	0
Future Volume (vph)	0	0	0	17	16	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	18	17	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	18	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

ICU Level of Service A




Analysis Period (min) 15

## HCM 6th TWSC

## 6: West Church Street &amp; McCool Street

## Existing PM Peak Hour

257 West Church Street TIS

Intersection						
Int Delay, s/veh	4.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	17	16	0
Future Vol, veh/h	0	0	0	17	16	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	18	17	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	18	0	-	0	9 9
Stage 1	-	-	-	-	9 -
Stage 2	-	-	-	-	0 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1599	-	-	-	1011 1073
Stage 1	-	-	-	-	1014 -
Stage 2	-	-	-	-	- -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1599	-	-	-	1011 1073
Mov Cap-2 Maneuver	-	-	-	-	1011 -
Stage 1	-	-	-	-	1014 -
Stage 2	-	-	-	-	- -

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1599	-	-	-	1011
HCM Lane V/C Ratio	-	-	-	-	0.017
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## Existing PM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	13	19	2	9	2	22	20	4	0	14	4
Future Volume (vph)	1	13	19	2	9	2	22	20	4	0	14	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.921			0.976			0.988			0.971	
Flt Protected		0.999			0.991			0.976				
Satd. Flow (prot)	0	1748	0	0	1838	0	0	1653	0	0	1845	0
Flt Permitted		0.999			0.991			0.976				
Satd. Flow (perm)	0	1748	0	0	1838	0	0	1653	0	0	1845	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	16	24	3	11	3	28	25	5	0	18	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	0	0	17	0	0	58	0	0	23	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.7%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## Existing PM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.3											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	13	19	2	9	2	22	20	4	0	14	4
Future Vol, veh/h	1	13	19	2	9	2	22	20	4	0	14	4
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	16	24	3	11	3	28	25	5	0	18	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.9			7.1			7.7			7		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	48%	3%	15%	0%
Vol Thru, %	43%	39%	69%	78%
Vol Right, %	9%	58%	15%	22%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	46	33	13	18
LT Vol	22	1	2	0
Through Vol	20	13	9	14
RT Vol	4	19	2	4
Lane Flow Rate	58	42	16	23
Geometry Grp	1	1	1	1
Degree of Util (X)	0.071	0.043	0.018	0.025
Departure Headway (Hd)	4.368	3.714	4.011	3.913
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	821	957	886	913
Service Time	2.39	1.763	2.063	1.947
HCM Lane V/C Ratio	0.071	0.044	0.018	0.025
HCM Control Delay	7.7	6.9	7.1	7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1



# Appendix D

## 2026 Background Traffic Operations Reports



Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2026 Background AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	9	0	0	8
Future Volume (vph)	0	0	9	0	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	10	0	0	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	10	9	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2026 Background AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	9	0	0	8
Future Vol, veh/h	0	0	9	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	10	0	0	9

















Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.008	-	-	0.006	-
HCM Control Delay (s)	8.3	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2026 Background AM Peak Hour  
257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	6	1	0	5	0	3	10	8	1	5	0
Future Volume (vph)	0	6	1	0	5	0	3	10	8	1	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt	0.985							0.950				
Flt Protected								0.993			0.993	
Satd. Flow (prot)	0	1872	0	0	1900	0	0	1792	0	0	1887	0
Flt Permitted								0.993			0.993	
Satd. Flow (perm)	0	1872	0	0	1900	0	0	1792	0	0	1887	0
Link Speed (k/h)	50				50				50			
Link Distance (m)	460.6				124.4				230.8			
Travel Time (s)	33.2				9.0				16.6			
Confl. Peds. (#/hr)	1					1	1					1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	8	1	0	6	0	4	13	10	1	6	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	9	0	0	6	0	0	27	0	0	7	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)	0.0				0.0				0.0			
Link Offset(m)	0.0				0.0				0.0			
Crosswalk Width(m)	4.8				4.8				4.8			
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25	15		25	15		25	15		25	15	
Sign Control	Free				Free				Stop			

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	14.6%
Analysis Period (min)	15
ICU Level of Service A	

HCM 6th TWSC  
4: Washington Street & Nichol Street

2026 Background AM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	6.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	6	1	0	5	0	3	10	8	1	5	0
Future Vol, veh/h	0	6	1	0	5	0	3	10	8	1	5	0
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	8	1	0	6	0	4	13	10	1	6	0










Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	7	0	0	9	0	0	19	16	12	30	16	8
Stage 1	-	-	-	-	-	9	9	-	7	7	-	-
Stage 2	-	-	-	-	-	10	7	-	23	9	-	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-	-
Critical Hdwy Stg 2	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1627	-	-	1624	-	-	1000	882	1074	984	882	1080
Stage 1	-	-	-	-	-	1017	892	-	1020	894	-	-
Stage 2	-	-	-	-	-	1016	894	-	1000	892	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1626	-	-	1624	-	-	994	881	1071	960	881	1078
Mov Cap-2 Maneuver	-	-	-	-	-	994	881	-	960	881	-	-
Stage 1	-	-	-	-	-	1017	892	-	1019	893	-	-
Stage 2	-	-	-	-	-	1008	893	-	973	892	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.9	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	962	1626	-	-	1624	-	-	893
HCM Lane V/C Ratio	0.028	-	-	-	-	-	-	0.009
HCM Control Delay (s)	8.9	0	-	-	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2026 Background AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	9	9	0
Future Volume (vph)	0	0	0	9	9	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	10	10	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	10	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2026 Background AM Peak Hour  
257 West Church Street TIS

















Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	9	9	0
Future Vol, veh/h	0	0	0	9	9	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	10	10	0
Major/Minor						
	Major1	Major2		Minor2		
Conflicting Flow All	10	0	-	0	5	5
Stage 1	-	-	-	-	5	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1610	-	-	-	1017	1078
Stage 1	-	-	-	-	1018	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1610	-	-	-	1017	1078
Mov Cap-2 Maneuver	-	-	-	-	1017	-
Stage 1	-	-	-	-	1018	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		8.6		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1610	-	-	-	1017	
HCM Lane V/C Ratio	-	-	-	-	0.01	
HCM Control Delay (s)	0	-	-	-	8.6	
HCM Lane LOS	A	-	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0	

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2026 Background AM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	5	11	6	6	1	11	17	5	0	13	0
Future Volume (vph)	1	5	11	6	6	1	11	17	5	0	13	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.915			0.991			0.978				
Flt Protected		0.997			0.977			0.984				
Satd. Flow (prot)	0	1630	0	0	1704	0	0	1828	0	0	1900	0
Flt Permitted		0.997			0.977			0.984				
Satd. Flow (perm)	0	1630	0	0	1704	0	0	1828	0	0	1900	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	6	12	7	7	1	12	19	6	0	14	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	19	0	0	15	0	0	37	0	0	14	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.5%

ICU Level of Service A





Analysis Period (min) 15

## HCM 6th AWS

## 7: Washington Street &amp; West Church Street

## 2026 Background AM Peak Hour

257 West Church Street TIS










Intersection												
Intersection Delay, s/veh	7.1											
Intersection LOS	A											
Movement												
Lane Configurations												
Traffic Vol, veh/h	1	5	11	6	6	1	11	17	5	0	13	0
Future Vol, veh/h	1	5	11	6	6	1	11	17	5	0	13	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	6	12	7	7	1	12	19	6	0	14	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach												
Opposing Approach	WB			EB				SB			NB	
Opposing Lanes	1			1				1			1	
Conflicting Approach Left	SB			NB				EB			WB	
Conflicting Lanes Left	1			1				1			1	
Conflicting Approach Right	NB			SB				WB			EB	
Conflicting Lanes Right	1			1				1			1	
HCM Control Delay	6.7			7.4				7.1			7.1	
HCM LOS	A			A				A			A	

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	6%	46%	0%
Vol Thru, %	52%	29%	46%	100%
Vol Right, %	15%	65%	8%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	33	17	13	13
LT Vol	11	1	6	0
Through Vol	17	5	6	13
RT Vol	5	11	1	0
Lane Flow Rate	37	19	14	14
Geometry Grp	1	1	1	1
Degree of Util (X)	0.04	0.019	0.017	0.016
Departure Headway (Hd)	3.945	3.624	4.34	3.987
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	910	987	826	899
Service Time	1.96	1.647	2.361	2.004
HCM Lane V/C Ratio	0.041	0.019	0.017	0.016
HCM Control Delay	7.1	6.7	7.4	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0



Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2026 Background PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	0	0	15	0	0	11
Future Volume (vph)	0	0	15	0	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	16	0	0	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	16	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2026 Background PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	15	0	0	11
Future Vol, veh/h	0	0	15	0	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	16	0	0	12













Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	1	0	33	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	32	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	980	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	991	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1622	-	970	1084
Mov Cap-2 Maneuver	-	-	-	-	970	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	981	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.011	-	-	0.01	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2026 Background PM Peak Hour  
257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+			+			+			+	
Traffic Volume (vph)	0	11	0	10	13	0	2	6	10	2	13	0
Future Volume (vph)	0	11	0	10	13	0	2	6	10	2	13	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt								0.927				
Flt Protected					0.979			0.994			0.993	
Satd. Flow (prot)	0	1727	0	0	1779	0	0	1652	0	0	1887	0
Flt Permitted					0.979			0.994			0.993	
Satd. Flow (perm)	0	1727	0	0	1779	0	0	1652	0	0	1887	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	0	14	0	13	17	0	3	8	13	3	17	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	14	0	0	30	0	0	24	0	0	20	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
<b>Intersection Summary</b>												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 17.9%	ICU Level of Service A											
Analysis Period (min) 15												










HCM 6th TWSC  
4: Washington Street & Nichol Street

2026 Background PM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	5.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	11	0	10	13	0	2	6	10	2	13	0
Future Vol, veh/h	0	11	0	10	13	0	2	6	10	2	13	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	11	0	0	0
Mvmt Flow	0	14	0	13	17	0	3	8	13	3	17	0
Major/Minor	Major1	Major2			Minor1			Minor2				
Conflicting Flow All	17	0	0	14	0	0	66	57	14	68	57	17
Stage 1	-	-	-	-	-	-	14	14	-	43	43	-
Stage 2	-	-	-	-	-	-	52	43	-	25	14	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1613	-	-	1617	-	-	932	838	1040	930	838	1068
Stage 1	-	-	-	-	-	-	1011	888	-	976	863	-
Stage 2	-	-	-	-	-	-	966	863	-	998	888	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1613	-	-	1617	-	-	912	831	1040	907	831	1068
Mov Cap-2 Maneuver	-	-	-	-	-	-	912	831	-	907	831	-
Stage 1	-	-	-	-	-	-	1011	888	-	976	856	-
Stage 2	-	-	-	-	-	-	940	856	-	977	888	-
Approach	EB	WB			NB			SB				
HCM Control Delay, s	0	3.1			8.9			9.4				
HCM LOS					A			A				
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	946	1613	-	-	1617	-	-	840				
HCM Lane V/C Ratio	0.024	-	-	-	0.008	-	-	0.023				
HCM Control Delay (s)	8.9	0	-	-	7.2	0	-	9.4				
HCM Lane LOS	A	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2026 Background PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	18	17	0
Future Volume (vph)	0	0	0	18	17	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	20	18	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	20	0	18	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2026 Background PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	4.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	18	17	0
Future Vol, veh/h	0	0	0	18	17	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	20	18	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	20	0	10
Stage 1	-	-	10
Stage 2	-	-	0
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1596	-	1010
Stage 1	-	-	1013
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1596	-	1010
Mov Cap-2 Maneuver	-	-	1010
Stage 1	-	-	1013
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1596	-	-	-	1010
HCM Lane V/C Ratio	-	-	-	-	0.018
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lanes, Volumes, Timings  
7: Washington Street & West Church Street

2026 Background PM Peak Hour  
257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	14	20	2	10	2	24	22	4	0	15	4
Future Volume (vph)	1	14	20	2	10	2	24	22	4	0	15	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.923			0.979			0.989			0.972	
Flt Protected		0.999			0.992			0.977				
Satd. Flow (prot)	0	1752	0	0	1845	0	0	1657	0	0	1847	0
Flt Permitted		0.999			0.992			0.977				
Satd. Flow (perm)	0	1752	0	0	1845	0	0	1657	0	0	1847	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	18	25	3	13	3	30	28	5	0	19	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	44	0	0	19	0	0	63	0	0	24	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary		
Area Type:	Other	
Control Type:	Unsignalized	
Intersection Capacity Utilization	19.9%	ICU Level of Service A
Analysis Period (min)	15	

HCM 6th AWS C  
7: Washington Street & West Church Street

2026 Background PM Peak Hour  
257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	14	20	2	10	2	24	22	4	0	15	4
Future Vol, veh/h	1	14	20	2	10	2	24	22	4	0	15	4
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	18	25	3	13	3	30	28	5	0	19	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7			7.2			7.8			7.1		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	48%	3%	14%	0%
Vol Thru, %	44%	40%	71%	79%
Vol Right, %	8%	57%	14%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	50	35	14	19
LT Vol	24	1	2	0
Through Vol	22	14	10	15
RT Vol	4	20	2	4
Lane Flow Rate	63	44	18	24
Geometry Grp	1	1	1	1
Degree of Util (X)	0.077	0.046	0.02	0.026
Departure Headway (Hd)	4.38	3.726	4.027	3.929
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	818	953	882	907
Service Time	2.406	1.78	2.084	1.969
HCM Lane V/C Ratio	0.077	0.046	0.02	0.026
HCM Control Delay	7.8	7	7.2	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1

