S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Functional Servicing Report

5205 King Street,
Beamsville

TOWN OF LINCOLN

URBAN LINK CONSTRUCTION LTD.

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1.0 INTRODUCTION AND BACKGROUND

1.1 OVERVIEW

S. Llewellyn & Associates Limited has been retained by Urban Link Construction Ltd. to provide consulting engineering services for the proposed residential development, located in the Town of Lincoln (see Figure 1.0 for location plan). The proposed development currently consists of a small commercial plaza, open grassed field, gravel parking area and a recently realigned watercourse along the west and north property limits. The site is bound by a wooded area to the north, residential lands to the east, commercial buildings to the west and King Street to the south. This report will outline the functional servicing strategy for the proposed development.

The proposed residential and commercial development is comprised of a 7-storey and 6-storey mixed use buildings with 161 and 85 residential units, respectively. This development will also include ground floor commercial units, an asphalt parking lot at grade with concrete curbing, sidewalks, landscaped areas and an associated underground parking structure beneath Building 1.

This Functional Servicing will provide detailed information on the proposed servicing and grading scheme for the development. Please refer to the site engineering plans prepared by S. Llewellyn & Associates Limited and the site plan prepared by SRM Architects Inc. for additional information.

1.2 BACKGROUND INFORMATION

The following documents were referenced in the preparation of this report:

Ref. 1: *Town of Lincoln Master Drainage Plan*, Philips Engineering (October 1989).

Ref. 2: *Town of Lincoln Municipal Design and Quality Standards,* Town of Lincoln (July 2008).

Ref. 3: *MOE Stormwater Management Practices Planning and Design Manual*, Ministry of Environment (March 2003).

Ref. 4: *Design Guidelines for Drinking-Water-Systems*, Ministry of Environment (2008).

Ref. 5: *Erosion & Sediment Control Guidelines for Urban Construction* (December 2006).

Ref. 6: *Development Charges Background Study – Consolidated Report, Town of Lincoln* (March 2024).

Ref. 7: *Technical Memorandum Sewer Analysis – Development Proposal- 5205 King Street, Beamsville Development Review, GEI Consultants* (April 11, 2025).



Figure 1.0 – Location Plan

2.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The following stormwater management (SWM) criteria will be applied to the site, in accordance with the Town of Lincoln, Niagara Region and Niagara Peninsula Conservation Authority requirements:

Quantity Control

The stormwater discharge rate from the proposed site shall be controlled to the predevelopment discharge rates for all storm events up to and including the 100-year storm event in accordance with the pre-consultation notes provided by the Town of Lincoln.

Quality Control

The stormwater runoff from the proposed condition site must meet Level 1 (Enhanced) stormwater quality control (80% TSS removal).

Erosion Control

Erosion and sediment control measures will be implemented in accordance with the requirements of the Town of Lincoln.

2.1 EXISTING CONDITIONS

Under existing conditions, the proposed development currently consists of a small commercial plaza, open grassed field, gravel parking area and a watercourse along the west and north property limits. The proposed development is bound by a wooded area to the north, residential lands to the east, commercial buildings to the west and King Street to the south.

Currently, there is an existing 600mmø storm sewer, a 300mmø sanitary sewer, and a 200mmø watermain fronting the proposed development flowing north on Lincoln Avenue. In addition, there is a 250mmø watermain along fronting the proposed site along King Street.

Furthermore, an existing watercourse is located along the west and north property limits of the site. This watercourse previously ran through the middle of the proposed site and has recently undergone a realignment in accordance with the NPCA regulations and approval. An existing 900mmø culvert under King Street and a 1050mmø culvert running along the frontage of the proposed development connect the existing watercourse from the upstream end on the south side of King Street to the newly realigned location downstream at the southwest corner of the site.

Two (2) catchment areas, Catchment 101 and 102, have been identified in the existing condition. Catchment 101 represents the existing uncontrolled discharge from the subject site which sheet drains north towards the existing watercourse. Catchment 102 represents the uncontrolled discharge that is captured within the existing commercial plaza development and outlets into the existing 600mmø storm sewer on Lincoln Avenue. See Table 2.1 below and the Existing Condition Drainage Area Plan in Appendix A for details.

Table 2.1 – Existing Condition Catchment Areas

Catchment ID	Description	Area (ha)	% Impervious	Runoff Coefficient (C)
101	Uncontrolled drainage to drainage watercourse to the north.	1.00	23	0.51
102	Uncontrolled drainage to 600mmø on Lincoln Ave.	0.34	96	0.89

An analysis was performed on Catchment 101 and 102 using the SWMHYMO hydrologic modelling program developed by J.F. Sabourin & Associates for the 2-year to 100-year Town of Lincoln Design Storms. A summary of the results can be found in Table 2.2 below and the detailed SWMHYMO input/output information in Appendix B.

Table 2.2 – Existing Condition Stormwater Discharge		
Storm Event	Catchment 101 Discharge (m^3/s)	Catchment 102 Discharge (m^3/s)
2-Yr Event	0.023	0.068
5-Yr Event	0.045	0.093
10-Yr Event	0.063	0.109
25-Yr Event	0.087	0.130
50-Yr Event	0.107	0.145
100-Yr Event	0.124	0.158

2.2 PROPOSED CONDITIONS

Under proposed conditions, the residential and commercial development is comprised of a 7-storey and 6-storey mixed use buildings with 161 and 85 respective residential units with commercial units on the first floor. This development will also include an asphalt parking lot at grade with concrete curbing, sidewalks, landscape areas and an associated underground parking structure beneath Building 1. The proposed development will be serviced by a private storm sewer system, designed and constructed in accordance with the Town of Lincoln standards.

