Stormwater Management of First Ave. & McNaughton Ave. Environmental Study

Technical Report

July 2025

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1. Introduction

Parsons was retained by the City of Oshawa to perform a Master Land Use and Urban Design Plan, and an Area-Specific Transportation Master Plan (Phases 1 to 4 of M.C.E.A process, that satisfies the requirements of Schedule A, A+, B and C Environmental Assessments (E.A.)) in the Central Oshawa Major Transit Station Area (M.T.S.A.). This technical report focusses on the stormwater management of First Ave./McNaughton Ave. corridor, which is situated within the M.T.S.A. See Figure 1 below.

FIGURE 1 - STUDY AREA

This report will address the stormwater management (S.W.M.) of existing conditions and post-development conditions for road widening and future development sites, along with approval-in-principle from regulatory agencies. The proposed conceptual road widening will cover First Ave. from Simcoe St. S. to Drew St., and McNaughton Ave. from Drew St. to Ritson Rd. S. The study aims to identify surcharged sectors, suggest discharge points and runoff coefficients for future development, while also minimizing any adverse impact on adjacent properties and downstream receivers.

1.1 Background Reference Information

As part of this report, there have been a series of standards, guidelines, and background information utilized. The following listed information has been used to adapt and develop the stormwater management report.

- City of Oshawa – Engineering Design Criteria Manual (version: January 2025)
- City of Oshawa Official Plan (Version: April 2024)
- City of Oshawa – GIS Mapping with contour lines & existing infrastructures
- Central Lake Ontario Conservation Authority (C.L.O.C.A.) – Technical Guidelines for Stormwater Management Submissions
- C.L.O.C.A. Comments regarding the Oshawa Major Transit Station Area Study and Regulatory Flood Impact Analysis – C.L.O.C.A. File IMS# PSSE87
- Oshawa M.T.S.A. Land Use & Mobility – by Parsons November 8, 2023
- Integrated Major Transit Station Area Study – by Parsons January 2023
- Credit Valley Conservation (CVC) & Toronto and Region Conservation Authorities (TRCA) - Low Impact Development Stormwater Management Planning and Design Guide (Version 1.0, 2010)
- Ontario Ministry of the Environment (MOE) – Stormwater Management Planning and Design Manual (March 2003)
- American Legal Publishing, Village of South Elgin, Illinois – Section: 156.04.C Street Standards (2023)
- Central Lake Ontario Conservation Authority (C.L.O.C.A.) – Montgomery Creek Restoration Plan (January 2015)
- Central Lake Ontario Conservation Authority (C.L.O.C.A.) – Oshawa Creek Hydrologic and Hydraulic Modeling (August 2014)
- Central Lake Ontario Conservation Authority (C.L.O.C.A.) – Hydrologic Modeling for Black, Harmony and Farewell Creeks (June 2015)
- Two-Zone Floodplain Mapping and Flood Mitigation Study – by Greck and Associates Limited (April 2021)
- Harmony and Farewell Creeks Flood Relief Study – by Greck and Associates Limited (November 2007)

1.2 Stormwater Management & Design Criteria

1.2.1 STORMWATER DESIGN CRITERIA

The following criteria were used to analyze the existing sewer network and provide a framework for safe and functional conveyance of future stormwater management. These criteria serve as baselines that also apply to new development but may be modified due to existing site conditions and to meet stormwater quantity and quality restrictions. The criteria were developed from the City of Oshawa Engineering Design Criteria Manual & Central Lake Ontario Conservation (C.L.O.C.A.).

- Minimum time of concentration Tc = 5min (for type II system).
- Minimum time of concentration Tc = 10min (for type I system).
- Rational Method: Q = 2.78C*I*A

  Where;

  Q = Design flow (L/s)
  C = Run-off co-efficient
  I = Rainfall intensity (mm/hr)
  A = Drainage area (hectares)
- Typical run-off coefficient values
  - By type of land use
    - Residential: 0.50 - 0.90
    - Commercial: 0.90
    - Industrial: 0.90
    - Schools: 0.65
    - Institutional: 0.45 - 0.90
    - Conservation Land: 0.20

        - Open Space & Recreation: 0.20
    - By type of surface
        - Impervious: 0.90
        - Unpaved: 0.40 – 0.60
        - Grass, Woods, or Railroad: 0.20
- Manning's formula to determine flow capacity of pipe, n = roughness coefficient = 0.013
- Velocity in storm sewers:
    - Minimum 0.75m/s
    - Maximum 4.00m/s
    - Maximum decrease trough a maintenance hole 0.60m/s.
- Minimum main line storm sewer pipe size shall be 250mm diameter.
- Manholes maximum spacing with pipe diameter of 1200mm or less: 110m.
- Manholes maximum spacing with pipe diameter of 1200mm or more: 150m.
- Manholes are required at every change in alignment, grade, or pipe material.
- Maximum spacing for catch basins shall be 90m on each side of the roadway.
- Maximum depth of ponding at a blocked catch basin shall be 0.40m.

1.2.2 STORMWATER QUANTITY MANAGEMENT

The study area of First Ave. & McNaughton Ave. existing conditions has a storm sewer system connected to Oshawa Creek and Montgomery Creek. Any re-construction, modification to the right of way or private development in the vicinity will be required to adopt stormwater quantity control including peak flow control, volume control and major-minor system conveyance.

All future construction within the study area and the M.T.S.A. are subject to discharge criteria to municipal infrastructure as per the City of Oshawa Guidelines shall be followed and are summarized below:

- Stom sewer system type:
    - Type I system refer to foundation drains connected to a foundation drain collector pipe.
    - Type II system refer to foundation drains connected to storm sewer pipe.
    - Type III system refer to foundation drains connected to sanitary sewer pipe.
- For type I foundation drains connected to the foundation drain collector, the City of Oshawa one-year-intensity-duration-frequence curve should be used. The foundation drain collector pipe shall outfall to a free outfall above the elevation of the 100-year storm sewer system flood line.
- For type II storm sewer design, free-flow conditions should be assumed using the Toronto – Bloor Street ten-year intensity-duration-frequency curve, see Appendix B. A 100-year hydraulic grade line analysis shall be included in the design. Any underside of footing elevation shall be designed 0.6m above the 100-year hydraulic grade line elevation.
- It is mandatory for the drainage of all lands within the development limits to be self-contained.
- To manage stormwater flows that exceed the design capacity of the piped storm sewer system, overland flow should be directed within the roadway or defined swales. The excess flow scenario should consider a storm event with a one hundred 100-year return period and be carried to an approved point of acceptance. Typically, major overland routes should follow the road network.
- The general basis for storm water management controls within the City of Oshawa is based on the MECP Interim Storm Water Quality Control Guidelines.

In addition, C.L.O.C.A. quantity control requirements include:

- Limiting the post-development peak flow rates at the corresponding pre-development rates for the 1:2 year through 1:100 year design storm events.
- Maintaining existing watershed boundaries drainage patterns.
- If there is a known deficiency in the downstream conveyance system, additional quantity control may be required.

- Master Drainage Plan are to be followed and post-development flows shall not be higher than pre-development flow unless it can be demonstrated through modeling that the additional flow will not cause detrimental effects downstream.

To manage stormwater, there are several retention or infiltration methods that can be employed. These alternatives can be used for public right, such as roads or on private developments. The different options are outlined in Section 2 and 3 of this report.

1.2.3 STORMWATER QUALITY MANAGEMENT

The C.L.O.C.A., Technical Guidelines for Stormwater Management possess various design criteria of stormwater quality management applicable to the study area and M.T.S.A. Below are guidelines to be followed and achieved by different method explained later in this report:

- The water quality target is the long-term average removal of 80 % of Total Suspended Solids (T.S.S.) on an annual loading basis from all runoffs leaving the site based on the post-development level of imperviousness.
- Oil/Grit separator device (O.G.S.) can be used as a stand-alone stormwater management quality device or used as one element part of a multicomponent system. Low impact development measures (L.I.D.) shall be considered and implemented prior to O.G.S. and wet ponds.
- The particle sizing distribution used to size an O.G.S. should be a fine distribution similar to the M.O.E.'s size distribution unless a different particle sizing distribution is required in accordance with the unit's performance certification. O.G.S. shall also be sized and placed to capture and treat a minimum of 90% of the runoff volume on site when used as a stand-alone system.
- The efficiency of T.S.S. removal from and O.G.S. can achieve 50%. The City staff and C.L.O.C.A. authorities may consider higher removal efficiency if field performance data verified are supported by the Canadian Environmental Technology Verification (ETV).

1.2.4 WATER BALANCE MANAGEMENT

As per the C.L.O.C.A. guidelines, water balance/groundwater management is applicable in the City of Oshawa for identified High Volume Recharge Areas (H.V.R.A.) and Ecologically Significant Groundwater Recharge Areas (E.S.G.R.A.). Any area identified within these sectors would need special measures to ensure the balance between surface water and groundwater is properly maintained. Post-development infiltration volumes shall be equal to pre-development infiltration volumes obtained from borehole data prior to construction. Infiltration volumes can be achieved by various method such as:

- Reducing lot grading/slopes
- Roof leaders discharging to ponding areas and pits
- Infiltration trenches
- Grass swales
- Perforated pipe and catch basin systems.

It is also critical to not oversaturate the site and surrounding areas which could affect the stability of slopes, cause surface runoff, or damage infrastructures.

In the M.T.S.A. study area, the sector has not been identified in the latest H.V.R.A. (December 2018) or E.S.G.R.A. (December 2017) mapping areas.