# Appendix E

## 2026 Total Traffic Operations Reports





Lanes, Volumes, Timings  
1: Access A & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	
Traffic Volume (vph)	0	0	7	0	0	25
Future Volume (vph)	0	0	7	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	8	0	0	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	8	27	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
1: Access A & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	
Traffic Vol, veh/h	0	0	7	0	0	25
Future Vol, veh/h	0	0	7	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	27

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1622
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1622
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.025	-	-	0.005	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lanes, Volumes, Timings  
2: Access B & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	
Traffic Volume (vph)	25	0	3	7	0	10
Future Volume (vph)	25	0	3	7	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.987		
Satd. Flow (prot)	1863	0	0	1839	1611	0
Flt Permitted				0.987		
Satd. Flow (perm)	1863	0	0	1839	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	0	3	8	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	11	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
2: Access B & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	
Traffic Vol, veh/h	25	0	3	7	0	10
Future Vol, veh/h	25	0	3	7	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	0	3	8	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	27
Stage 1	-	-	27
Stage 2	-	-	14
Critical Hdwy	-	4.12	6.22
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.318
Pot Cap-1 Maneuver	-	1587	970
Stage 1	-	-	996
Stage 2	-	-	1009
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1587	968
Mov Cap-2 Maneuver	-	-	968
Stage 1	-	-	996
Stage 2	-	-	1007

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1048	-	-	1587	-
HCM Lane V/C Ratio	0.01	-	-	0.002	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	35	0	9	10	0	10
Future Volume (vph)	35	0	9	10	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.977		
Satd. Flow (prot)	1863	0	0	1820	1611	0
Flt Permitted				0.977		
Satd. Flow (perm)	1863	0	0	1820	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	0	10	11	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	0	0	21	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 17.7%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	35	0	9	10	0	10
Future Vol, veh/h	35	0	9	10	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	10	11	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	38
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1572
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1572
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1034	-	-	1572	-
HCM Lane V/C Ratio	0.011	-	-	0.006	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	9	18	17	0	6	0	10	10	8	1	5	2
Future Volume (vph)	9	18	17	0	6	0	10	10	8	1	5	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.948						0.962			0.959	
Flt Protected		0.990						0.982			0.995	
Satd. Flow (prot)	0	1783	0	0	1900	0	0	1795	0	0	1813	0
Flt Permitted		0.990						0.982			0.995	
Satd. Flow (perm)	0	1783	0	0	1900	0	0	1795	0	0	1813	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	12	23	22	0	8	0	13	13	10	1	6	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	57	0	0	8	0	0	36	0	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
<b>Intersection Summary</b>												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 20.3%	ICU Level of Service A											
Analysis Period (min) 15												










HCM 6th TWSC  
4: Washington Street & Nichol Street

2026 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	9	18	17	0	6	0	10	10	8	1	5	2
Future Vol, veh/h	9	18	17	0	6	0	10	10	8	1	5	2
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	12	23	22	0	8	0	13	13	10	1	6	3
<b>Major/Minor</b>												
	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	9	0	0	45	0	0	72	67	37	82	78	10
Stage 1	-	-	-	-	-	-	58	58	-	9	9	-
Stage 2	-	-	-	-	-	-	14	9	-	73	69	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	1624	-	-	1576	-	-	924	828	1041	910	816	1077
Stage 1	-	-	-	-	-	-	959	851	-	1017	892	-
Stage 2	-	-	-	-	-	-	1011	892	-	942	841	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1623	-	-	1576	-	-	910	821	1038	882	809	1075
Mov Cap-2 Maneuver	-	-	-	-	-	-	910	821	-	882	809	-
Stage 1	-	-	-	-	-	-	951	844	-	1008	891	-
Stage 2	-	-	-	-	-	-	1000	891	-	909	834	-
<b>Approach</b>												
	EB		WB		NB		SB					
HCM Control Delay, s	1.5		0		9.1		9.2					
HCM LOS					A		A					
<b>Minor Lane/Major Mvmt</b>												
	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	907	1623	-	-	1576	-	-	872				
HCM Lane V/C Ratio	0.04	0.007	-	-	-	-	-	0.012				
HCM Control Delay (s)	9.1	7.2	0	-	0	-	-	9.2				
HCM Lane LOS	A	A	A	-	A	-	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0				




Lanes, Volumes, Timings  
5: West Church Street & Access C

2026 Total AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	8	14	0
Future Volume (vph)	0	0	0	8	14	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	9	15	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	9	0	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2026 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	5.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	8	14	0
Future Vol, veh/h	0	0	0	8	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	9	15	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	9	0	-	0	5
Stage 1	-	-	-	-	5
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1611	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1611	-	-	-	1017
Mov Cap-2 Maneuver	-	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1611	-	-	-	1017
HCM Lane V/C Ratio	-	-	-	-	0.015
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0



Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2026 Total AM Peak Hour  
257 West Church Street TIS

	↖	→	←	↖	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (vph)	0	14	8	11	12	0
Future Volume (vph)	0	14	8	11	12	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.923				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1719	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1719	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	15	9	12	13	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	15	21	0	13	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2026 Total AM Peak Hour  
257 West Church Street TIS

















<b>Intersection</b>						
Int Delay, s/veh	2.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	14	8	11	12	0
Future Vol, veh/h	0	14	8	11	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	15	9	12	13	0
<b>Major/Minor</b>						
Major1	Major2					
Minor2						
Conflicting Flow All	21	0	-	0	30	15
Stage 1	-	-	-	-	15	-
Stage 2	-	-	-	-	15	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1595	-	-	-	984	1065
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	1008	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1595	-	-	-	984	1065
Mov Cap-2 Maneuver	-	-	-	-	984	-
Stage 1	-	-	-	-	1008	-
Stage 2	-	-	-	-	1008	-
<b>Approach</b>						
EB	WB		SB			
HCM Control Delay, s	0		0		8.7	
HCM LOS					A	
<b>Minor Lane/Major Mvmt</b>						
EBL	EBT	WBT	WBR	SBLn1		
Capacity (veh/h)	1595	-	-	-	984	
HCM Lane V/C Ratio	-	-	-	-	0.013	
HCM Control Delay (s)	0	-	-	-	8.7	
HCM Lane LOS	A	-	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0	

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2026 Total AM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	10	23	6	10	3	17	22	5	4	25	0
Future Volume (vph)	1	10	23	6	10	3	17	22	5	4	25	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.908			0.981			0.983				
Flt Protected		0.999			0.984			0.981			0.994	
Satd. Flow (prot)	0	1613	0	0	1736	0	0	1832	0	0	1889	0
Flt Permitted		0.999			0.984			0.981			0.994	
Satd. Flow (perm)	0	1613	0	0	1736	0	0	1832	0	0	1889	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	11	26	7	11	3	19	24	6	4	28	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	38	0	0	21	0	0	49	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.5%

ICU Level of Service A





Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## 2026 Total AM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.2											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	10	23	6	10	3	17	22	5	4	25	0
Future Vol, veh/h	1	10	23	6	10	3	17	22	5	4	25	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	11	26	7	11	3	19	24	6	4	28	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.8			7.5			7.3			7.3		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	39%	3%	32%	14%
Vol Thru, %	50%	29%	53%	86%
Vol Right, %	11%	68%	16%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	44	34	19	29
LT Vol	17	1	6	4
Through Vol	22	10	10	25
RT Vol	5	23	3	0
Lane Flow Rate	49	38	21	32
Geometry Grp	1	1	1	1
Degree of Util (X)	0.055	0.038	0.025	0.036
Departure Headway (Hd)	4.037	3.656	4.327	4.068
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	887	974	824	879
Service Time	2.063	1.698	2.368	2.098
HCM Lane V/C Ratio	0.055	0.039	0.025	0.036
HCM Control Delay	7.3	6.8	7.5	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1

Lanes, Volumes, Timings  
1: Access A & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Volume (vph)	0	0	24	0	0	15
Future Volume (vph)	0	0	24	0	0	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	26	0	0	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	26	16	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
1: Access A & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Vol, veh/h	0	0	24	0	0	15
Future Vol, veh/h	0	0	24	0	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	26	0	0	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.015	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
2: Access B & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (vph)	15	0	10	24	0	7
Future Volume (vph)	15	0	10	24	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.985		
Satd. Flow (prot)	1863	0	0	1835	1611	0
Flt Permitted				0.985		
Satd. Flow (perm)	1863	0	0	1835	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	0	11	26	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	37	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 18.5%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
2: Access B & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Vol, veh/h	15	0	10	24	0	7
Future Vol, veh/h	15	0	10	24	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	0	11	26	0	8

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	16
Stage 1	-	-	16
Stage 2	-	-	48
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1602	942
Stage 1	-	-	1007
Stage 2	-	-	974
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1602	935
Mov Cap-2 Maneuver	-	-	935
Stage 1	-	-	1007
Stage 2	-	-	967

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1063	-	-	1602	-
HCM Lane V/C Ratio	0.007	-	-	0.007	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	22	0	17	34	0	12
Future Volume (vph)	22	0	17	34	0	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.984		
Satd. Flow (prot)	1863	0	0	1833	1611	0
Flt Permitted				0.984		
Satd. Flow (perm)	1863	0	0	1833	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	0	18	37	0	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	0	55	13	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 19.4%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2026 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	22	0	17	34	0	12
Future Vol, veh/h	22	0	17	34	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	0	18	37	0	13

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	24
Stage 1	-	-	24
Stage 2	-	-	73
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1591	902
Stage 1	-	-	999
Stage 2	-	-	950
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1591	891
Mov Cap-2 Maneuver	-	-	891
Stage 1	-	-	999
Stage 2	-	-	939

Approach	EB	WB	NB
HCM Control Delay, s	0	2.4	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1052	-	-	1591	-
HCM Lane V/C Ratio	0.012	-	-	0.012	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-















## Lanes, Volumes, Timings

## 4: Washington Street &amp; Nichol Street

## 2026 Total PM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	2	21	11	10	24	0	18	6	10	2	13	9
Future Volume (vph)	2	21	11	10	24	0	18	6	10	2	13	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.957						0.960			0.949	
Flt Protected		0.997			0.985			0.975			0.995	
Satd. Flow (prot)	0	1708	0	0	1772	0	0	1722	0	0	1794	0
Flt Permitted		0.997			0.985			0.975			0.995	
Satd. Flow (perm)	0	1708	0	0	1772	0	0	1722	0	0	1794	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	3	27	14	13	31	0	23	8	13	3	17	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	44	0	0	44	0	0	44	0	0	32	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 18.9%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th TWSC

## 4: Washington Street &amp; Nichol Street

## 2026 Total PM Peak Hour

257 West Church Street TIS

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	2	21	11	10	24	0	18	6	10	2	13	9
Future Vol, veh/h	2	21	11	10	24	0	18	6	10	2	13	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	0	11	0	0
Mvmt Flow	3	27	14	13	31	0	23	8	13	3	17	12










Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	31	0	0	41	0	0	112	97	34	108	104	31
Stage 1	-	-	-	-	-	-	40	40	-	57	57	-
Stage 2	-	-	-	-	-	-	72	57	-	51	47	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1595	-	-	1581	-	-	870	797	1014	876	790	1049
Stage 1	-	-	-	-	-	-	980	866	-	960	851	-
Stage 2	-	-	-	-	-	-	943	851	-	967	860	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1595	-	-	1581	-	-	840	789	1014	852	782	1049
Mov Cap-2 Maneuver	-	-	-	-	-	-	840	789	-	852	782	-
Stage 1	-	-	-	-	-	-	978	864	-	958	844	-
Stage 2	-	-	-	-	-	-	907	844	-	944	858	-

Approach	EB		WB		NB		SB
HCM Control Delay, s	0.4		2.1		9.3		9.3
HCM LOS					A		A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	874	1595	-	-	1581	-	-	871
HCM Lane V/C Ratio	0.05	0.002	-	-	0.008	-	-	0.035
HCM Control Delay (s)	9.3	7.3	0	-	7.3	0	-	9.3
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1




Lanes, Volumes, Timings  
5: West Church Street & Access C

2026 Total PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	14	11	0
Future Volume (vph)	0	0	0	14	11	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	15	12	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	15	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2026 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	14	11	0
Future Vol, veh/h	0	0	0	14	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	15	12	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	15	0	-	0	8
Stage 1	-	-	-	-	8
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1603	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1603	-	-	-	1013
Mov Cap-2 Maneuver	-	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-

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

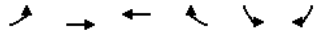
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1603	-	-	-	1013
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

## Lanes, Volumes, Timings

## 6: West Church Street &amp; McCool Street

## 2026 Total PM Peak Hour

257 West Church Street TIS



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Volume (vph)	0	11	14	21	20	0
Future Volume (vph)	0	11	14	21	20	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.918				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1710	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1710	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	12	15	23	22	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	12	38	0	22	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 13.3%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th TWSC