Three (3) catchment areas, Catchments 201, 202 and 203, have been identified in the proposed condition. Catchment 201 represents the uncontrolled discharge from the development which sheet flows directly into the existing watercourse. Catchment 202 represents the uncontrolled sheet flow from the landscaped and walkway areas within the subject site which will be captured and conveyed to the 600mmø storm sewer on Lincoln Avenue. Catchment 203 represents the discharge from the site that is captured and controlled by the private storm sewer system which ultimately north into the existing watercourse. See Table 2.1 below and the Proposed Condition Drainage Area Plan in Appendix A for details.

Table 2.3 – Proposed Conditions Catchment Areas				
Catchment ID	Description	Area (ha)	% Impervious	Runoff Coefficient (C)
201	Uncontrolled drainage to watercourse.	0.08	0	0.25
202	Uncontrolled drainage to 600mmø on Lincoln Ave.	0.09	39	0.50
203	Controlled drainage to existing watercourse.	1.17	86	0.83

2.3 WATER QUANTITY CONTROL

It is proposed to apply quantity control measures to the runoff from Catchment 203 by means of a dual-stage orifice system consisting of a 75mmø and 275mmø orifice plate located on the outlet MH1 to restrict discharge from the site to the pre-development discharge rate for the 2-year to 100-year storm events. See the Site Servicing Plan for the orifice location.

With the installation of on-site quantity control measures for Catchment 203, it will be required to provide stormwater storage during storm events up to and including the 100-year event. To provide the required storage, it is proposed to install a 1.5-layer ACO StormBrixx Standard Duty underground storage tank beneath the open grassed area at the northeast corner of the site. Details of the proposed storage tank can be found on the Site Servicing Plan. The stage-storage-discharge characteristics can be seen in Table 2.4 below and Appendix A for details.

Table 2.4 – Proposed Condition Stage-Storage-Discharge

Elevation (m)	Storage (m^3)	Discharge (m^3/s)
104.16 (Orifice Invert #1)	0	0.0000
104.20 (Invert of Tank)	0	0.0000
104.45 (0.25m Deep)	90	0.0059
104.70 (0.50m Deep)	179	0.0083
104.95 (0.75m Deep)	269	0.0102
105.15 (Orifice Invert #2)	341	0.0115
105.20 (1.00m Deep)	359	0.0471
105.45 (1.25m Deep)	449	0.0996
105.59 (Top of Tank)	499	0.1186
105.95 (Lowest Top of Grate)		0.1567

An analysis was performed on the proposed condition site using the SWMHYMO hydrologic modelling program to determine the volume of stormwater storage that is required during the 2-year to 100-year Town of Lincoln Design Storms. A summary of the results can be found in Table 2.5 and 2.6 below and the detailed SWMHYMO input/output information in Appendix B.

Table 2.5 – Proposed Condition Stormwater Discharge (Catchment 201+203)					
Storm Event	201 Uncontrolled Discharge to Watercourse (m^3/s)	203 Controlled Discharge to Watercourse (m^3/s)	Total Discharge (201+203) (m^3/s) [1]	Allowable Discharge (m^3/s) [2]	Required Storage (m^3)
2-Yr	0.003	0.010	0.012	0.023	251
5-Yr	0.006	0.020	0.021	0.045	345
10-Yr	0.009	0.051	0.053	0.063	366
25-Yr	0.012	0.075	0.081	0.087	406
50-Yr	0.014	0.098	0.106	0.107	446
100-Yr	0.017	0.111	0.120	0.124	478
[1] Discharge calculated using the SWMHYMO "ADD HYD" command.					
[2] Catchment 101 2-100 year predevelopment discharge rate.					

Table 2.6 – Proposed Condition Stormwater Discharge (Catchment 202)		
Storm Event	202 Uncontrolled Discharge to Lincoln Ave (m^3/s)	Allowable Discharge (m^3/s) [2]
2-Yr	0.009	0.068
5-Yr	0.014	0.093
10-Yr	0.017	0.109
25-Yr	0.022	0.130
50-Yr	0.026	0.145
100-Yr	0.029	0.158
[1] Catchment 102 2-100 year predevelopment discharge rate.		

The analysis determined the following:

- The proposed condition discharge rates will not exceed the predevelopment discharge rates during the 2-year to 100-year design storms with the installation of the proposed dual-stage orifice device.

- Catchment 203 will require 478m^3 of stormwater storage during the 100-year event, which can be accommodated by the proposed storage tank, having a volume of 499m^3.

2.4 WATER QUALITY CONTROL

The proposed development is required to achieve a "Enhanced" (80% TSS removal) level of water quality protection. To achieve this criterion, discharge from Catchment 203 will be treated a Hydro International Up-Flo Filter before ultimately discharging to the drainage watercourse.