1.2.5 STREAM EROSION & VOLUME MANAGEMENT

To protect existing watershed and streambeds, impervious and pervious surfaces must control and release water in a control manner. As per C.L.O.C.A. guidelines the public or private development must adhere to those requirements listed below:

- The runoff generated by a 25mm rainfall event must be contained on site through infiltration, evaporation, reuse, bio-retention, and similar methods. Additionally, any remaining runoff volume from the 25mm event should be retained on site for a period of 24 to 48 hours.
- However, if certain factors are affecting the site, the runoff can be lowered to a maximum extent practical of 5mm. Factors be considered:
    - Shallow bedrock
    - High groundwater
    - Zoning, setbacks, or other land-use requirements
    - Property or infrastructure restrictions
    - Poor soils (low infiltration rates, highly compacted, contaminated)
    - Highly vulnerable aquifer

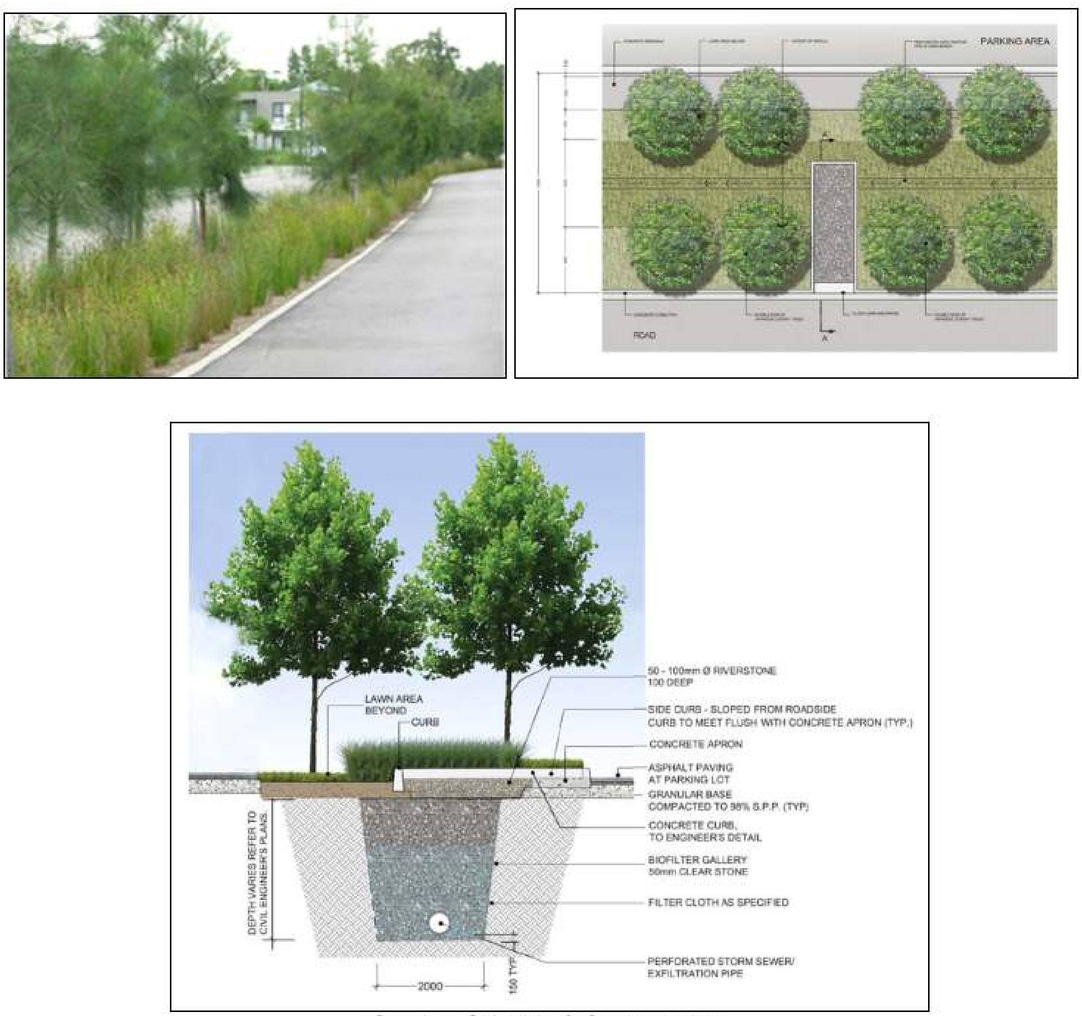
1.2.6 EROSION & SEDIMENT CONTROL

During the construction of any roads or private developments within the M.T.S.A. area, erosion and sediment control measures shall be followed as per the City of Oshawa Engineering Design Criteria Manual (Section 6.0). An erosion and sedimentation control plan will be required prior to any construction work, subject to approval by the Engineering Services of the City of Oshawa and the Central Lake Ontario Conservation Authority (C.L.O.C.A.). The study area storm sewer system eventually discharges into three different sub watersheds: Oshawa Creek, Montgomery Creek and Harmony Creek which all eventually flow into Lake Ontario. The erosion and sediment control plan will ensure that stormwater runoff is controlled, and that sediment is prevented from entering sewers and watercourses.

2. Public Right of Way Improvements

The study area was divided into three road segments, each explaining the existing conditions and recommendations for storm sewer management improvements to meet design criteria. When designing new roads or reconstructing existing ones, such as First Ave. & McNaughton Ave., designers should optimize the right-of-way with a stormwater management strategy. This can be achieved by integrating bio swales and L.I.D. (Low Impact Development) into the drainage design.

One effective approach is to construct enhanced grass swales or bioretention planters that can store and treat water. Enhanced grass swales are open channels with vegetation that serve to transport, purify, and reduce the intensity of stormwater runoff. By incorporating vegetation into the slopes and flat bottoms or triangle bottom, the velocity of water is slowed down, enabling sedimentation, filtration through the root zone and soil, evaporation, and infiltration into the underlying soil. The addition of check dams can also enhance contaminant removal rates. A similar option with restricted space could be a dry swale. It is a modified design of an enhanced grass swale that includes an engineered soil media bed and a perforated pipe under draining the system. See below Figure 2 & Figure 3 for examples of grass swales with or without check dams can be applied in right-of-way of parking lots. Appendix A attached to this report shows existing conditions of storm sewer pipe capacity for public roads south of the existing railway, the appendix A should also be analyzed with section 3 of this report.



Source:, Schollen & Company Inc.

FIGURE 2 - EXAMPLE OF INTEGRATED SWM PRACTICES IN FILL AND REDEVELOPMENT SITES (TRCA, 2010)

FIGURE 3 - ENHANCED GRASS SWALES FEATURE CHECK DAMS (TRCA, 2010)

With restricted space in rights-of-way, incorporating curbs and bioretention may be a good SWM solution as it temporarily stores, treats, and infiltrates runoff. The system design for bioretention depends on the infiltration rate of the native soil. It can be designed without an underdrain for complete infiltration, with an underdrain for partial infiltration, or with an impermeable liner and underdrain for filtration only, which is also known as a biofilter. The main part of bioretention is the filter bed, which is made up of sand and organic material. Other important aspects include using plants that are adapted to stormwater conditions and a mulch ground cover. Bioretention can also serve as a convenient area for snow storage and treatment.

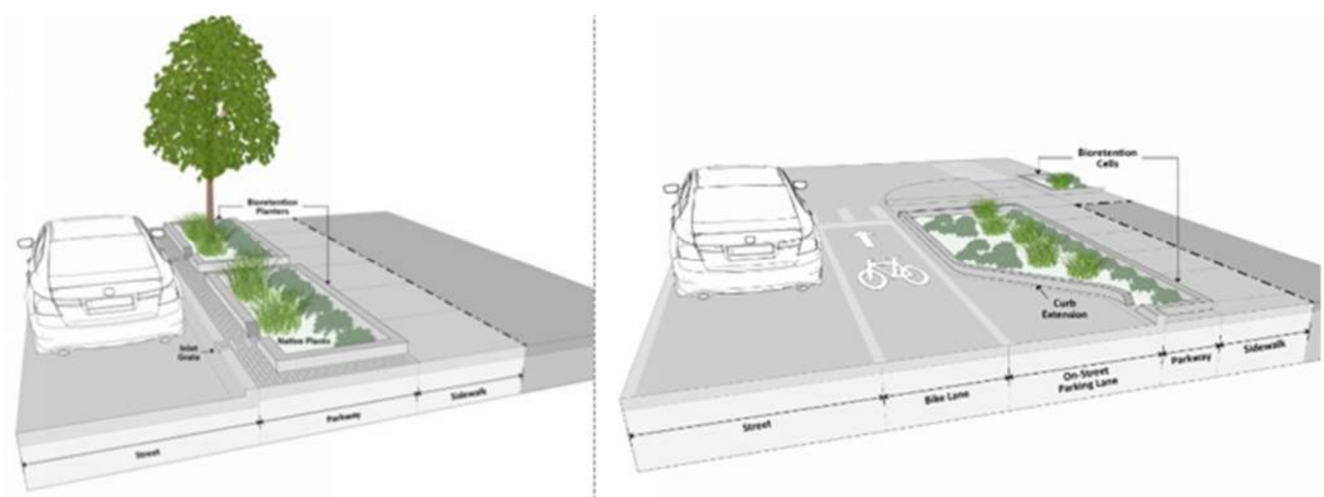


FIGURE 4 - BIORETENTION WITH CURB DESING (VILLAGE OF SOUTH ELGIN ILLINOIS, 2013)

Other alternatives such as permeable paving allows water to pass through it and infiltrate into the ground below. It is designed to reduce stormwater runoff and improve water quality by allowing rainwater to be absorbed into the soil. Similar to swales and bioretention, existing soil conditions would need to be evaluated and determined if suitable for permeable pavement. The system can be installed with or without an underdrain for full, partial or no infiltration. Permeable paving can be made from a variety of materials, such as concrete pavers, porous asphalt, or interlocking blocks with gaps between them. This type of SWM could be used in right-of-way where on-street parking is located, or sidewalks and pedestrian path as shown in the figure below.

Pervious Concrete

Pervious concrete walkway plaza (Source: Villanova Urban Stormwater Partnership)

Pervious concrete applied to an alleyway in Chicago (Source: City of Chicago)

Porous Asphalt

Porous asphalt parking lot (Source: Villanova Urban Stormwater Partnership)

Porous asphalt installed curb to curb on a residential street (Source: City of Portland, Bureau of Environmental Services)

Permeable Interlocking Concrete Pavers

Permeable pavers used in combination with bioretention in a parking lot in Elmhurst, IL (Source: ICPI).