## 6: West Church Street &amp; McCool Street

## 2026 Total PM Peak Hour

257 West Church Street TIS

Intersection						
Int Delay, s/veh	2.7					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	↔
Traffic Vol, veh/h	0	11	14	21	20	0
Future Vol, veh/h	0	11	14	21	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	12	15	23	22	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	38	0	0
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	4.12	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	2.218	-	-
Pot Cap-1 Maneuver	1572	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1572	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

















Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1572	-	-	-	973
HCM Lane V/C Ratio	-	-	-	-	0.022
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2026 Total PM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	19	29	2	14	5	37	35	4	3	23	4
Future Volume (vph)	1	19	29	2	14	5	37	35	4	3	23	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919			0.970			0.993			0.982	
Flt Protected		0.999			0.994			0.976			0.995	
Satd. Flow (prot)	0	1744	0	0	1832	0	0	1657	0	0	1856	0
Flt Permitted		0.999			0.994			0.976			0.995	
Satd. Flow (perm)	0	1744	0	0	1832	0	0	1657	0	0	1856	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	24	37	3	18	6	47	44	5	4	29	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	62	0	0	27	0	0	96	0	0	38	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.2% ICU Level of Service A





Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## 2026 Total PM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.6											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	19	29	2	14	5	37	35	4	3	23	4
Future Vol, veh/h	1	19	29	2	14	5	37	35	4	3	23	4
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	24	37	3	18	6	47	44	5	4	29	5
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.2			7.3			8.1			7.3		
HCM LOS	A			A			A			A		
Lane	NBLn1	EBLn1	WBLn1	SBLn1								
Vol Left, %	49%	2%	10%	10%								
Vol Thru, %	46%	39%	67%	77%								
Vol Right, %	5%	59%	24%	13%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	76	49	21	30								
LT Vol	37	1	2	3								
Through Vol	35	19	14	23								
RT Vol	4	29	5	4								
Lane Flow Rate	96	62	27	38								
Geometry Grp	1	1	1	1								
Degree of Util (X)	0.119	0.066	0.03	0.043								
Departure Headway (Hd)	4.456	3.803	4.058	4.068								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	802	927	868	872								
Service Time	2.497	1.889	2.15	2.131								
HCM Lane V/C Ratio	0.12	0.067	0.031	0.044								
HCM Control Delay	8.1	7.2	7.3	7.3								
HCM Lane LOS	A	A	A	A								
HCM 95th-tile Q	0.4	0.2	0.1	0.1								

# Appendix F

## 2031 Background Traffic Operations Reports





Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2031 Background AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	9	0	0	8
Future Volume (vph)	0	0	9	0	0	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	10	0	0	9
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	10	9	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2031 Background AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	9	0	0	8
Future Vol, veh/h	0	0	9	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	10	0	0	9

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.3
HCM LOS			A

















Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.008	-	-	0.006	-
HCM Control Delay (s)	8.3	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

## Lanes, Volumes, Timings

## 4: Washington Street &amp; Nichol Street

## 2031 Background AM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	7	1	0	6	0	3	10	8	1	6	0
Future Volume (vph)	0	7	1	0	6	0	3	10	8	1	6	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.986						0.950				
Flt Protected								0.993			0.994	
Satd. Flow (prot)	0	1873	0	0	1900	0	0	1792	0	0	1889	0
Flt Permitted								0.993			0.994	
Satd. Flow (perm)	0	1873	0	0	1900	0	0	1792	0	0	1889	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	9	1	0	8	0	4	13	10	1	8	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	10	0	0	8	0	0	27	0	0	9	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 14.6%

ICU Level of Service A





Analysis Period (min) 15

## HCM 6th TWSC

## 4: Washington Street &amp; Nichol Street

## 2031 Background AM Peak Hour

257 West Church Street TIS

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	7	1	0	6	0	3	10	8	1	6	0
Future Vol, veh/h	0	7	1	0	6	0	3	10	8	1	6	0
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length		-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	9	1	0	8	0	4	13	10	1	8	0










Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	9	0	0	10
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.1	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2
Pot Cap-1 Maneuver	1624	-	-	1623
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1623	-	-	1623
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.9	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	959	1623	-	-	1623	-	-	888
HCM Lane V/C Ratio	0.028	-	-	-	-	-	-	0.01
HCM Control Delay (s)	8.9	0	-	-	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2031 Background AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	9	9	0
Future Volume (vph)	0	0	0	9	9	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.865					
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	10	10	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	10	0	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2031 Background AM Peak Hour  
257 West Church Street TIS

Intersection						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	9	9	0
Future Vol, veh/h	0	0	0	9	9	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	10	10	0
Major/Minor						
	Major1	Major2		Minor2		
Conflicting Flow All	10	0	-	0	5	5
Stage 1	-	-	-	-	5	-
Stage 2	-	-	-	-	0	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1610	-	-	-	1017	1078
Stage 1	-	-	-	-	1018	-
Stage 2	-	-	-	-	-	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1610	-	-	-	1017	1078
Mov Cap-2 Maneuver	-	-	-	-	1017	-
Stage 1	-	-	-	-	1018	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		SB		
HCM Control Delay, s	0	0		8.6		
HCM LOS	A					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1610	-	-	-	1017	
HCM Lane V/C Ratio	-	-	-	-	0.01	
HCM Control Delay (s)	0	-	-	-	8.6	
HCM Lane LOS	A	-	-	-	A	
HCM 95th %tile Q(veh)	0	-	-	-	0	

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2031 Background AM Peak Hour

257 West Church Street TIS

	↖	→	↘	↙	←	↖	↙	↘	↗	↘	↙	↘
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	6	12	7	7	1	12	19	6	0	14	0
Future Volume (vph)	1	6	12	7	7	1	12	19	6	0	14	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.916			0.992			0.977				
Flt Protected		0.998			0.977			0.984				
Satd. Flow (prot)	0	1636	0	0	1705	0	0	1827	0	0	1900	0
Flt Permitted		0.998			0.977			0.984				
Satd. Flow (perm)	0	1636	0	0	1705	0	0	1827	0	0	1900	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	7	13	8	8	1	13	21	7	0	16	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	21	0	0	17	0	0	41	0	0	16	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.8%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th AWS

## 7: Washington Street &amp; West Church Street

## 2031 Background AM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.1											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	6	12	7	7	1	12	19	6	0	14	0
Future Vol, veh/h	1	6	12	7	7	1	12	19	6	0	14	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	7	13	8	8	1	13	21	7	0	16	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.7			7.5			7.1			7.1		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	32%	5%	47%	0%
Vol Thru, %	51%	32%	47%	100%
Vol Right, %	16%	63%	7%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	19	15	14
LT Vol	12	1	7	0
Through Vol	19	6	7	14
RT Vol	6	12	1	0
Lane Flow Rate	41	21	17	16
Geometry Grp	1	1	1	1
Degree of Util (X)	0.045	0.021	0.02	0.017
Departure Headway (Hd)	3.946	3.644	4.359	3.998
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	909	981	822	896
Service Time	1.962	1.669	2.382	2.018
HCM Lane V/C Ratio	0.045	0.021	0.021	0.018
HCM Control Delay	7.1	6.7	7.5	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.1	0.1	0.1

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2031 Background PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	16	0	0	12
Future Volume (vph)	0	0	16	0	0	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	17	0	0	13
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	17	13	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2031 Background PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	16	0	0	12
Future Vol, veh/h	0	0	16	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	17	0	0	13

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

















Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.012	-	-	0.011	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-







Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2031 Background PM Peak Hour  
257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	12	0	10	14	0	2	7	10	2	14	0
Future Volume (vph)	0	12	0	10	14	0	2	7	10	2	14	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt								0.930				
Flt Protected					0.979			0.994			0.993	
Satd. Flow (prot)	0	1727	0	0	1778	0	0	1661	0	0	1887	0
Flt Permitted					0.979			0.994			0.993	
Satd. Flow (perm)	0	1727	0	0	1778	0	0	1661	0	0	1887	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	0	15	0	13	18	0	3	9	13	3	18	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	15	0	0	31	0	0	25	0	0	21	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
<b>Intersection Summary</b>												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 18.0%	ICU Level of Service A											
Analysis Period (min) 15												










HCM 6th TWSC  
4: Washington Street & Nichol Street

2031 Background PM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	5.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	12	0	10	14	0	2	7	10	2	14	0
Future Vol, veh/h	0	12	0	10	14	0	2	7	10	2	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	11	0	0	0
Mvmt Flow	0	15	0	13	18	0	3	9	13	3	18	0
Major/Minor												
	Major1	Major2		Minor1		Minor2						
Conflicting Flow All	18	0	0	15	0	0	68	59	15	70	59	18
Stage 1	-	-	-	-	-	-	15	15	-	44	44	-
Stage 2	-	-	-	-	-	-	53	44	-	26	15	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1612	-	-	1616	-	-	930	836	1039	927	836	1066
Stage 1	-	-	-	-	-	-	1010	887	-	975	862	-
Stage 2	-	-	-	-	-	-	965	862	-	997	887	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1612	-	-	1616	-	-	909	829	1039	903	829	1066
Mov Cap-2 Maneuver	-	-	-	-	-	-	909	829	-	903	829	-
Stage 1	-	-	-	-	-	-	1010	887	-	975	855	-
Stage 2	-	-	-	-	-	-	937	855	-	975	887	-
Approach	EB	WB		NB		SB						
HCM Control Delay, s	0	3		8.9		9.4						
HCM LOS				A		A						
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	937	1612	-	-	1616	-	-	838				
HCM Lane V/C Ratio	0.026	-	-	-	0.008	-	-	0.024				
HCM Control Delay (s)	8.9	0	-	-	7.2	0	-	9.4				
HCM Lane LOS	A	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2031 Background PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	20	19	0
Future Volume (vph)	0	0	0	20	19	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	22	21	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	22	0	21	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2031 Background PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	4.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	20	19	0
Future Vol, veh/h	0	0	0	20	19	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	22	21	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	22	0	11
Stage 1	-	-	11
Stage 2	-	-	0
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1593	-	1009
Stage 1	-	-	1012
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1593	-	1009
Mov Cap-2 Maneuver	-	-	1009
Stage 1	-	-	1012
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1593	-	-	-	1009
HCM Lane V/C Ratio	-	-	-	-	0.02
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

# Lanes, Volumes, Timings

7: Washington Street & West Church Street

2031 Background PM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	15	22	2	10	2	26	23	5	0	16	5
Future Volume (vph)	1	15	22	2	10	2	26	23	5	0	16	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.921			0.979			0.988			0.969	
Flt Protected		0.999			0.992			0.976				
Satd. Flow (prot)	0	1748	0	0	1845	0	0	1653	0	0	1841	0
Flt Permitted		0.999			0.992			0.976				
Satd. Flow (perm)	0	1748	0	0	1845	0	0	1653	0	0	1841	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	19	28	3	13	3	33	29	6	0	20	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	48	0	0	19	0	0	68	0	0	26	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 20.1%

ICU Level of Service A

Analysis Period (min) 15

# HCM 6th AWSC

7: Washington Street & West Church Street

2031 Background PM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.4											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	15	22	2	10	2	26	23	5	0	16	5
Future Vol, veh/h	1	15	22	2	10	2	26	23	5	0	16	5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	19	28	3	13	3	33	29	6	0	20	6
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7			7.2			7.8			7.1		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	48%	3%	14%	0%
Vol Thru, %	43%	39%	71%	76%
Vol Right, %	9%	58%	14%	24%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	54	38	14	21
LT Vol	26	1	2	0
Through Vol	23	15	10	16
RT Vol	5	22	2	5
Lane Flow Rate	68	48	18	27
Geometry Grp	1	1	1	1
Degree of Util (X)	0.083	0.05	0.02	0.029
Departure Headway (Hd)	4.383	3.737	4.046	3.924
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	818	950	877	908
Service Time	2.409	1.793	2.105	1.965
HCM Lane V/C Ratio	0.083	0.051	0.021	0.03
HCM Control Delay	7.8	7	7.2	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.2	0.1	0.1

# Appendix G

## 2031 Total Traffic Operations Reports



Lanes, Volumes, Timings  
1: Access A & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	7	0	0	25
Future Volume (vph)	0	0	7	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	8	0	0	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	8	27	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
1: Access A & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	7	0	0	25
Future Vol, veh/h	0	0	7	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	27

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.025	-	-	0.005	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-



Lanes, Volumes, Timings  
2: Access B & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (vph)	25	0	3	7	0	10
Future Volume (vph)	25	0	3	7	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.987		
Satd. Flow (prot)	1863	0	0	1839	1611	0
Flt Permitted				0.987		
Satd. Flow (perm)	1863	0	0	1839	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	0	3	8	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	11	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
2: Access B & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Vol, veh/h	25	0	3	7	0	10
Future Vol, veh/h	25	0	3	7	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	0	3	8	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	27
Stage 1	-	-	27
Stage 2	-	-	14
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1587	970
Stage 1	-	-	996
Stage 2	-	-	1009
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1587	968
Mov Cap-2 Maneuver	-	-	968
Stage 1	-	-	996
Stage 2	-	-	1007