It is approximated that the filter unit for Catchment 203 will require 22 filter modules to achieve 80% TSS removal and be housed in a 3.9m x 2.5m vault. Up-Flo filter sizing procedures will be provided at the detailed design stage. The Up-Flo Filter has been certified under the ETV for 81.2% removal efficiency.

Up-Flo filter units require regular inspection and maintenance as per the manufacturer's specifications to ensure the unit operates properly. A maintenance manual for the Up-Flo filter unit has been provided in Appendix C.

2.5 LOW IMPACT DEVELOPMENT (LID)

The site presents several challenges that prevent the implementation of LID measures for onsite water quality. Therefore, it is proposed to achieve the water quality targets through traditional means via a proposed filter unit.

Due to the need for vehicle connectivity between the surface parking and the underground parking structure, the asphalt parking areas will require relatively steep slopes. These slopes hinder the design of effective LIDs for stormwater treatment, as they increase the velocity of water flowing through them. The higher velocity prevents particle settlement, and the required slopes do not provide sufficient space for a flat area where stormwater can accumulate and infiltrate. Additionally, many of the inlet locations are situated above the underground parking structure. At these inlets, the area drains convey water directly into the building's mechanical storm sewer system. As a result, it is not feasible to convey stormwater directly to LIDs over the underground structure. It is not advisable to implement LIDs over top or adjacent to the underground parking structure due to potential maintenance issues.

Lastly, as noted in the geotechnical assessment completed by Bruce A. Brown Associates (2022), the site primarily consists of clayey silt or silt fill, which does not meet the acceptable infiltration rate required for infiltration-based LIDs

2.6 SEDIMENT AND EROSION CONTROL

In order to minimize erosion during the grading and site servicing period of construction, the following measures will be implemented:

- Install silt fencing along the outer boundary of the site to ensure that sediment does not migrate to the adjacent properties;
- Install sediment control (silt sacks) in the existing catchbasins to ensure that no untreated runoff enters the existing conveyance system; and
- To maximize the detention time for the 25mm storm event, the minimum office diameter of 75mmø has been proposed for the low flow orifice. This has been provided to comply with the erosion standards outlined in the NPCA Stormwater Management Guidelines. The calculated drawdown time for the 25 mm storm event is 12.5 hours, which is the best effort to meet the NPCA erosion guidelines, considering the size of the development. For detailed drawdown calculations, please refer to Appendix A.

To ensure and document the effectiveness of the erosion and sediment control structures, an appropriate inspection and maintenance program is necessary. The program will include the following activities:

- Inspection of the erosion and sediment controls (e.g. silt fences, sediment traps, outlets, vegetation, etc.) with follow up reports to the governing municipality; and
- The developer and/or his contractor shall be responsible for any costs incurred during the remediation of problem areas.

Details of the proposed erosion & sediment control measures will be provided on the Grading & Erosion & Sediment Control Plan.

3.0 SANITARY SEWER SERVICING

3.1 EXISTING CONDITIONS

Under existing conditions, there is an existing 300mmø sanitary sewer located within the roadway of way on Lincoln Avenue east of the proposed development. The existing sanitary sewer flows north along Lincoln Avenue.

3.2 SANITARY DEMAND

Sanitary discharge from the site was estimated in accordance with the Town of Lincoln and Ministry of Environment Guidelines. It is estimated that 1.7 persons/unit will occupy each unit in each of the residential component of the mixed-use building. The commercial sanitary discharge has been calculated in accordance with the MOE Design Guidelines for Sewage Works 2008 as stipulated in the Town of Lincoln standards. Tables 3.1 to 3.4 summarizes the sanitary sewer discharge rates from the proposed site.

Table 3.1 – Proposed Residential Sanitary Sewer Discharge (Building 1)

	Mixed Use Building
	(161 Residential Units)
Site Area	1.60 ha
Population [A]	1.7 persons/unit x 161 Units = 274 persons
Average Dry Weather Flow [B]	255 l/person/day x 274 persons = 69,870 l/day (0.81 l/s)
Peaking Factor [C]	4.00
Infiltration Allowance [D]	0.286 l/s/ha x (1.60 ha) = 0.46 l/s
Design Flow	(0.81 x 4.00) + 0.46 = **3.70 l/s**

[A] Assume 1.7 people/bed
[B] Average demand = 255 l/capita/day per Town of Lincoln Standards
[C] Peaking Factor = 1 + (14 / (4 + $P^{0.5}$)) with P expressed in thousands (Max. Peaking Factor 4)
[D] Infiltration flow based on 0.286 l/s/ha infiltration rate per Town of Lincoln Standards.