Permeable pavers in Hoboken, NJ used around trees which allow air and water to reach the roots (Source: Bruce Ferguson).

FIGURE 5 - EAMPLES OF PERMEABLE PAVEMENT APPLICATIONS (TRCA, 2010)

By adopting any type of drainage system mentioned above, stormwater quality will be enhanced while also reducing stormwater quantity impact on existing sewers and downstream watersheds such as Oshawa Creek and Montgomery Creek. Other alternative for stormwater quality shall be considered such as Oil-Grit Separators (O.G.S.) installed at the end of a pipe segment in order to reach T.S.S. removal objectives. See Appendix E for other examples of SWM, LID system used around North America.

The recommendation below aims to preserve existing infrastructure and limit the runoff coefficient to ensure that the existing sewers are not surcharged during a 2-year storm event. Section 5 of this report will address the replacement of a new main storm sewer on First Ave. and McNaughton Ave to obtain a type II system as per the City of Oshawa guidelines.

2.1 Segment 1 – Simcoe St. S. to Front St. Storm Sewer

2.1.1 SIMCOE ST. S. TO ALBERT ST.

Existing Conditions

The existing condition of this road has no main storm sewer pipe serving this section of First Ave. Based on topographic contour lines, the road surface runoff drains towards Albert St., and two catch basins are collecting it, both of which are connected to MH006654 based on closed-circuit television (C.C.T.V.) investigation. From this manhole, it was determined that most of the flow is going south on Albert St. in the 750mmØ pipe while a portion of the flow also goes into the 450mmØ pipe flowing east on First Ave.

As per the surrounding topography, EWS-01 includes the right-of-way of First Ave. from Simcoe St. S. to Albert St., and property 505 Simcoe St. S., including the parking lot located west of the building. No existing topo of this parking lot is available; however, a catch basin might be located within the property and draining towards Simcoe St. S. main storm sewer line.

The existing two catch basins within the right-of-way mentioned above collecting this watershed are located at the intersection of Albert St. & First Ave.

Recommendation

To comply with the City of Oshawa's guidelines, which require a maximum catch basin spacing of 90m, additional catch basins and a main storm sewer pipe should be installed on First Ave to improve road drainage. The road segment spans approximately 140m. A new gravity main storm sewer pipe of 600mmØ flowing to MH006654 would be installed with two additional catch basins on each side of the road. Additionally, the existing catch basin at the intersection would be relocated and connected to the new 600mmØ sewer pipe. This will result in a spacing of approximately 75m between catch basins on each side of the road. The new road right-of-way runoff coefficient shall be limited to 0.65 at a 2-year storm event.

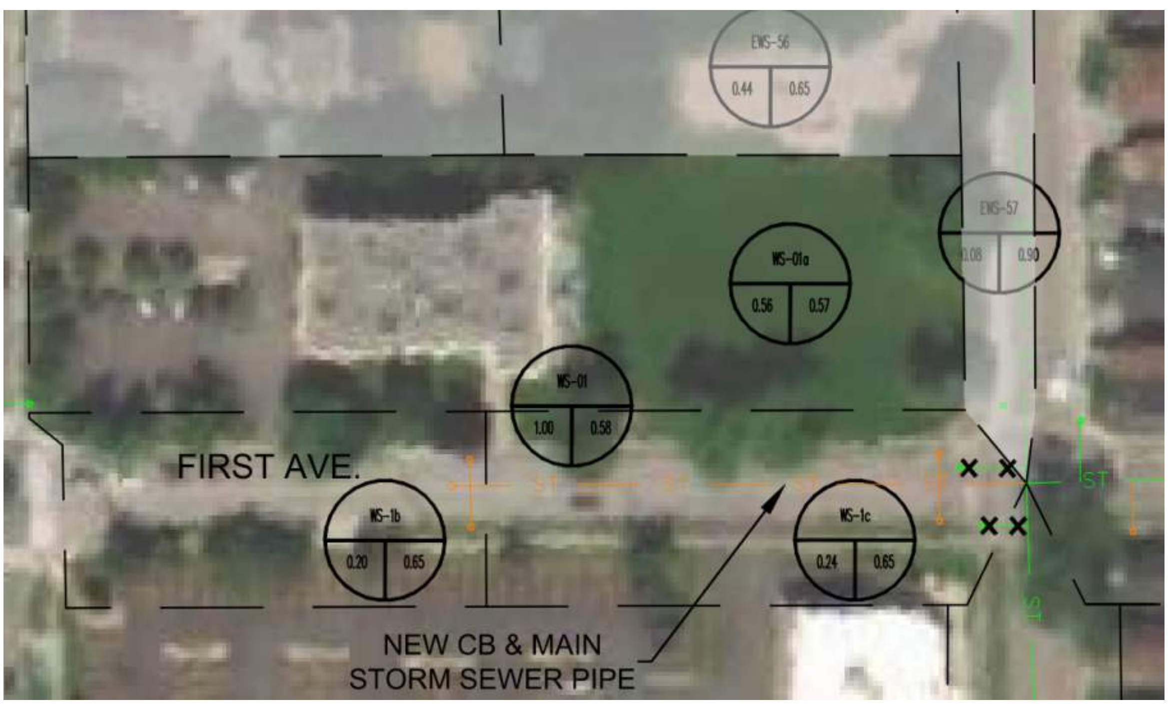


FIGURE 6 - SIMCOE ST. S. TO ALBERT ST.

2.1.2 ALBERT ST. TO FRONT ST.

Existing Conditions

The existing storm sewer pipe on First Ave. is a 450mmØ pipe with a length of 100.8m between MH006654 and MH002296 from West to East. This pipe collects surface water from EWS-02 with three catch basins but also collects overflow from the Albert St. main storm sewer pipe flowing North to South. The main sewer pipe on Albert St., which outlets at MH006654, is a 750mmØ pipe with an invert of 100.31. Also, in MH006654 is the storm sewer pipe of First Ave., which is a 450mmØ pipe with an invert of 100.51. Hence, when the 750mmØ pipe of Albert St. has flow with 0.2m of water accumulation in the pipe, water starts to flow on First Ave. in the 450mmØ pipe.

An unknown tap in pipe of 200mmØ at 3 o'clock, 83.40m west of MH002296 was identified in the C.C.T.V. This pipe lead is possibly from an abandoned catch basin.

Recommendation

As per existing inverts and pipe size, it was estimated that a 2-year storm event would generate approximately 700L/s of peak flow through MH006654, with 73% of the flow going South and 27% going East. Based on the rational method calculations, the new flow from WS-01 would not place the existing storm sewer of Albert St. overcapacity.

The C.C.T.V. showed the pipe to be in good condition except at 1.5m West of MH002296, where the top of the pipe was repaired using wood material. Hence, it is recommended to correctly repair this pipe by completely replacing this section up to MH002296.

On this segment of First Ave., two catch basins are located on the north side of the road but only one on the south side of the road. An additional catch basin on the south side of the street near the intersection of Albert St. could therefore be installed to enhanced road drainage.

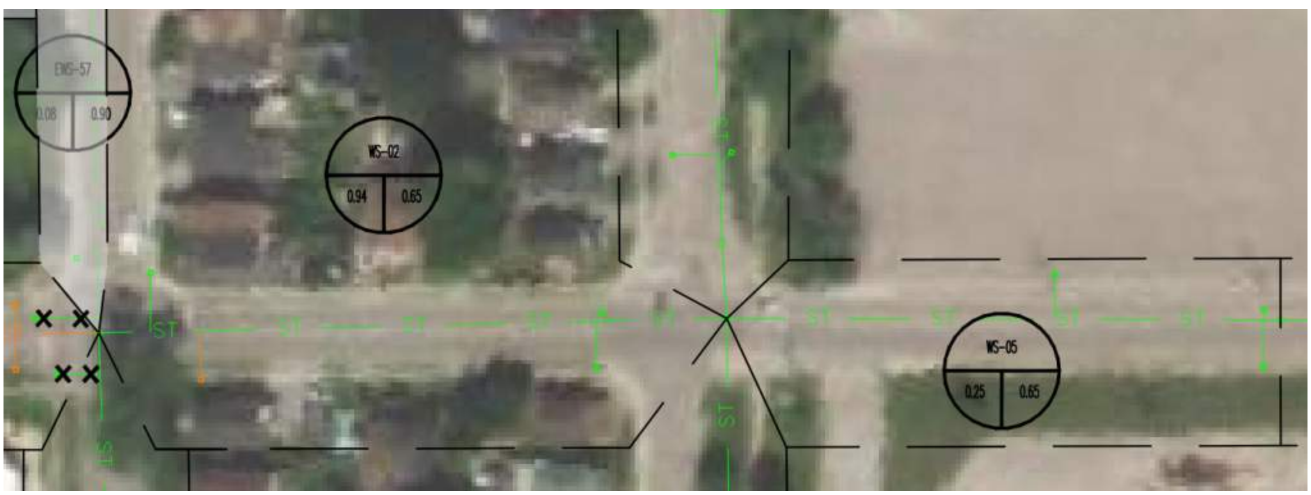


FIGURE 7 - ALBERT ST. TO FRONT ST.

2.2 Segment 2 – Front St. to Howard St.

2.2.1 FRONT ST. TO HOWARDS ST.

Existing Conditions

This road section of First Ave. collects multiple watersheds, and the main storm sewer pipe starts as a 675mmØ, then upsizes to a 750mmØ and reaches a 900mmØ before reaching Howard St. intersection.

The first pipe segment of 88.9m from MH002296 to MH006663 consists of a concrete pipe in good condition with a diameter of 675mm. Although it is in good condition, this pipe receives stormwater from EWS-02 mentioned above and EWS-03, EWS-04, EWS-05 which cause the pipe to be overcapacity during the 2-year storm event. EWS-03 & EWS-04 are surface water runoff from both directions of Front St., collected by sewers and connected to MH002296. EWS-05 collects the west side of the parking lot located at 144 First Ave., and a portion of First Ave.