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1048	-	-	1587	-
HCM Lane V/C Ratio	0.01	-	-	0.002	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	35	0	9	10	0	10
Future Volume (vph)	35	0	9	10	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.977		
Satd. Flow (prot)	1863	0	0	1820	1611	0
Flt Permitted				0.977		
Satd. Flow (perm)	1863	0	0	1820	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	0	10	11	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	0	0	21	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 17.7%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	35	0	9	10	0	10
Future Vol, veh/h	35	0	9	10	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	10	11	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	38
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1572
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1572
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.5	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1034	-	-	1572	-
HCM Lane V/C Ratio	0.011	-	-	0.006	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	9	19	17	0	7	0	10	10	8	1	6	2
Future Volume (vph)	9	19	17	0	7	0	10	10	8	1	6	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.950						0.962			0.966	
Flt Protected		0.990						0.982			0.996	
Satd. Flow (prot)	0	1787	0	0	1900	0	0	1795	0	0	1828	0
Flt Permitted		0.990						0.982			0.996	
Satd. Flow (perm)	0	1787	0	0	1900	0	0	1795	0	0	1828	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	12	25	22	0	9	0	13	13	10	1	8	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	59	0	0	9	0	0	36	0	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 20.6%

ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC  
4: Washington Street & Nichol Street

2031 Total AM Peak Hour  
257 West Church Street TIS

Intersection

Int Delay, s/veh 4.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	9	19	17	0	7	0	10	10	8	1	6	2
Future Vol, veh/h	9	19	17	0	7	0	10	10	8	1	6	2
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length												
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	12	25	22	0	9	0	13	13	10	1	8	3










Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	10	0	0	47
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.1	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2
Pot Cap-1 Maneuver	1623	-	-	1573
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1622	-	-	1573
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	9.2	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	902	1622	-	-	1573	-	-	862
HCM Lane V/C Ratio	0.04	0.007	-	-	-	-	-	0.014
HCM Control Delay (s)	9.2	7.2	0	-	0	-	-	9.2
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0




Lanes, Volumes, Timings  
5: West Church Street & Access C

2031 Total AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	8	14	0
Future Volume (vph)	0	0	0	8	14	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	9	15	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	9	0	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2031 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	5.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	8	14	0
Future Vol, veh/h	0	0	0	8	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	9	15	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	9	0	-	0	5
Stage 1	-	-	-	-	5
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1611	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1611	-	-	-	1017
Mov Cap-2 Maneuver	-	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1611	-	-	-	1017
HCM Lane V/C Ratio	-	-	-	-	0.015
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2031 Total AM Peak Hour  
257 West Church Street TIS

	↖	→	←	↗	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (vph)	0	14	8	11	12	0
Future Volume (vph)	0	14	8	11	12	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.923				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1719	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1719	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	15	9	12	13	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	15	21	0	13	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2031 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	14	8	11	12	0
Future Vol, veh/h	0	14	8	11	12	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	15	9	12	13	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	21	0	-	0	30
Stage 1	-	-	-	-	15
Stage 2	-	-	-	-	15
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1595	-	-	-	984
Stage 1	-	-	-	-	1008
Stage 2	-	-	-	-	1008
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1595	-	-	-	984
Mov Cap-2 Maneuver	-	-	-	-	984
Stage 1	-	-	-	-	1008
Stage 2	-	-	-	-	1008

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1595	-	-	-	984
HCM Lane V/C Ratio	-	-	-	-	0.013
HCM Control Delay (s)	0	-	-	-	8.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0



# Lanes, Volumes, Timings

## 7: Washington Street & West Church Street

# 2031 Total AM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	11	24	7	11	3	18	24	6	4	26	0
Future Volume (vph)	1	11	24	7	11	3	18	24	6	4	26	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.909			0.982			0.982				
Flt Protected		0.999			0.983			0.982			0.994	
Satd. Flow (prot)	0	1616	0	0	1732	0	0	1832	0	0	1889	0
Flt Permitted		0.999			0.983			0.982			0.994	
Satd. Flow (perm)	0	1616	0	0	1732	0	0	1832	0	0	1889	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	12	27	8	12	3	20	27	7	4	29	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	40	0	0	23	0	0	54	0	0	33	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

### Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 20.4%

ICU Level of Service A

Analysis Period (min) 15

# HCM 6th AWSC

## 7: Washington Street & West Church Street

# 2031 Total AM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.2											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	11	24	7	11	3	18	24	6	4	26	0
Future Vol, veh/h	1	11	24	7	11	3	18	24	6	4	26	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	12	27	8	12	3	20	27	7	4	29	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.9			7.5			7.3			7.3		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	3%	33%	13%
Vol Thru, %	50%	31%	52%	87%
Vol Right, %	12%	67%	14%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	48	36	21	30
LT Vol	18	1	7	4
Through Vol	24	11	11	26
RT Vol	6	24	3	0
Lane Flow Rate	53	40	23	33
Geometry Grp	1	1	1	1
Degree of Util (X)	0.06	0.041	0.028	0.038
Departure Headway (Hd)	4.037	3.673	4.352	4.078
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	886	968	819	876
Service Time	2.067	1.72	2.397	2.113
HCM Lane V/C Ratio	0.06	0.041	0.028	0.038
HCM Control Delay	7.3	6.9	7.5	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1

Lanes, Volumes, Timings  
1: Access A & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	24	0	0	15
Future Volume (vph)	0	0	24	0	0	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	26	0	0	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	26	16	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
1: Access A & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	24	0	0	15
Future Vol, veh/h	0	0	24	0	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	26	0	0	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.015	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
2: Access B & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (vph)	15	0	10	24	0	7
Future Volume (vph)	15	0	10	24	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.985		
Satd. Flow (prot)	1863	0	0	1835	1611	0
Flt Permitted				0.985		
Satd. Flow (perm)	1863	0	0	1835	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	0	11	26	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	37	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	18.5%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
2: Access B & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	↖
Traffic Vol, veh/h	15	0	10	24	0	7
Future Vol, veh/h	15	0	10	24	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	0	11	26	0	8

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	16
Stage 1	-	-	16
Stage 2	-	-	48
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1602	1063
Stage 1	-	-	1007
Stage 2	-	-	974
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1602	935
Mov Cap-2 Maneuver	-	-	935
Stage 1	-	-	1007
Stage 2	-	-	967

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1063	-	-	1602	-
HCM Lane V/C Ratio	0.007	-	-	0.007	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	22	0	18	34	0	13
Future Volume (vph)	22	0	18	34	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.983		
Satd. Flow (prot)	1863	0	0	1831	1611	0
Flt Permitted				0.983		
Satd. Flow (perm)	1863	0	0	1831	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	0	20	37	0	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	0	57	14	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 19.5%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2031 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	22	0	18	34	0	13
Future Vol, veh/h	22	0	18	34	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	0	20	37	0	14

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	24	0	101
Stage 1	-	-	-	-	24
Stage 2	-	-	-	-	77
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1591	-	898
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	946
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1591	-	886
Mov Cap-2 Maneuver	-	-	-	-	886
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	934

Approach	EB	WB	NB
HCM Control Delay, s	0	2.5	8.5
HCM LOS			A













Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1052	-	-	1591	-
HCM Lane V/C Ratio	0.013	-	-	0.012	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

## Lanes, Volumes, Timings

## 4: Washington Street &amp; Nichol Street

## 2031 Total PM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+			+			+			+	
Traffic Volume (vph)	2	22	11	10	25	0	18	7	10	2	14	9
Future Volume (vph)	2	22	11	10	25	0	18	7	10	2	14	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.958						0.961			0.951	
Flt Protected		0.997			0.986			0.975			0.995	
Satd. Flow (prot)	0	1708	0	0	1773	0	0	1725	0	0	1798	0
Flt Permitted		0.997			0.986			0.975			0.995	
Satd. Flow (perm)	0	1708	0	0	1773	0	0	1725	0	0	1798	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	3	28	14	13	32	0	23	9	13	3	18	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	45	0	0	45	0	0	45	0	0	33	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 19.2%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th TWSC

## 4: Washington Street &amp; Nichol Street

## 2031 Total PM Peak Hour

257 West Church Street TIS

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+			+			+			+	
Traffic Vol, veh/h	2	22	11	10	25	0	18	7	10	2	14	9
Future Vol, veh/h	2	22	11	10	25	0	18	7	10	2	14	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	0	11	0	0
Mvmt Flow	3	28	14	13	32	0	23	9	13	3	18	12

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	32	0	0	42	0	0	114	99	35	110	106	32
Stage 1	-	-	-	-	-	-	41	41	-	58	58	-
Stage 2	-	-	-	-	-	-	73	58	-	52	48	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1593	-	-	1580	-	-	868	795	1013	873	788	1048
Stage 1	-	-	-	-	-	-	979	865	-	959	851	-
Stage 2	-	-	-	-	-	-	942	851	-	966	859	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1593	-	-	1580	-	-	837	787	1013	848	780	1048
Mov Cap-2 Maneuver	-	-	-	-	-	-	837	787	-	848	780	-
Stage 1	-	-	-	-	-	-	977	863	-	957	844	-
Stage 2	-	-	-	-	-	-	905	844	-	942	857	-










Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	2.1	9.4	9.3
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	869	1593	-	-	1580	-	-	865
HCM Lane V/C Ratio	0.052	0.002	-	-	0.008	-	-	0.037
HCM Control Delay (s)	9.4	7.3	0	-	7.3	0	-	9.3
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1






Lanes, Volumes, Timings  
5: West Church Street & Access C

2031 Total PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	14	11	0
Future Volume (vph)	0	0	0	14	11	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	15	12	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	15	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2031 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	14	11	0
Future Vol, veh/h	0	0	0	14	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	15	12	0










Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	15	0	-	0	8
Stage 1	-	-	-	-	8
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1603	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1603	-	-	-	1013
Mov Cap-2 Maneuver	-	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1603	-	-	-	1013
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2031 Total PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	11	14	23	22	0
Future Volume (vph)	0	11	14	23	22	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.916				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1706	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1706	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	12	15	25	24	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	12	40	0	24	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2031 Total PM Peak Hour  
257 West Church Street TIS

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	11	14	23	22	0
Future Vol, veh/h	0	11	14	23	22	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	12	15	25	24	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	40	0	-	0	40 28
Stage 1	-	-	-	-	28 -
Stage 2	-	-	-	-	12 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1570	-	-	-	972 1047
Stage 1	-	-	-	-	995 -
Stage 2	-	-	-	-	1011 -
Platoon blocked, %	-	-	-	-	
Mov Cap-1 Maneuver	1570	-	-	-	972 1047
Mov Cap-2 Maneuver	-	-	-	-	972 -
Stage 1	-	-	-	-	995 -
Stage 2	-	-	-	-	1011 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1570	-	-	-	972
HCM Lane V/C Ratio	-	-	-	-	0.025
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

# Lanes, Volumes, Timings

## 7: Washington Street & West Church Street

# 2031 Total PM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	20	31	2	14	5	39	36	5	3	24	5
Future Volume (vph)	1	20	31	2	14	5	39	36	5	3	24	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919			0.970			0.992			0.980	
Flt Protected		0.999			0.994			0.976			0.995	
Satd. Flow (prot)	0	1744	0	0	1832	0	0	1657	0	0	1853	0
Flt Permitted		0.999			0.994			0.976			0.995	
Satd. Flow (perm)	0	1744	0	0	1832	0	0	1657	0	0	1853	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	25	39	3	18	6	49	46	6	4	30	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	65	0	0	27	0	0	101	0	0	40	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

### Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.4%

ICU Level of Service A

Analysis Period (min) 15

# HCM 6th AWSC

## 7: Washington Street & West Church Street

# 2031 Total PM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.6											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	20	31	2	14	5	39	36	5	3	24	5
Future Vol, veh/h	1	20	31	2	14	5	39	36	5	3	24	5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	25	39	3	18	6	49	46	6	4	30	6
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.2			7.3			8.1			7.3		
HCM LOS	A			A			A			A		
Lane	NBLn1	EBLn1	WBLn1	SBLn1								
Vol Left, %	49%	2%	10%	9%								
Vol Thru, %	45%	38%	67%	75%								
Vol Right, %	6%	60%	24%	16%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	80	52	21	32								
LT Vol	39	1	2	3								
Through Vol	36	20	14	24								
RT Vol	5	31	5	5								
Lane Flow Rate	101	66	27	41								
Geometry Grp	1	1	1	1								
Degree of Util (X)	0.125	0.07	0.03	0.046								
Departure Headway (Hd)	4.46	3.811	4.073	4.065								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	801	923	863	873								
Service Time	2.502	1.904	2.171	2.129								
HCM Lane V/C Ratio	0.126	0.072	0.031	0.047								
HCM Control Delay	8.1	7.2	7.3	7.3								
HCM Lane LOS	A	A	A	A								
HCM 95th-tile Q	0.4	0.2	0.1	0.1								