Table 3.2 – Proposed Commercial Sanitary Sewer Discharge (Building 1)	
	Mixed Use Building
	(4 Commercial Units)
Commercial Floor Area	675 m^2
Average Dry Weather Flow [A]	5 l/day/m^2 x 675 m^2 = 3,375 l/day (0.04 l/s)
Peaking Factor [B]	9.5
Infiltration Allowance [D]	N/A
Design Flow	(3,375 l/day x 9.5) = **32,063 l/day (0.37 l/s)**

[A] 5L/day/m^2 As per MOE Design Guidelines for Sewage Works 2008
[B] As per the recommendations of the MOE Design Guidelines for Sewage Works 2008 the Peaking Factor is taken from Table 3-3 In the MOE Design Guidelines for Drinking Water Systems for an equivalent population.
Equivalent Population = 3,375 l/day ÷ 310 l/job/day = 11.0 persons
[D] Infiltration flow for the commercial area is included in the Residential Sanitary Flow

Building 1 Sanitary Discharge
3.70 l/s + 0.37 l/s = **4.07 l/s**

Table 3.3 – Proposed Residential Sanitary Sewer Discharge (Building 2)	
	Mixed Use Building
	(85 Residential Units)
Site Area	1.60 ha
Population [A]	1.7 persons/unit x 85 Units = 145 persons
Average Dry Weather Flow [B]	255 l/person/day x 145 persons = 36,975 l/day (0.43 l/s)
Peaking Factor [C]	4.00
Infiltration Allowance [D]	N/A
Design Flow	0.43 x 4.00 = **1.72 l/s**

[A] Assume 1.7 people/bed
[B] Average demand = 255 l/capita/day per Town of Lincoln Standards
[C] Peaking Factor = 1 + (14 / (4 + $P^{0.5}$)) with P expressed in thousands (Max. Peaking Factor 4)
[D] Infiltration flow included in the Residential Sanitary Flow for Building 1

Table 3.4 – Proposed Commercial Sanitary Sewer Discharge (Building 2)	
	Mixed Use Building
	(2 Commercial Units)
Commercial Floor Area	396 m^2
Average Dry Weather Flow [A]	5 l/day/m^2 x 396 m^2 = 1,980 l/day (0.02 l/s)
Peaking Factor [B]	9.5
Infiltration Allowance [D]	N/A
Design Flow	(1,980 l/day x 9.5) = **18,810 l/day (0.22 l/s)**

[A] 5L/day/m^2 As per MOE Design Guidelines for Sewage Works 2008
[B] As per the recommendations of the MOE Design Guidelines for Sewage Works 2008 the Peaking Factor is taken from Table 3-3 In the MOE Design Guidelines for Drinking Water Systems for an equivalent population.
Equivalent Population = 1,980 l/day ÷ 310 l/jobs/day = 7.0 persons
[D] Infiltration flow for the commercial area is included in the Residential Sanitary Flow

Building 2 Sanitary Discharge
1.72 l/s + 0.22 l/s = **1.94 l/s**

Total Sanitary Discharge
4.07 l/s + 1.94 l/s = 6.01 l/s

3.3 PROPOSED SANITARY SERVICING AND CAPACITY ANALYSIS

The proposed site will be serviced by a 200mmø sanitary sewer system that will be designed and constructed in accordance with the Town of Lincoln standards. Drainage from the proposed sanitary sewers system will discharge to the existing 300mmø sanitary sewer on Lincoln Avenue, east of the proposed development.

The minimum grade of the proposed 200mmø sanitary service will be 1.00%. At this minimum grade, the proposed sanitary sewer will have a capacity of 0.029 m^3/s (29 l/s). Therefore, the proposed 200mmø sanitary sewers at a minimum of 1.0% grade is adequately sized to service the proposed site.

A technical memorandum dated April 11, 2025 was completed by GEI Consulting to evaluate the capacity of the downstream sanitary sewer system (refer to Appendix C for details). The results indicate that the sanitary sewers in the Friesen Boulevard catchment are undersized to convey existing flows and, therefore, cannot accommodate additional sanitary drainage. To address this capacity constraint, it is understood that either an I&I (inflow and infiltration) reduction of at least 20 L/s must be achieved, or the sanitary sewers on Tamarac Avenue (from north of Oakwood Avenue to Hartwood Avenue) must be upsized from 200mmø to 300mmø, and the sewers on Friesen Boulevard (from Hartwood Avenue to Ontario Street) must be upsized from 250mmø to 375mmø.

It is S. Llewellyn & Associates understanding that the Town of Lincoln has begun investigating and implementing mitigation measures to reduce I&I flows within these sewers. Ongoing discussions with the Town will be necessary to review the results of this investigation and to determine if the proposed mitigation measures in the neighborhood will be sufficient to achieve the required I&I reduction.

Furthermore, it is understood that surcharging due to backflows in the Ontario Street sewers north of Friesen Boulevard will be addressed by the planned upsizing of the sanitary sewers and pump station on Ontario Street. Until these upgrades are fully completed, a phased release of allocation to the Ontario Street sewers is in place. Under current conditions, the Ontario Street sewer can accommodate a population growth equivalent to 2,000 people. According to GEI's report, the proposed development represents an equivalent population of 605 people for capacity tracking purposes. Therefore, there is sufficient capacity in the Ontario Street sewers to accommodate the development.

4.0 DOMESTIC AND FIRE WATER SUPPLY SERVICING

4.1 EXISTING CONDITIONS

The existing municipal water distribution system consists of an existing 250mmø watermain located south of the proposed development on King Street. There also exists a 200mmø along Lincoln Ave, east of the proposed development, which branches off the aforementioned watermain.

Two (2) fire hydrants are located within a close proximity of the proposed site, located on King Street to the south and Lincoln Avenue to the east.

4.2 DOMESTIC WATER DEMAND

Water demand for the site was estimated in accordance with the Town of Lincoln and Ministry of Environment Guidelines. Table 4.1, 4.2 & 4.3 summarize the domestic water calculations for the proposed development.