The next pipe segment starts from MH006663 to MH002681, and the size upgrades to a 750mmØ concrete pipe. EWS-06 located North of First Ave. is directly connected to this storm sewer pipe. Due to the pipe diameter upgrade, this pipe is not overcapacity during the 2-year storm event.

The next pipe segment on First Ave. is approximately 83m long, which connects MH002681 to MH002715, and the pipe diameter upgrades to 900mm. This pipe is connected to catch basins capturing a small portion of surface water from private property South of First Ave., and the low point on First Ave., represented by EWS-08 on drawing and calculation. The pipe is not overcapacity for the 2-year storm event.

From MH002715 to MH002507 located at the intersection of Frist Ave. and Howard St., this pipe section remains with a diameter if 900mm. The EWS-07 is connected to this pipe segment from a catch basin and a pipe lead. This segment of 40m is overcapacity during the 2-year storm event.

After reaching MH002507, the storm sewer network turns North on Howards St. towards MH002709. Even though the size upgrades to 1000mmØ concrete pipes, additional watershed are connected, and it remains overcapacity during the 2-year storm event until it changes into a 1200mmØ pipe on Beatty Ave. The existing watershed plan with existing pipe overcapacity during the 2-year storm event are identified in Appendix C.

Recommendation

With the new development of residential properties mention in Section 3, the existing watershed EWS-04 to EWS-09 and others will be restricted to a lower run-off coefficient and storm event which will reduce the flow in the storm pipe mentioned above. See Appendix C Proposed Watershed Plan with Existing Pipe.

2.3 Segment 3 – Howard St. to Ritson Rd. South

2.3.1 HOWARD ST. TO DREW ST.

Existing Conditions

Based on existing catch basin location and contour lines, the road surface water is draining from the Drew St. intersection towards the Howard St. intersection. First Ave. is approximately 80m long in this segment, and single catch basins are located on each side of First Ave., a few meters before the Howard St. intersection. The catch basins are connected to MH002507 and flow North into the storm sewer concrete pipe of 1000mmØ.

Recommendation

The road drainage could be enhanced by adding catch basins and a main sewer pipe starting 40m east of MH002507 (half of First Ave. in between Howard St. & Drew St.). With two existing catch basins and two new catch basins, four catch basins would be collecting surface water from this road segment and directing the water into the new main storm connected to existing MH002507.

2.3.2 DREW ST. TO RITSON RD. SOUTH

Existing Conditions

The street name for this segment changes from First Ave. to McNaughton Ave. Surface water flows from Drew St. towards Ritson Rd. South for this road segment of approximately 200m.

Two single catch basins located 100m east of Drew St. are collecting surface water into the main storm sewer pipe of 300mmØ. This main storm sewer pipe of 83.6m connects to MH475 where it then upsizes to a 375mmØ pipe for 13.3m.

At the intersection of McNaughton Ave. and Ritson Rd South, two double catch basins are connected to the 375mmØ pipe collecting the remaining surface stormwater.

Based on topographic images, it is assumed that properties on both sides of the streets are entirely draining towards the road.

Recommendation

The existing main storm sewer pipe of 300mmØ and 375mmØ are overcapacity during a 2-year storm event and would need to be upsized. This road segment should be separated into three watersheds with each watershed having two single catch basin (one on each side of the road).

FIGURE 8 - DREW ST. TO RITSON RD. SOUTH

3. Short-Term & Future Private Redevelopment

Since there will be multiple redevelopment sites across the MTSA these sites will be subject to the new storm water management requirements. Four vacant lots near Front St. and First Ave. are already considered as short-term redevelopment with two of them already in the site plan application process with servicing & stormwater management report. Exception or storm water management requirement will be made for 63 Albany St. & 64 Albany St. as discussed in the sections below.

However, the two sites on First Ave. currently consist predominantly of impervious surfaces, and their connections directly affect the storm sewer system on First Ave. To prevent downstream sewer pipes from becoming surcharged, the future development will be divided into sub-watershed areas with distinct outlet locations. Effective management of both stormwater quantity and quality will be essential for these three vacant lot developments, as well as for any future property developments, to mitigate the existing surcharged pipe conditions during a 1-year storm event.

The required stormwater quantity management on any new private development will be restricted from the 100-year post-development flow to the 2-year pre-development flow with a runoff coefficient of C = 0.45 and a time of concentration of 10minutes. The allowable peak flow per hectares for any new development shall therefore be limited to 100 L/s/ha. This peak flow was determined based on a time of concentration of tc = 10min. Additionally, as shown in Appendix A, the proposed new 1-year storm event, with existing storm sewer pipe and a few pipes replacement but most importantly including stormwater management measures, ensures the existing storm sewer system does not become surcharged during a 1-year storm event. Previously, the existing conditions led to multiple pipes becoming surcharged during a 1-year storm event, see existing conditions 1-year design sheet in Appendix A. All future development property also requires 80% T.S.S. removal with ETV particle distribution.

Stormwater management for private sites can be achieved through multiple methods such as wet/dry ponds, LID/ bioswales as discussed in Section 2 but there's also other techniques such as rooftop storage (Figure 9) and underground storage (Figure 10) which are effective for commercial or high density residential development. The addition of ICD or weirs can be implemented to restrain site outlet flow to its allowable release rate. End-of-pipe Best Management Practices (B.M.P.s) such as Oil-Grit Separators (O.G.S.), should be considered for stormwater quality management on proposed site developments to reach total suspended solids T.S.S. removal objectives.

Clockwise from top left: Chicago City Hall (Source: Roofscapes, 2005); York University in Toronto, Jackman Public School in Toronto; and Earth Rangers Building in Vaughan (Source: TRCA)

FIGURE 9 - EXAMPLES OF GREEN ROOF (TRCA, 2010)


Source: StormTech (left); Cultech (right)

FIGURE 10 - EXAMPLES OF INFILTRATION CHAMBERS UNDER CONSTRUCTION IN COMMERCIAL DEVELOPMENTS (TRCA, 2010)

3.1 Property at 63 Albany St.

This property, approximately 0.70 hectares in size, is currently vacant and consists of a mixture of grass, asphalt, and gravel. According to the Proposed Residential Development Servicing & Stormwater Management Report prepared by Jain Infrastructure Consultants Ltd., no water quantity control is required for the site. Consequently, the proposed storm sewer design sheet attached in Appendix A of this report assumes an area (WS-04a) of 0.70 hectares and a runoff coefficient of 0.75, as described in the post-development drainage plan from the Jain Infrastructure report. The discharge point for this site is located on Front Street, with the sewer flowing southeast on First Avenue. The site is shown in the figure below.

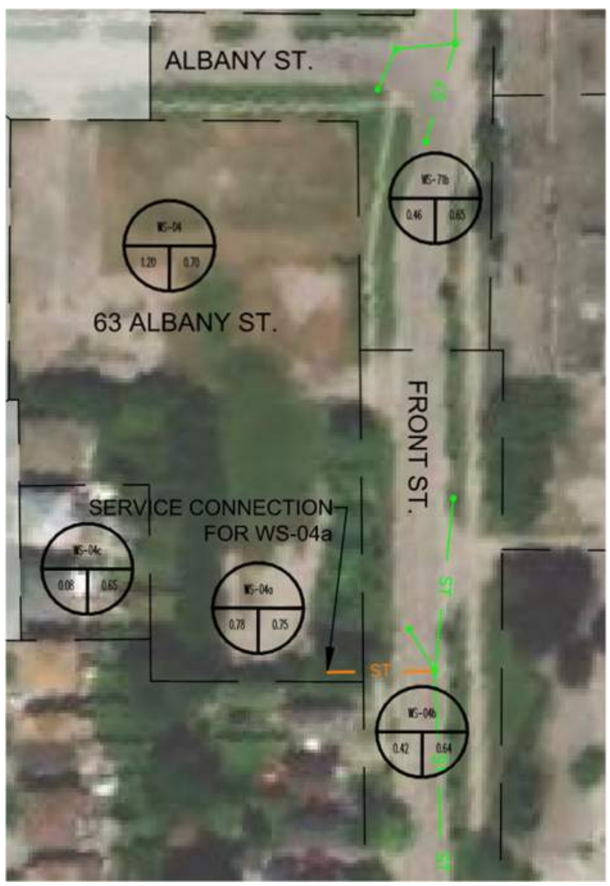


FIGURE 11 - WS-04

3.2 Property at 64 Albany St.

The property at 64 Albany Street has a very similar scenario to the property mentioned above. A functional servicing and stormwater management report prepared by D.G. Biddle & Associates Limited was prepared for an 11-story residential building development. According to the report, no stormwater quantity controls are necessary for this site. The site of 0.26 hectares with a runoff coefficient of 0.85 was therefore added to the proposed storm sewer design sheet attached in Appendix A. The discharge point for this site is also on Front St. but flows northeast before reaching Ritson Rd. South mains storm sewer trunk. The site is shown in the figure below.