# Appendix H

## 2036 Background Traffic Operations Reports



Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2036 Background AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	10	0	0	9
Future Volume (vph)	0	0	10	0	0	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	11	0	0	10
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	11	10	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2036 Background AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	10	0	0	9
Future Vol, veh/h	0	0	10	0	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	11	0	0	10

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.009	-	-	0.007	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-



## Lanes, Volumes, Timings

## 4: Washington Street &amp; Nichol Street

## 2036 Background AM Peak Hour

257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	8	1	0	6	0	4	11	9	1	6	0
Future Volume (vph)	0	8	1	0	6	0	4	11	9	1	6	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.988						0.948				
Flt Protected								0.992			0.994	
Satd. Flow (prot)	0	1877	0	0	1900	0	0	1787	0	0	1889	0
Flt Permitted								0.992			0.994	
Satd. Flow (perm)	0	1877	0	0	1900	0	0	1787	0	0	1889	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	0	10	1	0	8	0	5	14	12	1	8	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	8	0	0	31	0	0	9	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 14.6%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th TWSC

## 4: Washington Street &amp; Nichol Street

## 2036 Background AM Peak Hour

257 West Church Street TIS

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	8	1	0	6	0	4	11	9	1	6	0
Future Vol, veh/h	0	8	1	0	6	0	4	11	9	1	6	0
Conflicting Peds, #/hr	1	0	0	0	0	0	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	0	10	1	0	8	0	5	14	12	1	8	0










Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	9	0	0	11
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.1	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2
Pot Cap-1 Maneuver	1624	-	-	1621
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1623	-	-	1621
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	8.9	9.1
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	959	1623	-	-	1621	-	-	887
HCM Lane V/C Ratio	0.033	-	-	-	-	-	-	0.01
HCM Control Delay (s)	8.9	0	-	-	0	-	-	9.1
HCM Lane LOS	A	A	-	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0




Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2036 Background AM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	10	10	0
Future Volume (vph)	0	0	0	10	10	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	11	11	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	11	0	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2036 Background AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	4.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	10	10	0
Future Vol, veh/h	0	0	0	10	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	11	11	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	11	0	6
Stage 1	-	-	6
Stage 2	-	-	0
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1608	-	1015
Stage 1	-	-	1017
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1608	-	1015
Mov Cap-2 Maneuver	-	-	1015
Stage 1	-	-	1017
Stage 2	-	-	-

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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1608	-	-	-	1015
HCM Lane V/C Ratio	-	-	-	-	0.011
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Lanes, Volumes, Timings  
7: Washington Street & West Church Street

2036 Background AM Peak Hour  
257 West Church Street TIS

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	1	6	13	8	8	1	13	20	6	0	15	0
Future Volume (vph)	1	6	13	8	8	1	13	20	6	0	15	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.914			0.993			0.978				
Flt Protected		0.998			0.977			0.984				
Satd. Flow (prot)	0	1629	0	0	1706	0	0	1828	0	0	1900	0
Flt Permitted		0.998			0.977			0.984				
Satd. Flow (perm)	0	1629	0	0	1706	0	0	1828	0	0	1900	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	7	14	9	9	1	14	22	7	0	17	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	22	0	0	19	0	0	43	0	0	17	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	22.4%
Analysis Period (min)	15
ICU Level of Service A	

HCM 6th AWSC  
7: Washington Street & West Church Street

2036 Background AM Peak Hour  
257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.2											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	1	6	13	8	8	1	13	20	6	0	15	0
Future Vol, veh/h	1	6	13	8	8	1	13	20	6	0	15	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	7	14	9	9	1	14	22	7	0	17	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.8			7.5			7.2			7.1		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	33%	5%	47%	0%
Vol Thru, %	51%	30%	47%	100%
Vol Right, %	15%	65%	6%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	39	20	17	15
LT Vol	13	1	8	0
Through Vol	20	6	8	15
RT Vol	6	13	1	0
Lane Flow Rate	43	22	19	17
Geometry Grp	1	1	1	1
Degree of Util (X)	0.048	0.022	0.023	0.019
Departure Headway (Hd)	3.959	3.64	4.371	4.005
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	906	981	819	894
Service Time	1.978	1.67	2.398	2.029
HCM Lane V/C Ratio	0.047	0.022	0.023	0.019
HCM Control Delay	7.2	6.8	7.5	7.1
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2036 Background PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	18	0	0	13
Future Volume (vph)	0	0	18	0	0	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	20	0	0	14
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	20	14	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
3: McCool Street & Nichol Street

2036 Background PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	18	0	0	13
Future Vol, veh/h	0	0	18	0	0	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	20	0	0	14













Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	1
Stage 2	-	-	40
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1622	970
Stage 1	-	-	1022
Stage 2	-	-	982
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1622	958
Mov Cap-2 Maneuver	-	-	958
Stage 1	-	-	1022
Stage 2	-	-	970

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.013	-	-	0.012	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2036 Background PM Peak Hour  
257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	0	13	0	11	15	0	3	8	11	3	15	0
Future Volume (vph)	0	13	0	11	15	0	3	8	11	3	15	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt								0.932				
Flt Protected					0.979			0.993			0.991	
Satd. Flow (prot)	0	1727	0	0	1778	0	0	1667	0	0	1883	0
Flt Permitted					0.979			0.993			0.991	
Satd. Flow (perm)	0	1727	0	0	1778	0	0	1667	0	0	1883	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	0	17	0	14	19	0	4	10	14	4	19	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	17	0	0	33	0	0	28	0	0	23	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
<b>Intersection Summary</b>												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 18.1%	ICU Level of Service A											
Analysis Period (min) 15												

HCM 6th TWSC  
4: Washington Street & Nichol Street

2036 Background PM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	5.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	13	0	11	15	0	3	8	11	3	15	0
Future Vol, veh/h	0	13	0	11	15	0	3	8	11	3	15	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	11	0	0	0
Mvmt Flow	0	17	0	14	19	0	4	10	14	4	19	0
Major/Minor												
	Major1	Major2			Minor1			Minor2				
Conflicting Flow All	19	0	0	17	0	0	74	64	17	76	64	19
Stage 1	-	-	-	-	-	-	17	17	-	47	47	-
Stage 2	-	-	-	-	-	-	57	47	-	29	17	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1611	-	-	1613	-	-	921	831	1036	919	831	1065
Stage 1	-	-	-	-	-	-	1008	885	-	972	860	-
Stage 2	-	-	-	-	-	-	960	860	-	993	885	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1611	-	-	1613	-	-	898	824	1036	891	824	1065
Mov Cap-2 Maneuver	-	-	-	-	-	-	898	824	-	891	824	-
Stage 1	-	-	-	-	-	-	1008	885	-	972	852	-
Stage 2	-	-	-	-	-	-	930	852	-	968	885	-
Approach												
	EB	WB			NB			SB				
HCM Control Delay, s	0	3.1			9			9.4				
HCM LOS					A			A				
Minor Lane/Major Mvmt												
	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	930	1611	-	-	1613	-	-	834				
HCM Lane V/C Ratio	0.03	-	-	-	0.009	-	-	0.028				
HCM Control Delay (s)	9	0	-	-	7.3	0	-	9.4				
HCM Lane LOS	A	A	-	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				












## Lanes, Volumes, Timings

## 6: West Church Street &amp; McCool Street

## 2036 Background PM Peak Hour

257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	21	20	0
Future Volume (vph)	0	0	0	21	20	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	23	22	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	23	0	22	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 13.3% ICU Level of Service A




Analysis Period (min) 15

## HCM 6th TWSC

## 6: West Church Street &amp; McCool Street

## 2036 Background PM Peak Hour

257 West Church Street TIS

Intersection						
Int Delay, s/veh	4.2					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	21	20	0
Future Vol, veh/h	0	0	0	21	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	23	22	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	23	0	-	0	12
Stage 1	-	-	-	-	12
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1592	-	-	-	1008
Stage 1	-	-	-	-	1011
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1592	-	-	-	1008
Mov Cap-2 Maneuver	-	-	-	-	1008
Stage 1	-	-	-	-	1011
Stage 2	-	-	-	-	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.7
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1592	-	-	-	1008
HCM Lane V/C Ratio	-	-	-	-	0.022
HCM Control Delay (s)	0	-	-	-	8.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2036 Background PM Peak Hour

257 West Church Street TIS

	↖	→	↘	↙	←	↖	↙	↗	↘	↖	↙	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	1	16	24	3	11	3	28	25	5	0	18	5
Future Volume (vph)	1	16	24	3	11	3	28	25	5	0	18	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.921			0.975			0.989			0.972	
Flt Protected		0.999			0.991			0.977				
Satd. Flow (prot)	0	1748	0	0	1836	0	0	1657	0	0	1847	0
Flt Permitted		0.999			0.991			0.977				
Satd. Flow (perm)	0	1748	0	0	1836	0	0	1657	0	0	1847	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	20	30	4	14	4	35	32	6	0	23	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	51	0	0	22	0	0	73	0	0	29	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 20.3%

ICU Level of Service A

Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## 2036 Background PM Peak Hour

257 West Church Street TIS

Intersection													
Intersection Delay, s/veh	7.4												
Intersection LOS	A												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔			↔			↔			↔		
Traffic Vol, veh/h	1	16	24	3	11	3	28	25	5	0	18	5	
Future Vol, veh/h	1	16	24	3	11	3	28	25	5	0	18	5	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0	
Mvmt Flow	1	20	30	4	14	4	35	32	6	0	23	6	
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0	
Approach	EB	WB				NB				SB			
Opposing Approach	WB	EB				SB				NB			
Opposing Lanes	1	1				1				1			
Conflicting Approach Left	SB	NB				EB				WB			
Conflicting Lanes Left	1	1				1				1			
Conflicting Approach Right	NB	SB				WB				EB			
Conflicting Lanes Right	1	1				1				1			
HCM Control Delay	7	7.2				7.9				7.1			
HCM LOS	A	A				A				A			
Lane	NBLn1	EBLn1	WBLn1	SBLn1									
Vol Left, %	48%	2%	18%	0%									
Vol Thru, %	43%	39%	65%	78%									
Vol Right, %	9%	59%	18%	22%									
Sign Control	Stop	Stop	Stop	Stop									
Traffic Vol by Lane	58	41	17	23									
LT Vol	28	1	3	0									
Through Vol	25	16	11	18									
RT Vol	5	24	3	5									
Lane Flow Rate	73	52	22	29									
Geometry Grp	1	1	1	1									
Degree of Util (X)	0.09	0.054	0.024	0.032									
Departure Headway (Hd)	4.4	3.747	4.047	3.952									
Convergence, Y/N	Yes	Yes	Yes	Yes									
Cap	813	946	875	901									
Service Time	2.431	1.811	2.114	1.999									
HCM Lane V/C Ratio	0.09	0.055	0.025	0.032									
HCM Control Delay	7.9	7	7.2	7.1									
HCM Lane LOS	A	A	A	A									
HCM 95th-tile Q	0.3	0.2	0.1	0.1									

# Appendix I

## 2036 Total Traffic Operations Reports



Lanes, Volumes, Timings  
1: Access A & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	0	0	7	0	0	25
Future Volume (vph)	0	0	7	0	0	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	8	0	0	27
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	8	27	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	13.3%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
1: Access A & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	0	0	7	0	0	25
Future Vol, veh/h	0	0	7	0	0	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	8	0	0	27

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.2	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.025	-	-	0.005	-
HCM Control Delay (s)	8.4	-	-	7.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lanes, Volumes, Timings  
2: Access B & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Volume (vph)	25	0	3	7	0	10
Future Volume (vph)	25	0	3	7	0	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.987		
Satd. Flow (prot)	1863	0	0	1839	1611	0
Flt Permitted				0.987		
Satd. Flow (perm)	1863	0	0	1839	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	0	3	8	0	11
Shared Lane Traffic (%)						
Lane Group Flow (vph)	27	0	0	11	11	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
2: Access B & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↗	
Traffic Vol, veh/h	25	0	3	7	0	10
Future Vol, veh/h	25	0	3	7	0	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	0	3	8	0	11

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	27
Stage 1	-	-	27
Stage 2	-	-	14
Critical Hdwy	-	4.12	6.22
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.318
Pot Cap-1 Maneuver	-	1587	970
Stage 1	-	-	996
Stage 2	-	-	1009
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1587	968
Mov Cap-2 Maneuver	-	-	968
Stage 1	-	-	996
Stage 2	-	-	1007

Approach	EB	WB	NB
HCM Control Delay, s	0	2.2	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1048	-	-	1587	-
HCM Lane V/C Ratio	0.01	-	-	0.002	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-



Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	35	0	10	10	0	11
Future Volume (vph)	35	0	10	10	0	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.976		
Satd. Flow (prot)	1863	0	0	1818	1611	0
Flt Permitted				0.976		
Satd. Flow (perm)	1863	0	0	1818	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	0	11	11	0	12
Shared Lane Traffic (%)						
Lane Group Flow (vph)	38	0	0	22	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 17.7%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	35	0	10	10	0	11
Future Vol, veh/h	35	0	10	10	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	0	11	11	0	12