Table 4.1 – Residential Domestic Water Demand (Building 1)	
Total Population [A]	274 persons
Average Daily Demand [B]	338 l/person/day x 274 persons = 92,612 l/day (1.07 l/s)
Max. Daily Peaking Factor [C]	3.83
Max. Hourly Peaking Factor [C]	5.75
Max. Daily Demand	(1.07 L/s x 3.83) **= 4.10 L/s**
Max. Hourly Demand	(1.07 L/s x 5.75) **= 6.15 L/s**
[A] Population taken from Table 3.1 [B] Assume Daily Demand taken from Table 3.1 [C] Max Daily/Hourly Peaking Factor taken from MOE Guidelines (Ref. 4)	

Table 4.2 – Commercial Domestic Water Demand (Building 1)	
Commercial Floor Area	675 m^2
Average Daily Demand [A]	5 l/day/m^2 x 675 m^2= 3,375 l/day (0.04 l/s)
Max. Daily Peaking Factor [B]	9.5
Max. Hourly Peaking Factor [B]	14.3
Max. Daily Demand	(0.04 L/s x 9.5) **= 0.38 L/s**
Max. Hourly Demand	(0.04 L/s x 14.3) **= 0.57 L/s**
[A] 5L/day/m^2 As per MOE Design Guidelines for Drinking Water Systems [B] Peaking Factor is taken from Table 3-2 In the MOE Design Guidelines for Drinking Water Systems for an equivalent population. Equivalent Population = 3,375 l/day ÷ 338 l/capita/day = 10.0 persons	

Max. Daily Demand (Building 1)
4.10 L/s + 0.38 L/s = 4.48 L/s

Max. Hourly Demand (Building 1)
6.15 L/s + 0.57 L/s = 6.72 L/s

Table 4.3 – Residential Domestic Water Demand (Building 2)	
Total Population [A]	145 persons
Average Daily Demand [B]	338 l/person/day x 145 persons = 49,010 l/day (0.37 l/s)
Max. Daily Peaking Factor [C]	5.09
Max. Hourly Peaking Factor [C]	7.69
Max. Daily Demand	(0.37 L/s x 5.09) **= 2.90 L/s**
Max. Hourly Demand	(0.37 L/s x 7.69) **= 4.38 L/s**
[A] Population taken from Table 3.3 [B] Assume Daily Demand taken from Table 3.3 [C] Max Daily/Hourly Peaking Factor taken from MOE Guidelines (Ref. 4)	

Table 4.4 – Commercial Domestic Water Demand (Building 2)	
Commercial Floor Area	396 m^2
Average Daily Demand [A]	5 l/day/m^2 x 396 m^2= 1,980 l/day (0.02 l/s)
Max. Daily Peaking Factor [B]	9.5
Max. Hourly Peaking Factor [B]	14.3
Max. Daily Demand	(0.02 L/s x 9.5) **= 0.19 L/s**
Max. Hourly Demand	(0.02 L/s x 14.3) **= 0.29 L/s**
[A] 5L/day/m^2 As per MOE Design Guidelines for Drinking Water Systems [B] Peaking Factor is taken from Table 3-2 In the MOE Design Guidelines for Drinking Water Systems for an equivalent population. Equivalent Population = 3,250 l/day ÷ 338 l/capita/day = 9.6 persons	

Max. Daily Demand (Building 2)
2.90 L/s + 0.19 L/s = 3.09 L/s

Max. Hourly Demand (Building 2)
4.38 L/s + 0.29 L/s = 4.67 L/s

4.3 FIRE FLOW DEMAND

Fire flow demands for the proposed development are governed by a number of guidelines and criteria, such as the Water Supply for Public Fire Protection (Fire Underwriters Survey, 2020), Ontario Building Code (OBC), and various codes and standards published by the National Fire Protection Association (NFPA).

The required fire flow demand for the proposed mixed-use buildings was analyzed using the FUS method. The fire flow demand is based on the worst case between Building 1 and 2. Based on FUS calculations, it was determined that the worst case required fire flow demand for the 7-storey mixed use Building 1 is **133 l/s**. See Fire Flow Demand Requirements in Appendix D for details.

Two Hydrant Flow Tests were completed by Vipond Inc. on March 12, 2025 for the existing hydrants located at 4377 Lincoln Avenue to the west and 5220 King Street. Table 4.3 summarizes the existing hydrant pressure/flow characteristics. See the Fire Hydrant Flow Test results by Vipond Inc. in Appendix C for details.

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Table 4.5 – Hydrant Flow Test Data	
Location	5220 King Street
Test Date	12/05/2025
Static Pressure	71 psi
Residual Pressure (Test #1)	71 psi
Test Flow Rate (Test #1)	1131 USGPM (71.4 l/s)
Residual Pressure (Test #2)	65 psi
Test Flow Rate (Test #2)	2080 USGPM (131.2 l/s)
Theoretical Flow @ 20 psi	**6606 USGPM (416.8 l/s)**
Location	4377 Lincoln Avenue
Test Date	12/05/2025
Static Pressure	85 psi
Residual Pressure (Test #1)	81 psi
Test Flow Rate (Test #1)	1040 USGPM (65.6 l/s)
Residual Pressure (Test #2)	75 psi
Test Flow Rate (Test #2)	1686 USGPM (106.4 l/s)
Theoretical Flow @ 20 psi	**4633 USGPM (292.3 l/s)**

Based on the hydrant flow test data provided by Vipond Inc., the theoretical maximum available flow rate is **292 l/s**. Therefore, the water distribution system has adequate pressure and capacity to service the subject site.