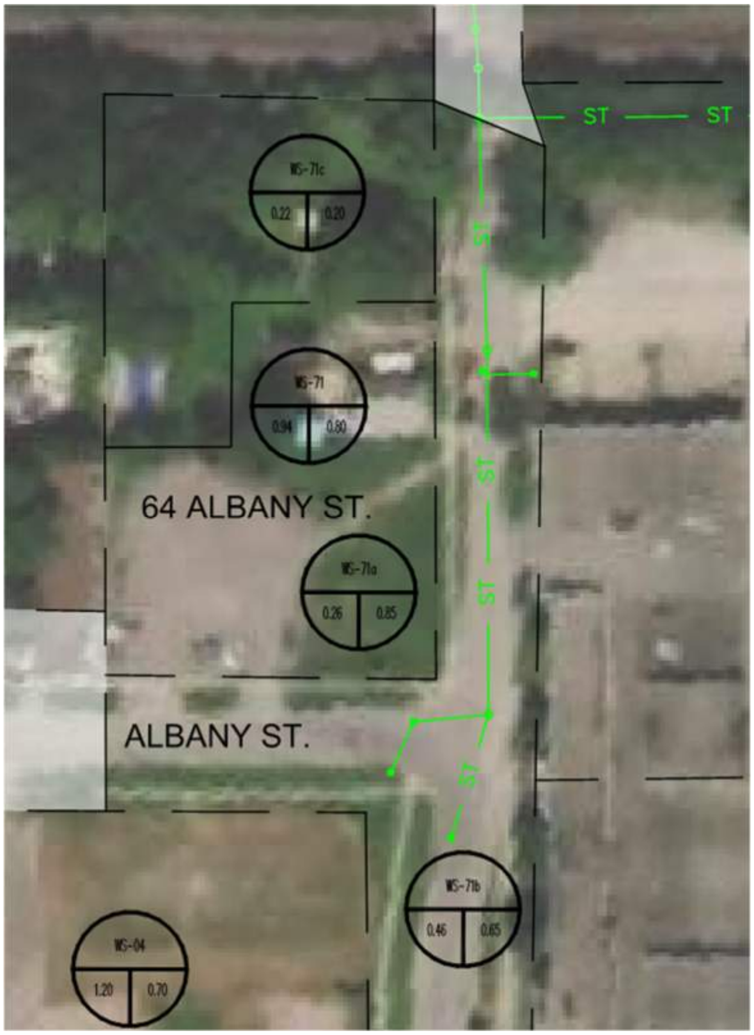


FIGURE 12 - WS-71

3.3 Property at 500 Howard St. & 144 First Ave.

Both properties are adjacent to each other, and surface water appears to be draining toward the southeast corner based on surface line topography. Due to the site large area of 7.40 ha described as WS-07, three sub-watersheds were divided to create three different outlet and not surcharge the existing storm system at the 1-year storm event.

WS-07a of 2.46 ha which contains the entire site of 144 First Ave., and a South portion of 500 Hoard St. would have its storm sewer connection at the southeast corner of the property. Its connection to the existing main storm sewer pipe would be in between MH002715 and MH002507 on the 900mmØ concrete pipe.

The WS-07b with and area of 2.27 ha located in the middle of WS-07 would be connecting in MH002151 going towards Beatty Ave. This connection would cause the necessity of replacing the existing storm sewer pipe of 1.6m long, 450mmØ located in between MH002151 and MH002496. The proposed pipe would need to be a 750mmØ pipe which will most likely require the replacement of both manholes connected to it.

Finally, the WS-07c of 2.66 ha located at the north end of WS-07 would also have its own outlet connection going into the 600mmØ pipe connected in between MH002084 and MH002106.

To mitigate flooding and existing sewer pipe to be over capacity, every sub watershed will need to be design for a 2-year storm event at a runoff coefficient of C = 0.5, or C = pre-development, whichever is less.

FIGURE 13 - WS-07

3.4 Property at 155 First Ave. Property

As per the drawings and report from Duplate Canada Limited in 1975, the majority of this site's storm sewer system was design to outlet at Howard St. in MH001965 which is connected to an 825mmØ pipe. This 825mmØ storm sewer flows North on Howards, then East on Etna Ave. and turns North on Drew St. to eventually connects with the storm sewer from First Ave. described in Section 3, 4 & 5. All buildings on this property were recently demolished, and the site is expected to be developed with high rise buildings for residential community. The WS-08 of 5.72 ha representing this property was therefore separated into three sub-watersheds with each of them having its own storm sewer outlet. The three sub-watersheds were divided assuming the existing road would be connecting. Therefore Second Ave. to Etna Ave. and Third Ave. to Toronto Ave. Every watershed shall be design for a 2-year storm event at a runoff coefficient of C = 0.5, or C = pre-development, whichever is less.

WS-08a has an area of 1.95 ha, and its outlet location would be located into the MH001965 which is the same location as the current site uses.

WS-08b located in between Second Ave. and Third Ave. would outlet in MH001826 located at the intersection of Howard St. and Etna Ave. This watershed has an area of 5.72 ha.

WS-08c located south of First Ave. has an area of 1.65 ha and its service connection would need to be on First Ave. at the northeast corner of the watershed. The receiving pipe would be a 900mmmØ concrete pipe connecting in between MH002715 and MH002507.

FIGURE 14 - WS-08

4. C.L.O.C.A. Modelling Comparison

As previously mentioned, stormwater from the MTSA study area is currently discharging into Montgomery, Harmony and Oshawa Creek, all leading into Lake Ontario. A hydrologic and hydraulic model was provided by the Central Lake Ontario Conservation Authority (C.L.O.C.A.) to compare the existing conditions to proposed conditions within the MTSA study area.

Based on the Oshawa MTSA Land Use Scenarios presentation from March 31, 2023, the existing conditions are predominantly developed with industrial and commercial land, as well as low-density neighborhoods classified as urban residential. This results in a low population and a low number of jobs per hectare. Figure 15, Figure 16 & Figure 17 demonstrate the existing and projected increase in population per hectare within the MTSA over the next 60+ years. It is important to highlight that this population increase will not adversely affect the regulatory floodplain in the vicinity or other downstream watersheds. As mentioned earlier proposed developments will be mandated to implement on-site stormwater management.