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	38	0	71
Stage 1	-	-	-	-	38
Stage 2	-	-	-	-	33
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1572	-	933
Stage 1	-	-	-	-	984
Stage 2	-	-	-	-	989
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1572	-	926
Mov Cap-2 Maneuver	-	-	-	-	926
Stage 1	-	-	-	-	984
Stage 2	-	-	-	-	982

Approach	EB	WB	NB
HCM Control Delay, s	0	3.7	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1034	-	-	1572	-
HCM Lane V/C Ratio	0.012	-	-	0.007	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

	↗	→	↘	↖	←	↙	↘	↗	↖	↙	↘	↗
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (vph)	9	20	17	0	7	0	11	11	9	1	6	2
Future Volume (vph)	9	20	17	0	7	0	11	11	9	1	6	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.950						0.959			0.966	
Flt Protected		0.990						0.983			0.996	
Satd. Flow (prot)	0	1787	0	0	1900	0	0	1791	0	0	1828	0
Flt Permitted		0.990						0.983			0.996	
Satd. Flow (perm)	0	1787	0	0	1900	0	0	1791	0	0	1828	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Confl. Peds. (#/hr)	1					1	1		3	3		1
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	12	26	22	0	9	0	14	14	12	1	8	3
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	60	0	0	9	0	0	40	0	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.0%

ICU Level of Service A

Analysis Period (min) 15

HCM 6th TWSC  
4: Washington Street & Nichol Street

2036 Total AM Peak Hour  
257 West Church Street TIS

Intersection

Int Delay, s/veh 4.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	20	17	0	7	0	11	11	9	1	6	2
Future Vol, veh/h	9	20	17	0	7	0	11	11	9	1	6	2
Conflicting Peds, #/hr	1	0	0	0	0	1	1	0	3	3	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	77	77	77	77	77	77	77	77	77
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	0	0
Mvmt Flow	12	26	22	0	9	0	14	14	12	1	8	3

Major/Minor	Major1	Major2	Minor1	Minor2
Conflicting Flow All	10	0	0	48
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	4.1	-	-	4.1
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	2.2	-	-	2.2
Pot Cap-1 Maneuver	1623	-	-	1572
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	1622	-	-	1572
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0	9.2	9.2
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	901	1622	-	-	1572	-	-	860
HCM Lane V/C Ratio	0.045	0.007	-	-	-	-	-	0.014
HCM Control Delay (s)	9.2	7.2	0	-	0	-	-	9.2
HCM Lane LOS	A	A	A	-	A	-	-	A
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

Lanes, Volumes, Timings  
5: West Church Street & Access C

2036 Total AM Peak Hour  
257 West Church Street TIS

	↖	→	←	↗	↘	↙
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Volume (vph)	0	0	0	8	14	0
Future Volume (vph)	0	0	0	8	14	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	9	15	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	9	0	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2036 Total AM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	5.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	0	0	8	14	0
Future Vol, veh/h	0	0	0	8	14	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	9	15	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	9	0	-	0	5
Stage 1	-	-	-	-	5
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1611	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1611	-	-	-	1017
Mov Cap-2 Maneuver	-	-	-	-	1017
Stage 1	-	-	-	-	1018
Stage 2	-	-	-	-	-

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










Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1611	-	-	-	1017
HCM Lane V/C Ratio	-	-	-	-	0.015
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

## Lanes, Volumes, Timings

## 6: West Church Street &amp; McCool Street

2036 Total AM Peak Hour

257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	14	8	12	13	0
Future Volume (vph)	0	14	8	12	13	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.920				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1714	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1714	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	15	9	13	14	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	15	22	0	14	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 13.3% ICU Level of Service A




Analysis Period (min) 15

## HCM 6th TWSC

## 6: West Church Street &amp; McCool Street

2036 Total AM Peak Hour

257 West Church Street TIS

Intersection						
Int Delay, s/veh	2.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	14	8	12	13	0
Future Vol, veh/h	0	14	8	12	13	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	15	9	13	14	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	22	0	-	0	31
Stage 1	-	-	-	-	16
Stage 2	-	-	-	-	15
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1593	-	-	-	983
Stage 1	-	-	-	-	1007
Stage 2	-	-	-	-	1008
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1593	-	-	-	983
Mov Cap-2 Maneuver	-	-	-	-	983
Stage 1	-	-	-	-	1007
Stage 2	-	-	-	-	1008

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.7
HCM LOS			A

















Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1593	-	-	-	983
HCM Lane V/C Ratio	-	-	-	-	0.014
HCM Control Delay (s)	0	-	-	-	8.7
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2036 Total AM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	11	25	8	12	3	19	25	6	4	27	0
Future Volume (vph)	1	11	25	8	12	3	19	25	6	4	27	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.908			0.984			0.983				
Flt Protected		0.999			0.982			0.982			0.994	
Satd. Flow (prot)	0	1613	0	0	1730	0	0	1834	0	0	1889	0
Flt Permitted		0.999			0.982			0.982			0.994	
Satd. Flow (perm)	0	1613	0	0	1730	0	0	1834	0	0	1889	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	7					7			6	6		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	0%	10%	17%	0%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	1	12	28	9	13	3	21	28	7	4	30	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	41	0	0	25	0	0	56	0	0	34	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.3%

ICU Level of Service A





Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## 2036 Total AM Peak Hour

257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.2											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	11	25	8	12	3	19	25	6	4	27	0
Future Vol, veh/h	1	11	25	8	12	3	19	25	6	4	27	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	0	0	10	17	0	0	0	0	0	0	0	0
Mvmt Flow	1	12	28	9	13	3	21	28	7	4	30	0
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	6.9			7.6			7.3			7.3		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	3%	35%	13%
Vol Thru, %	50%	30%	52%	87%
Vol Right, %	12%	68%	13%	0%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	50	37	23	31
LT Vol	19	1	8	4
Through Vol	25	11	12	27
RT Vol	6	25	3	0
Lane Flow Rate	56	41	26	34
Geometry Grp	1	1	1	1
Degree of Util (X)	0.062	0.042	0.031	0.039
Departure Headway (Hd)	4.048	3.675	4.369	4.085
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	883	968	816	874
Service Time	2.08	1.723	2.414	2.122
HCM Lane V/C Ratio	0.063	0.042	0.032	0.039
HCM Control Delay	7.3	6.9	7.6	7.3
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.1	0.1



Lanes, Volumes, Timings  
1: Access A & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Volume (vph)	0	0	24	0	0	15
Future Volume (vph)	0	0	24	0	0	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.950		
Satd. Flow (prot)	1863	0	0	1770	1611	0
Flt Permitted				0.950		
Satd. Flow (perm)	1863	0	0	1770	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	49.4			69.9	78.3	
Travel Time (s)	3.6			5.0	5.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	26	0	0	16
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	26	16	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
1: Access A & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	7.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Vol, veh/h	0	0	24	0	0	15
Future Vol, veh/h	0	0	24	0	0	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	26	0	0	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	-
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	-
Pot Cap-1 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	-
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1084	-	-	1622	-
HCM Lane V/C Ratio	0.015	-	-	0.016	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
2: Access B & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

	→	↗	↖	←	↙	↘
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Volume (vph)	15	0	10	24	0	7
Future Volume (vph)	15	0	10	24	0	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.865		
Flt Protected				0.985		
Satd. Flow (prot)	1863	0	0	1835	1611	0
Flt Permitted				0.985		
Satd. Flow (perm)	1863	0	0	1835	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	69.9			62.1	96.7	
Travel Time (s)	5.0			4.5	7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	0	11	26	0	8
Shared Lane Traffic (%)						
Lane Group Flow (vph)	16	0	0	37	8	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	18.5%			ICU Level of Service A		
Analysis Period (min)	15					

HCM 6th TWSC  
2: Access B & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗			↖	↙	↘
Traffic Vol, veh/h	15	0	10	24	0	7
Future Vol, veh/h	15	0	10	24	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	0	11	26	0	8

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	16
Stage 1	-	-	16
Stage 2	-	-	48
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	1602	942
Stage 1	-	-	1007
Stage 2	-	-	974
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	1602	935
Mov Cap-2 Maneuver	-	-	935
Stage 1	-	-	1007
Stage 2	-	-	967

Approach	EB	WB	NB
HCM Control Delay, s	0	2.1	8.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1063	-	-	1602	-
HCM Lane V/C Ratio	0.007	-	-	0.007	-
HCM Control Delay (s)	8.4	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
3: McCool Street & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

	→	↖	↗	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Volume (vph)	22	0	20	34	0	14
Future Volume (vph)	22	0	20	34	0	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.865	
Flt Protected				0.982		
Satd. Flow (prot)	1863	0	0	1829	1611	0
Flt Permitted				0.982		
Satd. Flow (perm)	1863	0	0	1829	1611	0
Link Speed (k/h)	50			50	50	
Link Distance (m)	62.1			460.6	231.7	
Travel Time (s)	4.5			33.2	16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	24	0	22	37	0	15
Shared Lane Traffic (%)						
Lane Group Flow (vph)	24	0	0	59	15	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(m)	0.0			0.0	3.6	
Link Offset(m)	0.0			0.0	0.0	
Crosswalk Width(m)	4.8			4.8	4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)		15	25		25	15
Sign Control	Free			Free	Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 19.6%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
3: McCool Street & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	2.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↖			↖	↖	
Traffic Vol, veh/h	22	0	20	34	0	14
Future Vol, veh/h	22	0	20	34	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	24	0	22	37	0	15













Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	24	0	105
Stage 1	-	-	-	-	24
Stage 2	-	-	-	-	81
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1591	-	893
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	942
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1591	-	880
Mov Cap-2 Maneuver	-	-	-	-	880
Stage 1	-	-	-	-	999
Stage 2	-	-	-	-	929

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	8.5
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	1052	-	-	1591	-
HCM Lane V/C Ratio	0.014	-	-	0.014	-
HCM Control Delay (s)	8.5	-	-	7.3	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lanes, Volumes, Timings  
4: Washington Street & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Volume (vph)	2	23	11	11	26	0	19	8	11	3	15	9
Future Volume (vph)	2	23	11	11	26	0	19	8	11	3	15	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.959						0.961			0.954	
Flt Protected		0.997			0.985			0.976			0.994	
Satd. Flow (prot)	0	1709	0	0	1772	0	0	1727	0	0	1802	0
Flt Permitted		0.997			0.985			0.976			0.994	
Satd. Flow (perm)	0	1709	0	0	1772	0	0	1727	0	0	1802	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.6			124.4			230.8			74.5	
Travel Time (s)		33.2			9.0			16.6			5.4	
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Heavy Vehicles (%)	0%	10%	0%	0%	8%	0%	0%	0%	11%	0%	0%	0%
Adj. Flow (vph)	3	29	14	14	33	0	24	10	14	4	19	12
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	46	0	0	47	0	0	48	0	0	35	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Free			Free			Stop			Stop	
<b>Intersection Summary</b>												
Area Type:	Other											
Control Type:	Unsignalized											
Intersection Capacity Utilization 18.8%	ICU Level of Service A											
Analysis Period (min) 15												










HCM 6th TWSC  
4: Washington Street & Nichol Street

2036 Total PM Peak Hour  
257 West Church Street TIS

Intersection												
Int Delay, s/veh	5.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	2	23	11	11	26	0	19	8	11	3	15	9
Future Vol, veh/h	2	23	11	11	26	0	19	8	11	3	15	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	78	78	78	78	78	78	78	78	78	78	78	78
Heavy Vehicles, %	0	10	0	0	8	0	0	0	11	0	0	0
Mvmt Flow	3	29	14	14	33	0	24	10	14	4	19	12
Major/Minor	Major1	Major2			Minor1			Minor2				
Conflicting Flow All	33	0	0	43	0	0	119	103	36	115	110	33
Stage 1	-	-	-	-	-	-	42	42	-	61	61	-
Stage 2	-	-	-	-	-	-	77	61	-	54	49	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.31	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.399	3.5	4	3.3
Pot Cap-1 Maneuver	1592	-	-	1579	-	-	861	791	1011	867	784	1046
Stage 1	-	-	-	-	-	-	978	864	-	955	848	-
Stage 2	-	-	-	-	-	-	937	848	-	963	858	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1592	-	-	1579	-	-	828	782	1011	839	775	1046
Mov Cap-2 Maneuver	-	-	-	-	-	-	828	782	-	839	775	-
Stage 1	-	-	-	-	-	-	976	862	-	953	840	-
Stage 2	-	-	-	-	-	-	897	840	-	936	856	-
Approach	EB	WB			NB			SB				
HCM Control Delay, s	0.4	2.2			9.4			9.4				
HCM LOS					A			A				
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	863	1592	-	-	1579	-	-	856				
HCM Lane V/C Ratio	0.056	0.002	-	-	0.009	-	-	0.04				
HCM Control Delay (s)	9.4	7.3	0	-	7.3	0	-	9.4				
HCM Lane LOS	A	A	A	-	A	A	-	A				
HCM 95th %tile Q(veh)	0.2	0	-	-	0	-	-	0.1				




Lanes, Volumes, Timings  
5: West Church Street & Access C

2036 Total PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	14	11	0
Future Volume (vph)	0	0	0	14	11	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1611	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1611	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		86.5	67.0		79.6	
Travel Time (s)		6.2	4.8		5.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	15	12	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	15	0	12	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
5: West Church Street & Access C