4.4 PROPOSED WATER SERVICING

The proposed water servicing for the subject site consists of installing a 150mmø watermain for each of the proposed buildings. The proposed 150mmø watermains will connect to the existing 250mmø watermain on King Street.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that the proposed mixed-use development can be constructed to meet the requirements of the Town of Lincoln, Niagara Region and Niagara Peninsula Conservation Authority requirements.

- The site be graded and serviced in accordance with the Preliminary Grading Plan and Preliminary Servicing Plan prepared by S. Llewellyn & Associates Limited;
- The proposed stormwater management tank will provide the required amount of stormwater storage during all storm events:
- A 75mmø and 275mmø dual orifice system be installed within DI1 as per the Site Servicing Plan and this Report to provide adequate quantity control;
- An Up-Flo Filter Unit will provide an “Enhanced” level of quality control;
- Erosion and sediment controls be installed as described in this Report to meet Town of Lincoln requirements; and
- The proposed sanitary and water servicing be installed as per the Preliminary Servicing Plan and this report to adequately service the proposed development.

We trust the information enclosed herein is satisfactory. Should you have any questions pleased do not hesitate to contact our office.

Prepared by:

S. LLEWELLYN & ASSOCIATES LIMITED





L. Frankovich, BASc. Eng.

S. Frankovich, P.Eng.

APPENDIX A
STORMWATER MANAGEMENT INFORMATION

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EX. WOODLOT

EX. COMMERCIAL LANDS

LINCOLN AVE.

EX. RESIDENTIAL LANDS

KING ST

EX. FARMLAND

101
1.00
23%
0.51

102
0.34
96%
0.89

N

LEGEND

- DRAINAGE BOUNDARY
- PERVIOUS AREA
- 101 / 4.90 / 0% / 0.25 — DRAINAGE AREA I.D. / DRAINAGE AREA (ha) / PERCENT IMPERVIOUS / RUNOFF COEFFICENT
- DIRECTION OF SHEET FLOW

FIGURE 2.0
PRE-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:1000

PROJECT: 5205 KING STREET, BEAMSVILLE, ON
PROJECT No.: 22035

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Tel. (905) 631-6978
Fax (905) 631-8927
email: info@sla.on.ca

3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

11/26/2024 12:44:32 PM - Luka Frankovich

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EX. WOODLOT

EX. COMMERCIAL LANDS

LINCOLN AVE.

EX. RESIDENTIAL LANDS

KING ST

EX. FARMLAND

KING ST

LINCOLN AVE.

201
0.08
0%
0.25

203
1.17
86%
0.83

202
0.09
39%
0.50

N

LEGEND

- DRAINAGE BOUNDARY
- PERVIOUS AREA
- 101 / 4.90 / 0% / 0.25 — DRAINAGE AREA I.D. / DRAINAGE AREA (ha) / PERCENT IMPERVIOUS / RUNOFF COEFFICENT
- DIRECTION OF SHEET FLOW

FIGURE 3.0
POST-DEVELOPMENT STORM DRAINAGE AREA PLAN

SCALE: 1:1000

PROJECT: 5205 KING STREET, BEAMSVILLE, ON
PROJECT No.: 22035

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3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

11/26/2024 12:42:32 PM - Luka Frankovich

5205 King Street
Beamsville, Ontario

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

STAGE-STORAGE-DISCHARGE CALCULATIONS

Outlet Device No. 1 (Quantity)

Type:	Orifice Plate #1	Orifice Plate #2
Diameter (mm)	**75**	**275**
Area (m^2)	0.00442	0.05940
Invert Elev. (m)	104.16	105.15
C/L Orifice Elev (m)	104.20	105.29
Disch. Coeff. (C_d)	0.6	0.6

Discharge (Q) = $C_d A (2 g H)^{0.5}$

						Outlet No. 1		Outlet No. 2		
	Elevation m	Tank Footprint Area m^2	Incremental Tank Volume m^3	Additional Underground Volume m^3	Active Storage Volume m^3	H m	Discharge m^3/s	H m	Discharge m^3/s	Total Discharge m^3/s
Orifice Invert #1	104.16		0	0	0					0.0000
Invert of Tank	104.20	370	0	0	0	0.000	0.0000			0.0000
0.25m Deep	104.45	370	90	90	90	0.253	0.0059			0.0059
0.50m Deep	104.70	370	90	90	179	0.503	0.0083			0.0083
0.75m Deep	104.95	370	90	90	269	0.753	0.0102			0.0102
Orifice Invert #2	105.15	370	72	72	341	0.953	0.0115	0.000	0.0000	0.0115
1.00m Deep	105.20	370	18	18	359	1.003	0.0118	0.050	0.0353	0.0471
1.25m Deep	105.45	370	90	90	449	1.253	0.0131	0.300	0.0865	0.0996
Top of Tank	105.59	370	50	50	499	1.393	0.0139	0.440	0.1047	0.1186
Lowest Top of Grate	105.95			0		1.753	0.0155	0.800	0.1412	0.1567