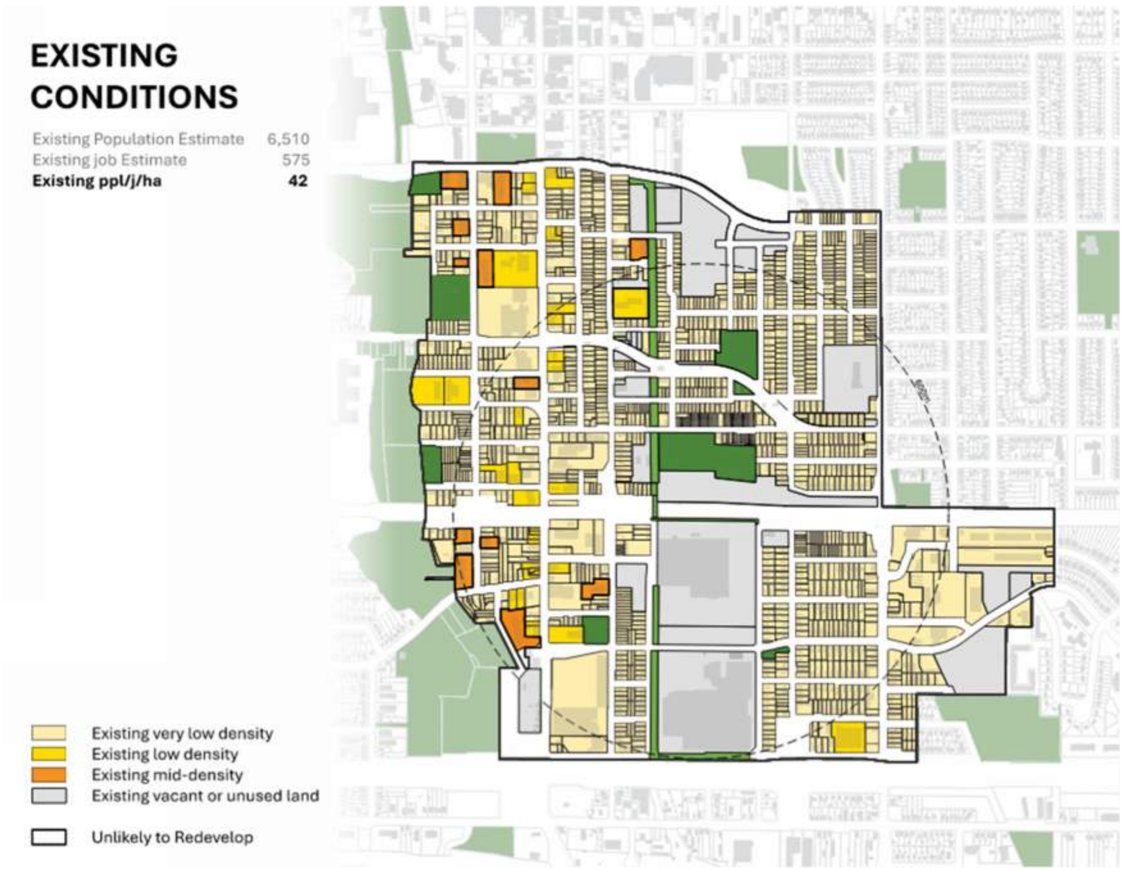


FIGURE 15 - EXISTING MTSA CONDITIONS

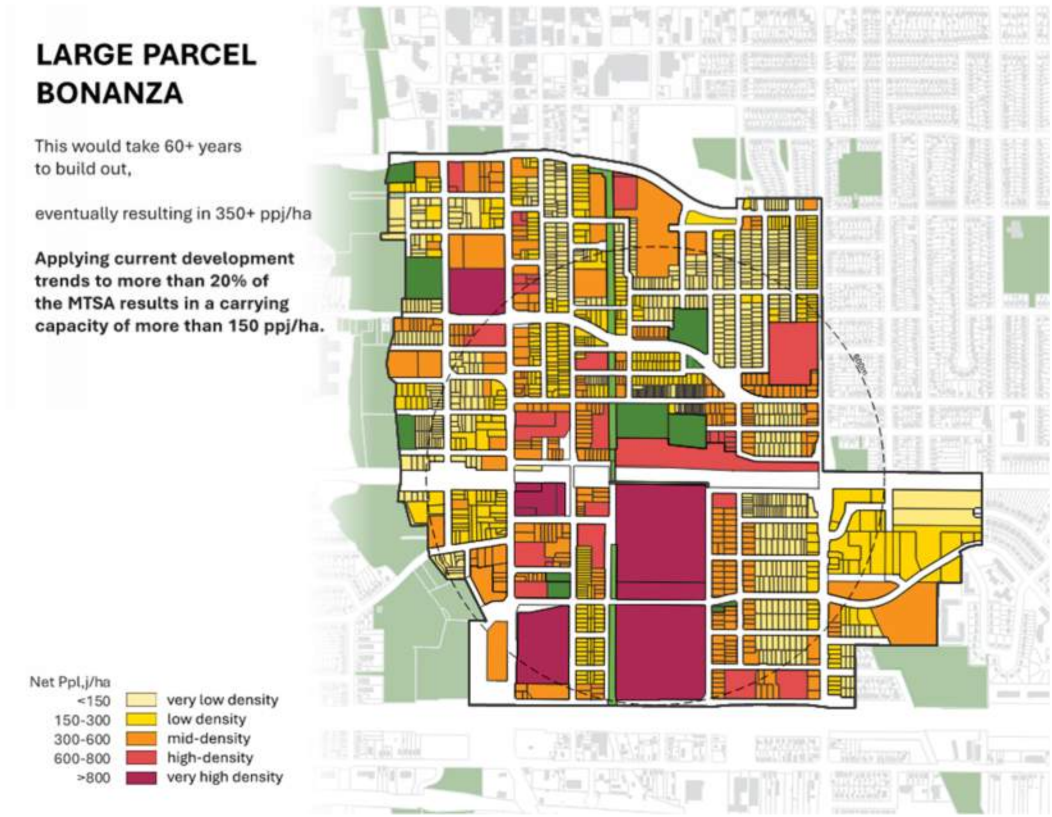


FIGURE 16 - DEVELOPMENT SCENARIO EXAMPLE

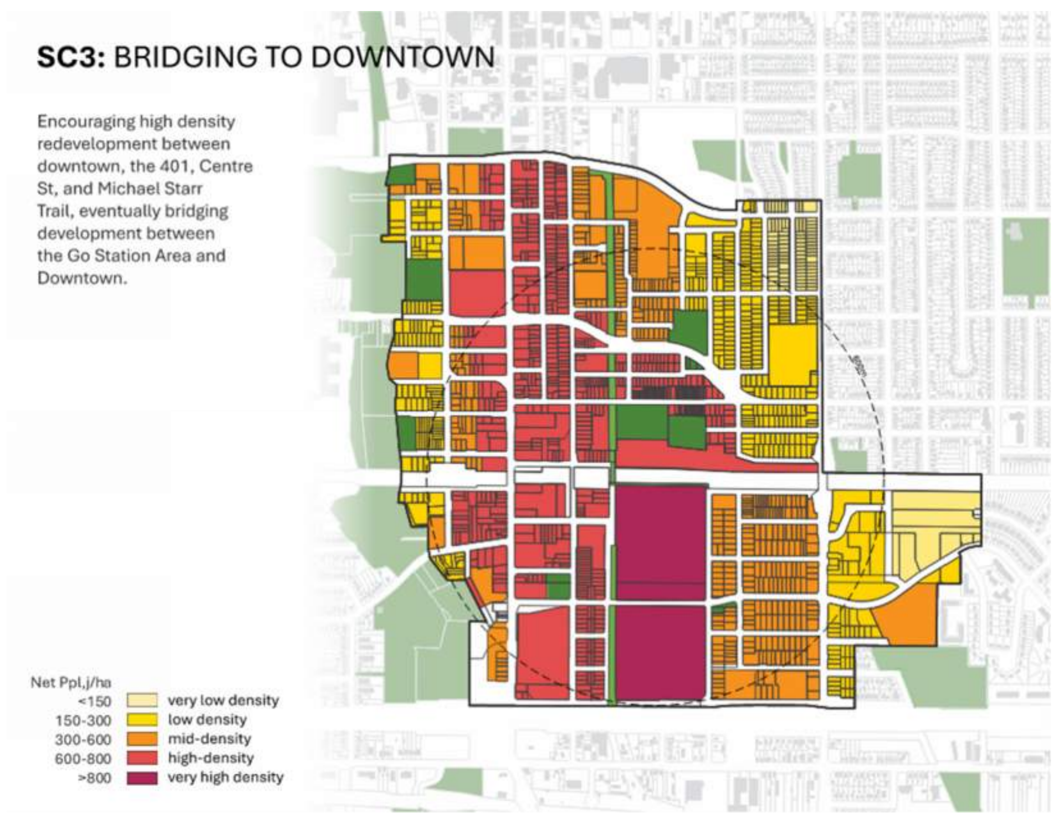


FIGURE 17 - DEVELOPMENT TRANSITION TO DOWNTOWN SCENARIO EXAMPLE

Based on the existing model, the same soil characteristic remains but new C factor and impervious percents are used in the modelling software to represent the future development peak flow in an uncontrolled or controlled stormwater conditions. For this MTSA study, the addition of medium to high-density population can be considered as a multi residential area. For stormwater purposes and impacts on watershed, this type of development will cause the addition of multi-story buildings, parking area and minimal pervious area. Based on the existing modelling parameters, new Timp, Ximp and C factor were added for a land use of multi residential (MR), see Appendix G for all land use factors in the modelling. In all scenarios below, the existing model & future scenario 2a was compared to future MTSA development as uncontrolled or controlled stormwater condition. The resulted peak flow varied depending on the storm event, location on the model and controlled or uncontrolled scenario. As mentioned earlier, every new development will require a runoff coefficient of C = 0.45 or C = pre-development whichever is less to reduce flow and existing pipe surcharged in the MTSA. The controlled scenario can be obtained by various stormwater management method as explained in section 3. For the purpose of this modelling, controlled scenario was obtained by modifying the parameters Timp and Ximp of concerned areas.

4.1 Montgomery Creek

As illustrated in the figure below, the majority (80%) of the MTSA is situated within the Montgomery sub watershed, which eventually flows downstream into Oshawa Creek.

FIGURE 18 - MTSA IN CLOCA WATERSHED

The existing model separates the Montgomery subwater watershed into M1, M2, M3, M4. All existing details and exact location of these can be found in Appendix F (Figure 2 – Catchments). For the MTSA analysis, only M3 and M4 are directly impacted, the uncontrolled scenario of the MTSA based on existing land use and future scenario 2a are presented below with the 100-year storm and regional storm Hurricane Hazel (HH).

TABLE 1 - MONTGOMERY CREEK PEAK FLOW WITH EXISTING LANDUSE - UNCONTROLLED

NHYD	Description	Existing Landuse Comparison			
		Ex. 100	Ex. HH	Ex. 100 Change (%)	Ex. HH Change (%)
503	M3	22.52	9.18	-	-
503	With MTSA M3a – Uncontrolled	28.28	9.39	25.58	2.29
504	M4	57.81	26.11	-	-
504	With MTSA M4a – Uncontrolled	65.67	26.63	13.60	1.99
49	Mouth of Montgomery	95.73	54.71	-	-
49	With MTSA – Uncontrolled	105.40	55.59	10.10	1.61

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

TABLE 2 - MONTGOMERY CREEK PEAK FLOW WITH SCRENARIO 2A LANDUSE - UNCONTROLLED

NHYD	Description	Scenario 2a Landuse Comparison			
		2a NW 100	2a NW HH	2a NW 100 Change (%)	2a NW HH Change (%)
503	M3	23.02	9.22	-	-
503	With MTSA M3a – Uncontrolled	28.30	9.40	22.95	1.93
504	M4	58.12	26.22	-	-
504	With MTSA M4a – Uncontrolled	67.59	26.74	16.28	2.00
49	Mouth of Montgomery	96.69	54.98	-	-
49	With MTSA – Uncontrolled	106.88	55.84	10.54	1.55

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

The MTSA study area covers approximately 30% of the Montgomery Creek watershed, which explains the impact this redevelopment can have on the watershed Montgomery Creek. The 100-year storm event demonstrates how important it is for future development to be controlled, as it could increase the peak by 10.5% at the mouth of Montgomery if no stormwater management is implemented. However, by applying stormwater management, a reduction in peak flow will occur, thereby reducing the risk of flooding, erosion and enhance the quality of Oshawa creek watershed.

The table below shows how peak flow will be reduced at the mouth of Montgomery creek during all peak flow event under a controlled scenario whether it's compared to the existing or future scenario 2a land use. All peak flow results from 2-year through 100-year storm event can be found in Appendix G.

TABLE 3 - MONTGOMERY CREEK PEAK FLOW EVENT - CONTROLLED

NHYD	Description	Peak flow 2-yr			Peak flow 10-yr			Peak flow 100-yr		
		Ex.	Future 2a	Change (%)	Ex.	Future 2a	Change (%)	Ex.	Future 2a	Change (%)
601	M3	7.52	7.89	4.70	14.06	14.38	2.26	22.52	23.02	2.15
601	With MTSA Parameters	5.05	-	-32.82	10.05	-	-28.55		-	-26.44
601	With MTSA Parameters	-	6.02	-23.69	-	11.24	-21.88	-	18.34	-20.35
601	M4	18.68	18.73	0.27	35.49	35.67	0.49	57.81	58.12	0.54
601	With MTSA Parameters	16.89	-	-9.59	32.47	-	-8.50	53.22	-	-7.93
601	With MTSA Parameters	-	17.28	-7.74	-	33.19	-6.93	-	54.34	-6.51
49	Mouth of Montgomery	29.29	30.37	3.56	56.73	57.75	1.77	94.06	94.98	0.97
49	With MTSA Parameters	26.27	-	-10.32	52.18	-	-8.02	87.82	-	-6.64
49	With MTSA Parameters	-	28.02	-7.73	-	54.05	-6.41	-	89.85	-5.40

4.2 Oshawa Main Creek

As demonstrated in **Figure 18** a small portion of the MTSA is situation into the Oshawa Main. The same concept and parameters were applied to sub area no. OM2 and OM3. Montgomery creek also flows into Oshawa Main Creek and additional downstream nodes peak flows are presented in the tables below:

TABLE 4 - OSHAWA MAIN CREEK PEAK FLOW WITH EXISTING LANDUSE - UNCONTROLLED

NHYD	Description	Existing Landuse Comparison			
		Ex. 100	Ex. HH	Ex. 100 Change (%)	Ex. HH Change (%)
602	OM2	50.42	27.28	-	-
602	With MTSA OM2a - Uncontrolled	50.58	27.31	0.32	0.11
603	OM3	21.37	10.36		
603	With MTSA OM3a - Uncontrolled	23.29	10.41	8.98	0.48
50	Junction Before Lake Ontario	194.53	681.85	-	-
50	With MTSA Uncontrolled	189.47	681.18	-2.60	-0.10
51	Lake Ontario	201.63	682.29	-	-
51	With MTSA Uncontrolled	196.58	681.62	-2.51	-0.10

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

TABLE 5 - OSHAWA MAIN CREEK PEAK FLOW WITH SCENARIO 2A LANDUSE - UNCONTROLLED

NHYD	Description	Scenario 2a Landuse Comparison			
		2a NW 100	2a NW HH	2a NW 100 Change (%)	2a NW HH Change (%)
602	OM2	51.42	27.32	-	-
602	With MTSA OM2a - Uncontrolled	51.58	27.36	0.32	0.12
603	OM3	21.13	10.39	-	-
603	With MTSA OM3a - Uncontrolled	22.72	10.44	7.52	0.52
50	Junction Before Lake Ontario	248.58	811.55	-	-
50	With MTSA Uncontrolled	249.25	810.88	0.27	-0.08
51	Lake Ontario	249.64	815.90	-	-
51	With MTSA Uncontrolled	250.30	815.76	0.27	-0.02

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

Both areas OM2a and OM3a in the MTSA are approximately 12 hectares each and are mostly developed with industrial, commercial, or urban residential uses. The impact of MTSA development in an uncontrolled scenario is very low for sub-area OM2 as most of the area OM2a is currently used for commercial. In sub-area OM3, the MTSA section is currently all urban residential, which explains why future development under uncontrolled conditions would cause a peak flow to increase of 8.98% when compared to existing land use and 7.5% when compared to the scenario 2a.

When comparing junction 51 from existing land use to existing land use with MTSA parameters, the peak flow drops by 2.51%. This is due to Montgomery Creek, which is very close to the Lake Ontario outlet junction. By generating a higher flow in less time, Montgomery Creek lowers the peak flow downstream at junction 51 by flowing in Lake Ontario outlet before its existing peak flow. However, it is still important to note the higher peak flow at junction 49, which represents the mouth of Montgomery Creek. As shown in Table 1, an uncontrolled scenario generates a higher peak flow of 10.10%, which could cause additional erosion in Montgomery creek. Hence, the MTSA development require stormwater management quantity controls, and the comparisons of a controlled scenario are presented below:

TABLE 6 - OSHAWA MAIN CREEK PEAK FLOW EVENT - CONTROLLED

NHYD	Description	Peak flow 2-yr			Peak flow 10-yr			Peak flow 100-yr		
		Ex.	Future 2a	Change (%)	Ex.	Future 2a	Change (%)	Ex.	Future 2a	Change (%)
601	OM2	14.82	15.62	5.08	30.12	31.50	4.40	50.42	52.51	3.99
601	With MTSA Parameters	14.46	-	-2.48	29.51	-	-2.04	49.49	-	-1.84
601	With MTSA Parameters	-	14.51	-7.08	-	29.67	-5.84	-	49.73	-5.29
601	OM3	6.75	6.63	-1.84	13.09	12.95	-1.05	21.37	21.20	-0.82
601	With MTSA Parameters	6.75	-	0.00	13.09	-	0.00	21.37	-	0.00
601	With MTSA Parameters	-	6.62	-0.15	-	12.92	-0.28	-	21.13	-0.30
40	Mouth of Oshawa MB	46.10	58.55	21.26	94.95	118.49	19.86	179.44	214.03	16.16
40	With MTSA Parameters	38.91	-	-0.01	91.08	-	0.00	177.23	-	0.00

40	With MTSA Parameters	-	56.44	-0.02	-	115.09	-0.01	-	208.63	0.00
50	Lake Ontario	46.10	58.55	21.26	94.95	118.49	19.86	179.44	214.03	16.16
50	With MTSA Parameters	42.86	-	-7.04	91.96	-	-3.15	178.55	-	-0.50
50	With MTSA Parameters	-	58.51	-0.07	-	118.85	0.30	-	214.08	0.02
51	Lake Ontario	50.10	58.88	14.92	99.77	119.04	16.19	186.55	214.91	13.20
51	With MTSA Parameters	46.85	-	-6.48	94.87	-	-4.91	181.53	-	-2.69
51	With MTSA Parameters	-	58.84	-0.07	-	119.41	0.30	-	214.95	0.02

When analyzing the table above, it is evident that peak flows of OM2 and OM3 are reduced or equal due to the applied stormwater management scenarios, similar to nodes M3 and M4 in Table 3. When analyzing the controlled scenarios in Table 3 & Table 6, peak flows at the mouth of Montgomery creek (node 49) and Oshawa creek (node 40) are equal or lower which is desired in order to maintain or lower flooding and erosion within the creeks. Nodes 50 and 51 are in the Oshawa Harbour in Lake Ontario. Peak flows obtain in the model are slightly higher when compared to scenario 2a but negligible as they represent less than 0.30% and 0.02% at the 10-year and 100-year event. It is important to note that peak flow event of 2-yr, 5-yr, 25-yr and 50-yr are lower as shown in Appendix G.

It is also important to consider the Oshawa Creek flood lines as outlined in the Two-Zone Floodplain Mapping and Flood Mitigation Study from April 22, 2021. As illustrated in the figure below, the western boundary of the MTSA is close to these flood lines. Any nearby development from the MTSA should be re-evaluated using the most recent flood line data and consult with C.L.O.C.A.

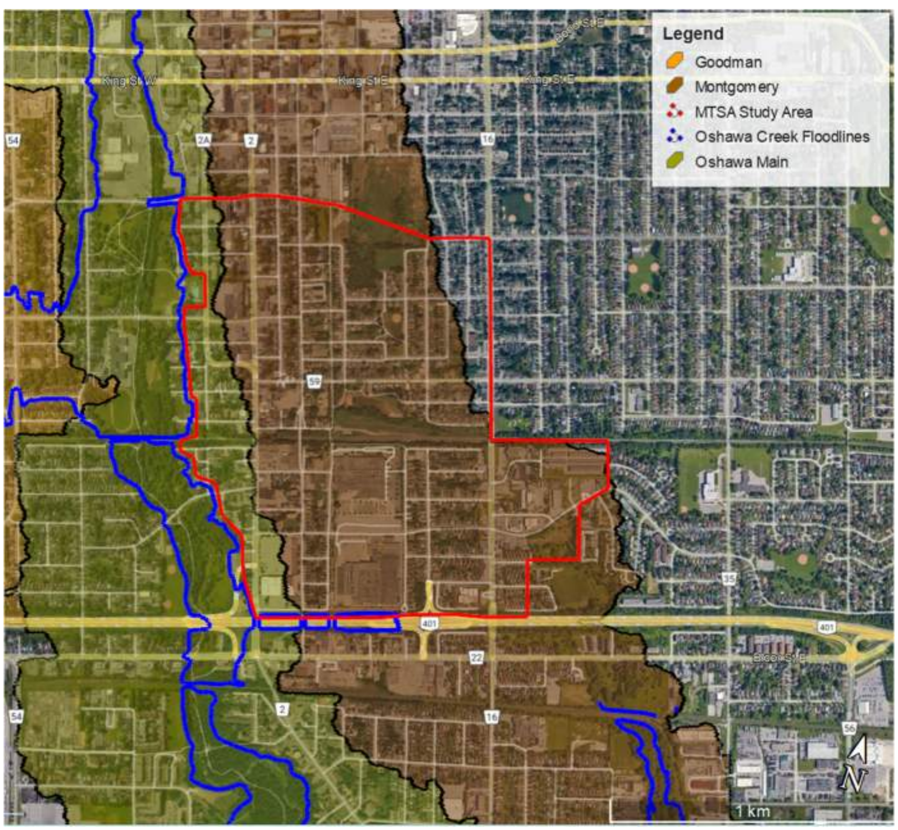


FIGURE 19 - OSHAWA CREEK FLOODLINES & MTSA

4.3 Harmony Creek

The remaining 4% of the MTSA is located in the northeast corner draining towards Harmony Creek which is not connected to Oshawa Creek Watershed. This watershed consists of Black Creek, Farewell creek and Harmony Creek which all connects and leads to Lake Ontario, see appendix H for existing modelling details and sub watershed map. This area of only 7ha from the MTSA is part of the sub watershed HR1 which is 305.61 ha and is also part of the Harmony Creek watershed of 1,284.92 ha. Resulting peak flow of uncontrolled conditions for the sub watershed HR1 is presented in the table below:

TABLE 7 - HARMONY CREEK PEAK FLOW WITH EXISTING LANDUSE - UNCONTROLLED

NHYD	Description	Existing Landuse Comparison			
		Ex. 100	Ex. HH	Ex. 100 Change (%)	Ex. HH Change (%)
601	HR1	71.77	39.16	-	-
601	With MTSA HR1a - Uncontrolled	73.07	39.22	1.81	0.15

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

TABLE 8 - HARMONY CREEK PEAK FLOW WITH FUTURE LANDUSE - UNCONTROLLED

NHYD	Description	Future Landuse Comparison			
		100	HH	Ex. 100 Change (%)	Ex, HH Change (%)
601	HR1	71.77	39.15	-	-
601	With MTSA HR1a - Uncontrolled	73.07	39.22	1.82	0.18

* HH storm event refers to regional storm event Hurricane Hazel (see appendix F for details)

The current land use of this 7ha area within the MTSA is mostly urban residential. Consequently, the modification to multi residential development in the MTSA area will slightly increase the peak flow by 1.8% for the 100-yr storm and only 0.18% for the regional storm event. The minor peak flow increase is due to the area impacted which is only 7ha out of the 305.61ha for the HR1 watershed.