2036 Total PM Peak Hour  
257 West Church Street TIS

<b>Intersection</b>						
Int Delay, s/veh	3.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	14	11	0
Future Vol, veh/h	0	0	0	14	11	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	15	12	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	15	0	-	0	8
Stage 1	-	-	-	-	8
Stage 2	-	-	-	-	0
Critical Hdwy	4.12	-	-	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	2.218	-	-	-	3.518
Pot Cap-1 Maneuver	1603	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1603	-	-	-	1013
Mov Cap-2 Maneuver	-	-	-	-	1013
Stage 1	-	-	-	-	1015
Stage 2	-	-	-	-	-










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

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1603	-	-	-	1013
HCM Lane V/C Ratio	-	-	-	-	0.012
HCM Control Delay (s)	0	-	-	-	8.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0






Lanes, Volumes, Timings  
6: West Church Street & McCool Street

2036 Total PM Peak Hour  
257 West Church Street TIS

						
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	11	14	24	23	0
Future Volume (vph)	0	11	14	24	23	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.914				
Flt Protected					0.950	
Satd. Flow (prot)	0	1863	1703	0	1770	0
Flt Permitted					0.950	
Satd. Flow (perm)	0	1863	1703	0	1770	0
Link Speed (k/h)		50	50		50	
Link Distance (m)		67.0	460.0		231.7	
Travel Time (s)		4.8	33.1		16.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	12	15	26	25	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	12	41	0	25	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(m)		0.0	0.0		3.6	
Link Offset(m)		0.0	0.0		0.0	
Crosswalk Width(m)		4.8	4.8		4.8	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25			15	25	15
Sign Control		Free	Free		Stop	
<b>Intersection Summary</b>						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 13.3%	ICU Level of Service A					
Analysis Period (min) 15						

HCM 6th TWSC  
6: West Church Street & McCool Street

2036 Total PM Peak Hour  
257 West Church Street TIS

Intersection						
Int Delay, s/veh	2.8					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	11	14	24	23	0
Future Vol, veh/h	0	11	14	24	23	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	12	15	26	25	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	41	0	-	0	40 28
Stage 1	-	-	-	-	28 -
Stage 2	-	-	-	-	12 -
Critical Hdwy	4.12	-	-	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	2.218	-	-	-	3.518 3.318
Pot Cap-1 Maneuver	1568	-	-	-	972 1047
Stage 1	-	-	-	-	995 -
Stage 2	-	-	-	-	1011 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	1568	-	-	-	972 1047
Mov Cap-2 Maneuver	-	-	-	-	972 -
Stage 1	-	-	-	-	995 -
Stage 2	-	-	-	-	1011 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	8.8
HCM LOS			A

















Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1568	-	-	-	972
HCM Lane V/C Ratio	-	-	-	-	0.026
HCM Control Delay (s)	0	-	-	-	8.8
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

## Lanes, Volumes, Timings

## 7: Washington Street &amp; West Church Street

## 2036 Total PM Peak Hour

257 West Church Street TIS

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	21	33	3	15	6	41	38	5	3	26	5
Future Volume (vph)	1	21	33	3	15	6	41	38	5	3	26	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt		0.919			0.965			0.992			0.981	
Flt Protected		0.999			0.994			0.976			0.995	
Satd. Flow (prot)	0	1744	0	0	1822	0	0	1656	0	0	1855	0
Flt Permitted		0.999			0.994			0.976			0.995	
Satd. Flow (perm)	0	1744	0	0	1822	0	0	1656	0	0	1855	0
Link Speed (k/h)		50			50			50			50	
Link Distance (m)		460.0			114.3			167.8			230.8	
Travel Time (s)		33.1			8.2			12.1			16.6	
Confl. Peds. (#/hr)	1		1	1		1			1	1		
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	18%	5%	0%	0%	0%	0%
Adj. Flow (vph)	1	27	42	4	19	8	52	48	6	4	33	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	70	0	0	31	0	0	106	0	0	43	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(m)		0.0			0.0			0.0			0.0	
Link Offset(m)		0.0			0.0			0.0			0.0	
Crosswalk Width(m)		4.8			4.8			4.8			4.8	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (k/h)	25		15	25		15	25		15	25		15
Sign Control		Stop			Stop			Stop			Stop	

## Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 21.7%

ICU Level of Service A





Analysis Period (min) 15

## HCM 6th AWSC

## 7: Washington Street &amp; West Church Street

## 2036 Total PM Peak Hour

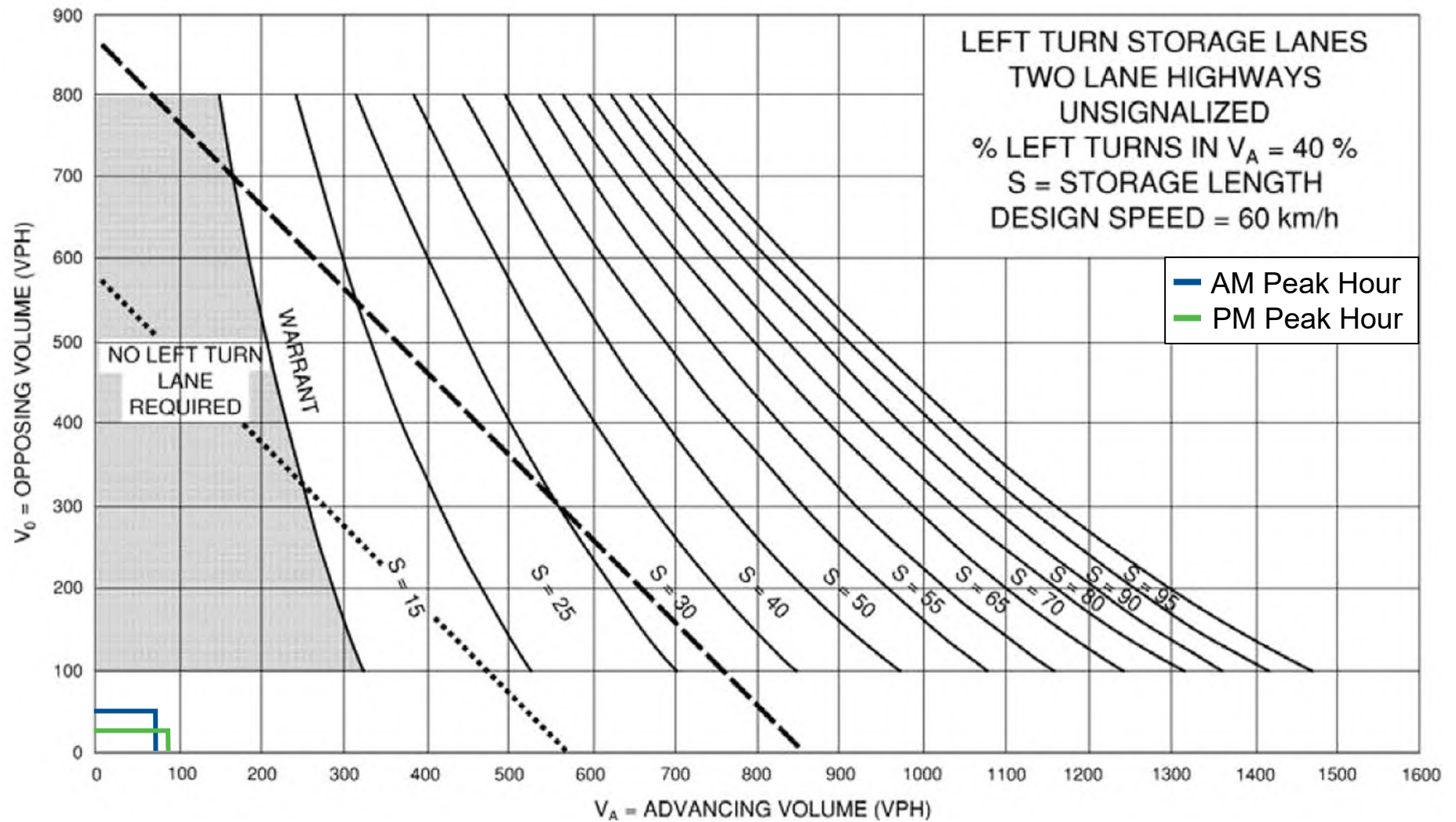
257 West Church Street TIS

Intersection												
Intersection Delay, s/veh	7.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	21	33	3	15	6	41	38	5	3	26	5
Future Vol, veh/h	1	21	33	3	15	6	41	38	5	3	26	5
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Heavy Vehicles, %	0	0	0	0	0	0	18	5	0	0	0	0
Mvmt Flow	1	27	42	4	19	8	52	48	6	4	33	6
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.2			7.3			8.2			7.4		
HCM LOS	A			A			A			A		
Lane	NBLn1	EBLn1	WBLn1	SBLn1								
Vol Left, %	49%	2%	12%	9%								
Vol Thru, %	45%	38%	62%	76%								
Vol Right, %	6%	60%	25%	15%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	84	55	24	34								
LT Vol	41	1	3	3								
Through Vol	38	21	15	26								
RT Vol	5	33	6	5								
Lane Flow Rate	106	70	30	43								
Geometry Grp	1	1	1	1								
Degree of Util (X)	0.132	0.074	0.035	0.049								
Departure Headway (Hd)	4.475	3.825	4.193	4.085								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	797	918	859	866								
Service Time	2.524	1.925	2.193	2.158								
HCM Lane V/C Ratio	0.133	0.076	0.035	0.05								
HCM Control Delay	8.2	7.2	7.3	7.4								
HCM Lane LOS	A	A	A	A								
HCM 95th-tile Q	0.5	0.2	0.1	0.2								

# Appendix J

## Left-turn Lane Warrants





Location:  
Direction:  
Horizon Year:

Nichol Street and Access B  
Westbound Left-Turn Lane  
2036 Total Horizon

647 264 3804

416-433-0737

[Rita.Kelly@infrastructureontario.ca](mailto:Rita.Kelly@infrastructureontario.ca)

Thank you,  
Joanne

Joanne Houghton | Property Manager  
CBRE Land Bank Management Team  
IO Property and Land Management Services  
659 Exeter Road  
London, Ontario N6E 1L3  
T 519-452-6815 | C 226-234-5123  
Email [jhoughton@dmsproperty.com](mailto:jhoughton@dmsproperty.com)

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**From:** John Vallee <[Johnvallee@gdvallee.ca](mailto:Johnvallee@gdvallee.ca)>

**Sent:** November 5, 2021 8:31 AM

**To:** Joanne Houghton <[jhoughton@dmsproperty.com](mailto:jhoughton@dmsproperty.com)>

**Cc:** Tom O'Hara <[tom@teamohara.com](mailto:tom@teamohara.com)>; Angie O'Hara <[angie@teamohara.com](mailto:angie@teamohara.com)>; John Iezzi <[johniezzi@gdvallee.ca](mailto:johniezzi@gdvallee.ca)>;  
Melissa Stickl Stewart <[melissastickl@gdvallee.ca](mailto:melissastickl@gdvallee.ca)>

**Subject:** Silos of Waterford Storm Sewer Outlet

You don't often get email from [johnvallee@gdvallee.ca](mailto:johnvallee@gdvallee.ca). [Learn why this is important](#)

Joanne.

Thank you so much for your help on the phone a few weeks ago.

You will recall that we talked about using the former rail corridor in Waterford as a servicing corridor for a storm sewer outlet to facilitate our development.

The image below shows the proposal that we discussed.

The red shaded area is our client's land for a proposed residential development.

The blue shaded area is the former railway land which we understand is owned by the Province of Ontario and used by Norfolk County as a rail trail.

The orange heavy line shows the schematic alignment of the proposed storm sewer on the Province's land. This proposed storm sewer will convey storm water from the development land, along the Province's land, across Norfolk County's road, and then discharge to the existing water body.

It is our intention to avoid any impact on the Waterford Trail. We plan to install the storm sewer beside the trail as your corridor is very wide.

Our client would be responsible for all construction costs including restoration of the Province's lands to a condition equal to existing conditions.

We anticipate that the storm sewer would be owned by the proposed residential condominium and therefore the condominium corporation would be responsible for maintenance of the storm sewer.

We anticipate that an easement would be required from the Province in favour of the developer for installation and the condominium corporation for maintenance.

We ask that you confirm to us that this is acceptable in principal to the Province, and that you advise us of the next steps and process to complete this agreement.

Thank you for your cooperation in this regard.