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

TANK DRAWDOWN CALCULATION

Pond drawdown time can be estimated using Equation 4.10
(MOEE SWMP Planning & Design Manual)

$$t = \frac{2A_p}{CA_o(2g)^{0.5}}\left(h_1^{0.5} - h_2^{0.5}\right)$$

t	= drawdown time in seconds	=	to be calculated	
Ap	= surface area of the pond (m^2)	=	**370**	(Avg. Surface Area between h_1 & h_2)
C	= discharge coefficient	=	0.60	
D	= diameter of controlling orifice (m)	=	**0.075**	
Ao	= cross-sectional area of orifice (m^2)	=	0.00442	
g	= acceleration due to gravity (m/s^2)	=	9.81	
	Orifice invert elevation (m)	=	***104.160***	(Permanent Pool Elev.)
	Orifice centreline elevation (m)	=	***104.198***	
	Extended detention elevation (m)	=	***104.710***	(Live Ponding Elev.)
h_1	= starting water level above orifice (m)	=	0.5125	
h_2	= ending water level above orifice (m)	=	0.00	

t = 45119.6 seconds =

12.5 hours
0.5 days

APPENDIX B
SWMHYMO INPUT/OUTPUT FILES

```
2     Metric units
*#************************************************************************|
*#  Project Name: 5205 King Street
*#                    BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#************************************************************************|
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[001]
                    LINC25MM.stm
*
READ STORM          STORM_FILENAME "STORM.001"
*
*#************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
CALIB NASHYD        ID=[1], NHYD=["101"], DT=[1]min, AREA=[1.00](ha),
                    DWF=[0](cms),  CN/C=[80], IA=[6.35](mm),
                    N=[3], TP=[0.20]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*#************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
CALIB STANDHYD      ID=[2], NHYD=["102"], DT=[1](min), AREA=[0.34](ha),
                    XIMP=[0.96], TIMP=[0.96], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[80],
                    Pervious   surfaces: IAper=[6.35](mm), SLPP=[3.5](%),
                                         LGP=[10](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.5](%),
                                         LGI=[40](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*#************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#************************************************************************|
*#************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
CALIB NASHYD        ID=[1], NHYD=["201"], DT=[1]min, AREA=[0.08](ha),
                    DWF=[0](cms),  CN/C=[80], IA=[6.35](mm),
                    N=[3], TP=[0.07]hrs,
                    RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
*#************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
CALIB STANDHYD      ID=[2], NHYD=["202"], DT=[1](min), AREA=[0.09](ha),
                    XIMP=[0.39], TIMP=[0.39], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[80],
                    Pervious   surfaces: IAper=[6.35](mm), SLPP=[3.5](%),
                                         LGP=[10](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.5](%),
                                         LGI=[10](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
```

```
*#*************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
CALIB STANDHYD      ID=[3], NHYD=["203"], DT=[1](min), AREA=[1.17](ha),
                    XIMP=[0.86], TIMP=[0.86], DWF=[0](cms), LOSS=[2],
                    SCS curve number CN=[80],
                    Pervious   surfaces: IAper=[6.35](mm), SLPP=[3.5](%),
                                         LGP=[10](m), MNP=[0.250], SCP=[0](min),
                    Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.5](%),
                                         LGI=[20](m), MNI=[0.015], SCI=[0](min),
                    RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
*#*************************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
ROUTE RESERVOIR     IDout=[4],   NHYD=["SWM"],  IDin=[3],
                    RDT=[1](min),
                          TABLE of ( OUTFLOW-STORAGE ) values
                                      (cms) - (ha-m)
                                        0         0
                                        0.0059    0.0090
                                        0.0083    0.0179
                                        0.0102    0.0269
                                        0.0115    0.0341
                                        0.0471    0.0359
                                        0.0996    0.0449
                                        0.1186    0.0499
                                        -1      -1   (max twenty pts)
                          IDovf=[5], NHYDovf=["OFL-SE"]
*#*************************************************************************|
ADD HYD             IDsum=[7], NHYD=["TOTAL"], IDs to add=[1, 4, 5]
*#*************************************************************************|
*%-----------------|-------------------------------------------------------|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
                    LINC3002.stm
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
                    LINC3005.stm
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[010]
                    LINC3010.stm
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[025]
                    LINC3025.stm
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[050]
                    LINC3050.stm
*
START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
                    LINC3100.stm
*
*%-----------------|-------------------------------------------------------|
FINISH
```

```
================================================================================

   SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
   S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
   SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
       S  W W W  M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
   SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9   =========
                                                          9   9  9   9   # 3902680
        StormWater Management HYdrologic Model            999    999    =========

 ********************************************************************************
 ***************************** SWMHYMO Ver/4.05  ********************************
 *********  A single event and continuous hydrologic simulation model  *********
 *********     based on the principles of HYMO and its successors      *********
 *********                  OTTHYMO-83 and OTTHYMO-89.                  *********
 ********************************************************************************
 ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
 *********                  Ottawa,  Ontario: (613) 836-3884           *********
 *********                  Gatineau, Quebec: (819) 243-6858           *********
 *********                  E-Mail: swmhymo@jfsa.Com                   *********
 ********************************************************************************

 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 +++++++++ Licensed user: S. Llewellyn & Associates Ltd                +++++++++