Redeveloping this area with high-density multi-residential housing will still necessitate stormwater management with a C factor of 0.45, which is consistent with the existing conditions. Therefore, no additional flow or negative impact is expected from the MTSA redevelopment on Harmony Creek under storm water controlled condition as shown in the table below. All peak flow results from 2-year through 100-year storm event can be found in Appendix I.

TABLE 9 - HARMONY CREEK PEAK FLOW EVENT - CONTROLLED

NHYD	Description	Peak flow 2-yr			Peak flow 10-yr			Peak flow 100-yr		
		Ex.	Future	Change (%)	Ex.	Future	Change (%)	Ex.	Future	Change (%)
601	HR1	21.79	21.33	-2.15	43.65	42.95	-1.63	72.86	71.77	-1.46
601	With MTSA Parameters	21.79	-	0.00	43.65	-	0.00	72.86	-	0.00
601	With MTSA Parameters	-	21.33	0.00	-	42.95	0.00	-	71.77	0.00

5. New Stom Sewer Alternative First Ave. & McNaughton Ave.

Based on existing pipe data from the city of Oshawa, foundation drains from existing houses are either not existent or connected to the sanitary sewer as a type III system. For future development, a type II system – foundations drain connected to the storm sewer is recommended to accommodate all type of development. As stated in the Oshawa Engineering Design Criteria Manual (February 2023), three characteristics define a type II system:

I. The storm sewer shall be designed assuming free-flow conditions using the Toronto - Bloor Street ten–year intensity–duration–frequency curve. The storm sewer shall be deep (2.75 meter minimum cover) and will be continuous throughout the complete street length with individual foundation drain service connections to each dwelling unit.
II. A 100-year hydraulic gradeline analysis shall be prepared for this system. The resulting hydraulic gradeline shall be plotted on the detailed design drawings.
III. The underside of the footing elevation shall be designed such that it is located at minimum 0.60 metres above the 100-year hydraulic gradeline elevation at the point of the foundation drain connection to the storm sewer.

With these criteria known, the existing storm sewer from First Ave. connecting to Ritson Rd. South is not deep enough and is surcharged during a 1-year storm event. Even with new development and stormwater management restrictions imposed, the existing storm sewer would still be surcharged at the ten-year storm event.

As a result, a new main storm sewer is proposed to accommodate foundation drains. The sewer will run along First Ave. from Simcoe St. South to Drew St., and along McNaughton Ave. from Drew St. to Ritson Rd. South, ultimately connecting to the first maintenance hole on Kitcher Ave., which eventually discharges into Montgomery Creek. This new storm sewer would also reduce peak flow into the existing storm sewer pipe north of McNaughton Ave. and south of the existing railway, leading to the existing storm sewer being properly sized for a ten-year storm event.

This proposed main storm sewer pipe was sized considering short-term redevelopment from Section 3 and would vary in size from 600mm Ø to 2100mm Ø. Details can be found in Appendix J for the spreadsheet analysis, and its proposed location is shown on Plan C-103.

6. SWM Criteria Summary

The table below summarizes the stormwater management criteria for future development in the MTSA area.

TABLE 10 – SWM CRITERIA FOR FUTURE MTSA DEVELOPMENT

Land type	Restriction	Control Method
	Quantity Control	
Private properties*	Control the post-development 100-year event to the pre-development 2-year event Using a runoff coefficient of C = 0.45 or C = pre-development, whichever is less Using a time of concentration of 10min	Underground storage, wet/dry pond, LID methods, green rooftop
Public roads	Control the post-development 100-year event to the pre-development 2-year event Using a runoff coefficient of C = 0.65 or C = pre-development, whichever is less Using a time of concentration of 10min (type I system) Using a time of concentration of 5min (type II system)	Low impact development (LID) features such as: Enhanced grass swales, bioswale, bioretention planters, vegetated islands
Exception for: 63 Albany St. (WS-04a)	Control the post-development 100-year event to the pre-development 2-year event Using a runoff coefficient of C = 0.75 Using a time of concentration of 10min	Underground storage, wet/dry pond, LID methods, green rooftop
Exception for: 64 Albany St. (WS-71a)	Control the post-development 100-year event to the pre-development 2-year event Using a runoff coefficient of C = 0.85 Using a time of concentration of 10min	Underground storage, wet/dry pond, LID methods, green rooftop
	Quality Control	
Private properties	80% T.S.S. removal based on ETV program particle distribution	LID and end of pipe treatment such as oil grid separators
Public roads	80% T.S.S. removal based on ETV program particle distribution	LID features such as: Enhanced grass swales, bioswale, bioretention planters, vegetated islands
	Stream Erosion & Volume Management	
Private properties & Public Roads	The City highly encourages the use of LIDs to retain runoff on-site to the greatest extent possible. LIDs should be implemented on site to meet the requirements of the CLOCA and the MECP, to detain the 25mm rainfall events and release them over a period of 24 to 48 hours	Infiltration, evaporation, reuse and bio-retention
	Water Balance	
Private properties & Public Roads	In areas identified as High Volume Recharge Areas (HVRA) or Ecologically Significant Groundwater Recharge Areas (ESGRA), special measures are needed to maintain the balance between surface water and groundwater. Post-development infiltration volumes must match pre-development levels as a water balance assessment should be completed as per the MOE. Care should be taken to avoid site oversaturation, which can destabilize slopes, cause runoff, or damage infrastructure.	Reducing lot grading, directing roof leaders to ponding areas, using infiltration trenches or grass swales

* For private properties along Front St. & First Ave. refer to Appendix C - Drawing C-102 for each watershed size and outlet location into the existing storm sewer system.
All stormwater management criteria are subject to the approval of the Engineering Services of the City of Oshawa and Central Lake Ontario Conservation Authority.

7. C.C.T.V. Analysis

The existing sewers on First Ave. and McNaughton Ave. were found to be in good condition, although a water level of 5%-10% was observed in a few sections due to sagging in the pipe. It is recommended that a system flushing be performed to remove any debris from the pipe. Three major deficiencies were noted during C.C.T.V. inspections.

TABLE 11 – C.C.T.V. ANALYSIS DEFICIENCIES

Street	Pipe Material & Diameter	From	To	Distance	Deficiency
First Ave.	Concrete - 450mmØ	MH002296	MH006654	1.5m	Top of pipe appears to be broken and was repaired with wood or other unknown material
First Ave.	Concrete – 900mmØ	MH002681	MH002715	58.40m	Pipe joint possibly cracked, gasket is visible, and joint is leaking causing water and sand into the pipe.
First Ave.	Concrete – 900mmØ	MH002715	MH002507	31.10m	Pipe joint is leaking causing water and sand into the pipe.

8. Future Study

Detailed design will be necessary for any new storm sewer pipe upgrade in the MTSA area and possibly outside of the MTSA if the existing downstream storm sewer is not designed for a ten-year storm event. A future study upgrading the storm sewer from Ritson Rd. to Montgomery Creek would also be necessary to assess the existing pipe condition and outlet.

Within the detailed design for First Ave. and McNaughton Ave., a specific or combination of stormwater management methods will need to be chosen. Detail design also includes spread analysis for catch basin spacing and roadway drainage, maintenance hole location, pipe sizing and material, and connecting existing or new foundation drains. Additionally, by implementing a new storm sewer on First Ave. and McNaughton Ave., future studies on other local road improvements, such as roadway drainage and foundation drains, could be performed.

9. Conclusion

This technical report provides a comprehensive analysis of stormwater management for the First Ave./McNaughton Ave. corridor within the Central Oshawa Major Transit Station Area (M.T.S.A.). Stormwater management for quantity and quality will need to be applied to private property modifications and future road reconstruction, such as First Ave. and McNaughton Ave. Multiple existing storm sewer were found to be surcharged during a 1-year storm event.

For any roadway's re-construction, swales and LID devices shall be used to enhance storm sewer quantity and quality. A new storm sewer type II system with catch basin leads is recommended on First Ave. from Simcoe St. S. to Albert St., as well as McNaughton Ave. from Drew St. to Ritson Rd. South. All proposed road widening in the MTSA should be design with control of the 100-year storm events to pre-development 2-year event, with a runoff coefficient C factor of 0.65 or C = pre-development whichever is less using time of concentration of Tc = 10min.

Furthermore, the main reason for the existing sewer system's overcapacity south of the Canadian Pacific Railway is related to private properties at 500 Howard St., 144 First Ave., and 155 First Ave. These industrial/commercial properties, which are to be redeveloped into multi-residential areas, shall control their post-development flow for 100-year storm events to pre-development 2-year event levels using a runoff coefficient (C factor) of 0.45. Additionally, devices and systems must be implemented to achieve at least 80% removal of TSS (Total Suspended Solids) based on Environment Canada's Canadian ETV Program particle distribution. Other private development within the MTSA area shall apply the same runoff coefficient of 0.45 with a time of concentration of 10min which equals to approximately 100 L/s/ha or pre-development conditions, whichever is less.

The modeling scenarios evaluated in Section 4 of this report confirmed that any redevelopment within the MTSA requires controlled stormwater management to prevent additional peak flows in creeks. Depending on existing conditions, peak flows will be equal to existing or reduced for each watershed (Oshawa Creek, Montgomery Creek, and Harmony Creek) based on stormwater management criteria are applied as mentioned above.

The existing and proposed watersheds were identified and sized based on previous plans provided by the City of Oshawa. Watershed plan and design sheet in Appendix A & Appendix C, illustrate how existing storm sewer are currently surcharged at different location. However, with the implementation of stormwater management measures during redevelopment, these sewers could be maintained and be adequate for a 1-year storm event with minimum pipe modification.

Appendix J also proposes an alternative solution for First Ave. and McNaughton Ave. with a new main storm sewer pipe to accommodate the foundation drains of future developments and comply with the latest Oshawa Design Guidelines of a type II storm sewer system. The new sewer would vary in size from 600mm Ø to 2100mm Ø and connect to the existing storm sewer at Ritson Rd. South and Kitchener Ave.

Every future development is subject to the approval of the Engineering Services of the City of Oshawa and the Central Lake Ontario Conservation Authority.