*John D. Vallee, P.Eng., President*  
**G. DOUGLAS VALLEE LIMITED**  
Consulting Engineers, Architects and Planner  
2 Talbot Street North Simcoe Ontario N3Y 3W4  
519.426.6270  
[www.gdvallee.ca](http://www.gdvallee.ca)





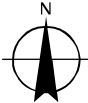


Legend

 Subject Lands

2020 Air Photo

4/4/2023

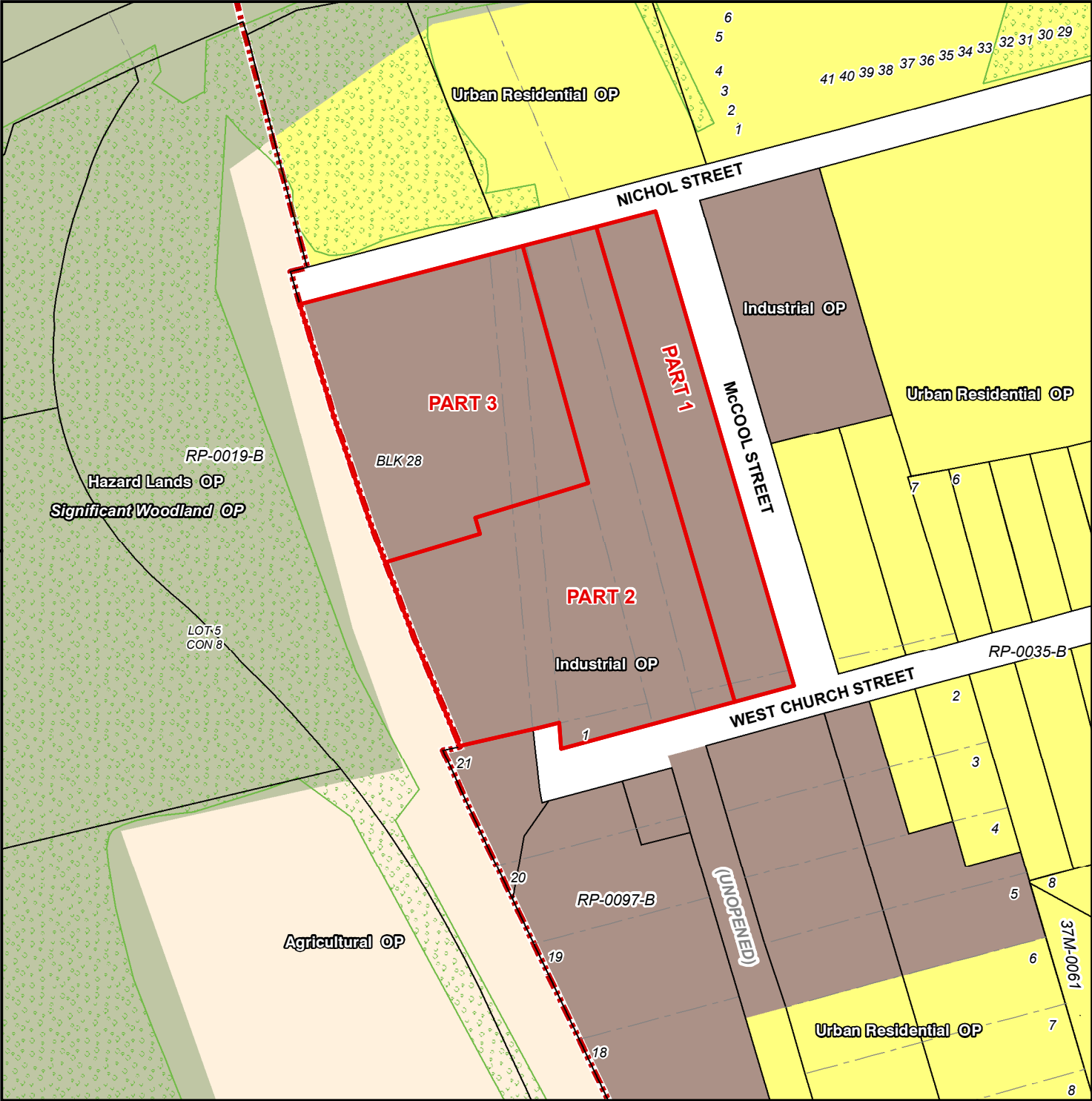


20 10 0 20 40 60 80 Meters



**MAP B**  
**PROPOSED OFFICIAL PLAN AMENDMENT MAP**  
Urban Area of WATERFORD

OPNPL2023082  
ZNPL2023083  
28TPL2023084



**Legend**

Subject Lands

Agricultural

Hazard Lands

Urban Residential

Industrial

Urban Area Boundary

Significant Woodland

**Official Plan Designations**

4/4/2023

**PART 1, PART 2 & PART 3**  
**From: Industrial**  
**To: Urban Residential**

N

20

10

0

20

40

60

80

Meters

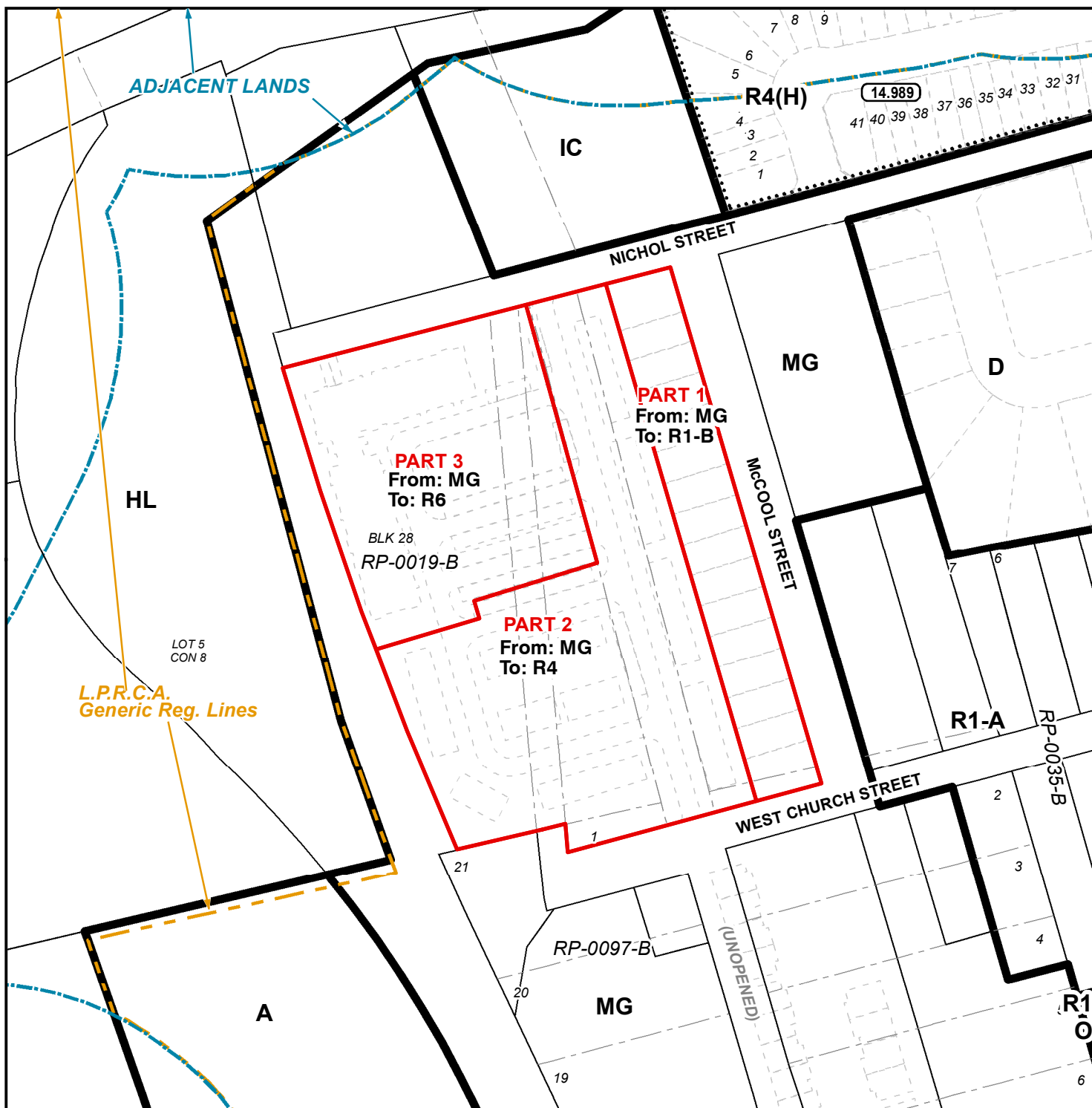
# MAP C

## PROPOSED ZONING BY-LAW AMENDMENT MAP Urban Area of WATERFORD

OPNPL2023082

ZNPL2023083

28TPL2023084



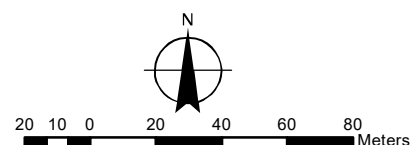
### LEGEND

- Subject Lands
- Adjacent Lands
- LPRCA Generic RegLines

ZONING BY-LAW 1-Z-2014

4/4/2023

- (H) - Holding
- A - Agricultural Zone
- IC - Community Institutional Zone
- D - Development Zone
- MG - General Industrial Zone
- HL - Hazard Land Zone
- OS - Open Space Zone
- R1-A - Residential R1-A Zone
- R1-B - Residential R1-B Zone
- R4 - Residential R4 Zone



# MAP D

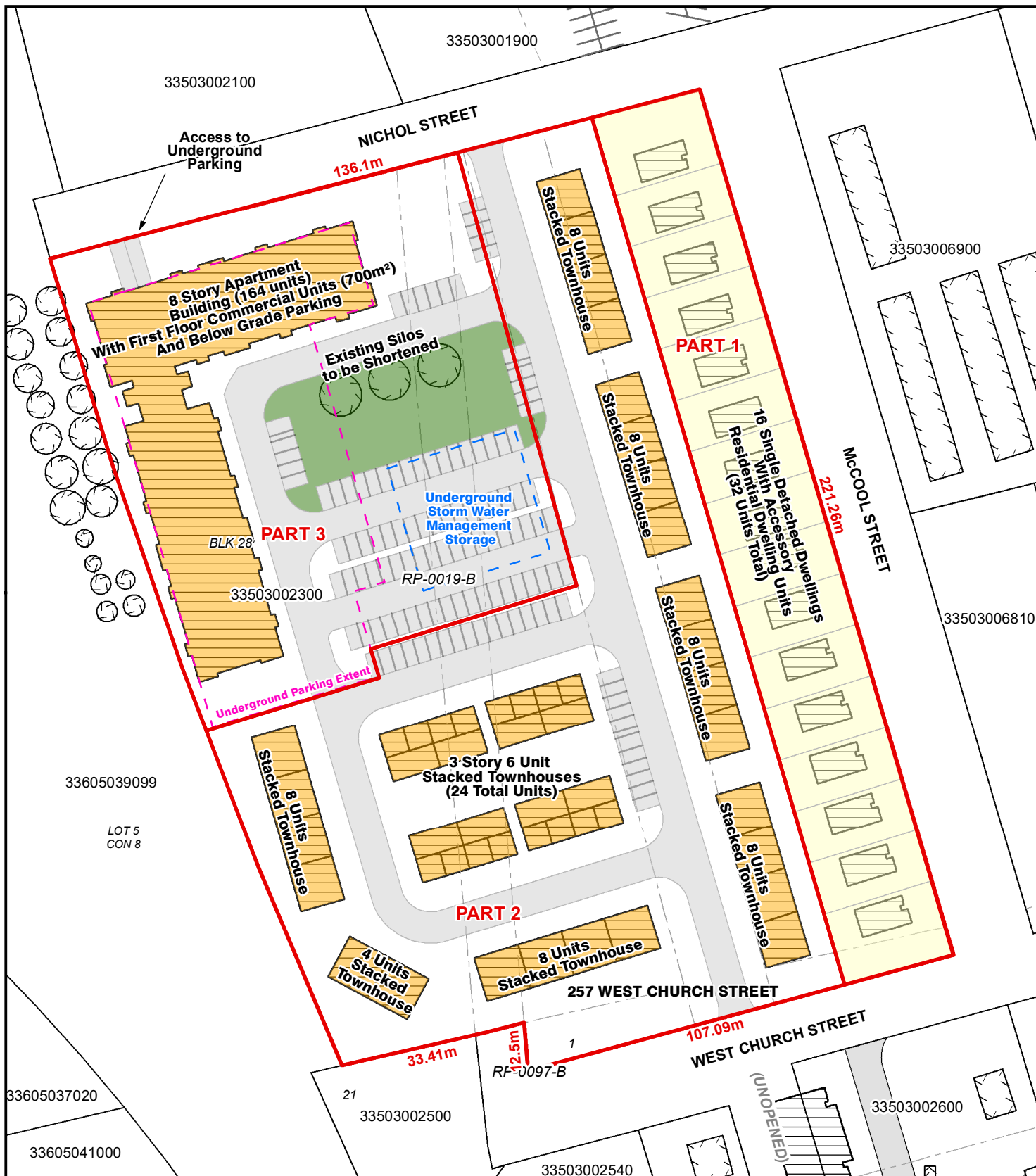
## CONCEPTUAL PLAN

Urban Area of WATERFORD

OPNPL2023082

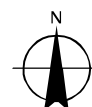
ZNPL2023083

28TPL2023084



### Legend

- Subject Lands
- Single Family Dwelling
- Multi Family Dwellings
- Underground Stormwater
- Park
- Other
- Underground Parking Line



4/4/2023

10 5 0 10 20 30 40 Meters