 +++++++++                in any City           SERIAL#:3902680       +++++++++
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

 ********************************************************************************
 *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
 *********           Maximum value for ID numbers  :     10            *********
 *********           Max. number of rainfall points: 105408            *********
 *********           Max. number of flow points    : 105408            *********
 ********************************************************************************


 *********************   D E T A I L E D   O U T P U T   **********************
 ********************************************************************************
 *         DATE: 2024-11-26     TIME: 12:31:26     RUN COUNTER: 001051          *
 ********************************************************************************
 * Input   filename: T:\PROJECTS\22035\SWMHYMO\22035.dat                        *
 * Output  filename: T:\PROJECTS\22035\SWMHYMO\22035.out                        *
 * Summary filename: T:\PROJECTS\22035\SWMHYMO\22035.sum                        *
 * User comments:                                                               *
 * 1:_____________________________________________________________________      *
 * 2:_____________________________________________________________________      *
 * 3:_____________________________________________________________________      *
 ********************************************************************************

--------------------------------------------------------------------------------
001:0001----------------------------------------------------------------------|
*#*****************************************************************************|
*#  Project Name: 5205 King Street
*#               BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*****************************************************************************|
*
--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
          #  1=LINC25MM.stm
--------------------------------------------------------------------------------
001:0002----------------------------------------------------------------------|
*
--------------------
| READ STORM       |    Filename: 25mm 4-HOUR (A=555 B=5.89 C=0.813)
| Ptotal=  25.27 mm|    Comments: 25mm 4-HOUR (A=555 B=5.89 C=0.813)
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   1.491 |   1.17  13.390 |   2.17   3.748 |   3.17   1.810
               .33   1.720 |   1.33  58.584 |   2.33   3.156 |   3.33   1.675
               .50   2.045 |   1.50  17.849 |   2.50   2.734 |   3.50   1.560
               .67   2.542 |   1.67   9.118 |   2.67   2.417 |   3.67   1.460
               .83   3.408 |   1.83   6.129 |   2.83   2.170 |   3.83   1.374
              1.00   5.319 |   2.00   4.638 |   3.00   1.973 |   4.00   1.299

--------------------------------------------------------------------------------
001:0003----------------------------------------------------------------------|
*
*#*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*****************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
----------------------
| CALIB NASHYD       |   Area     (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia       (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .012 (i)
     TIME TO PEAK    (hrs)=    1.600
     RUNOFF VOLUME    (mm)=    4.342
     TOTAL RAINFALL   (mm)=   25.268
     RUNOFF COEFFICIENT   =     .172

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0004----------------------------------------------------------------------|
*#*****************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33         .01
     Dep. Storage     (mm)=       1.00        6.35
     Average Slope     (%)=       1.50        3.50
     Length            (m)=      40.00       10.00
     Mannings n            =       .015        .250

     Max.eff.Inten.(mm/hr)=      58.58        7.26
               over (min)        2.00        9.00
     Storage Coeff.  (min)=       1.76 (ii)   9.18 (ii)
     Unit Hyd. Tpeak (min)=       2.00        9.00
     Unit Hyd. peak  (cms)=        .60         .12
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .05         .00        .053 (iii)
     TIME TO PEAK    (hrs)=       1.33        1.47       1.333
     RUNOFF VOLUME    (mm)=      24.27        4.34      23.471
     TOTAL RAINFALL   (mm)=      25.27       25.27      25.268
     RUNOFF COEFFICIENT   =        .96         .17        .929

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
001:0005----------------------------------------------------------------------|
*#*****************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*****************************************************************************|
*#*****************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
----------------------
| CALIB NASHYD       |   Area     (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia       (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.383
     RUNOFF VOLUME    (mm)=    4.341
     TOTAL RAINFALL   (mm)=   25.268
     RUNOFF COEFFICIENT   =     .172

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
001:0006----------------------------------------------------------------------|
*#*****************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04         .05
     Dep. Storage     (mm)=       1.00        6.35
     Average Slope     (%)=       1.50        3.50
     Length            (m)=      10.00       10.00
     Mannings n            =       .015        .250

     Max.eff.Inten.(mm/hr)=      58.58        7.64
               over (min)        1.00        8.00
     Storage Coeff.  (min)=        .77 (ii)   8.03 (ii)
     Unit Hyd. Tpeak (min)=       1.00        8.00
     Unit Hyd. peak  (cms)=       1.24         .14
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01         .00        .006 (iii)
     TIME TO PEAK    (hrs)=       1.32        1.45       1.333
     RUNOFF VOLUME    (mm)=      24.27        4.34      12.113
     TOTAL RAINFALL   (mm)=      25.27       25.27      25.268
     RUNOFF COEFFICIENT   =        .96         .17        .479

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
001:0007----------------------------------------------------------------------|
*#*****************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01         .16
     Dep. Storage     (mm)=       1.00        6.35
     Average Slope     (%)=       2.50        3.50
     Length            (m)=      20.00       10.00
     Mannings n            =       .015        .250

     Max.eff.Inten.(mm/hr)=      58.58        7.64
               over (min)        1.00        8.00
     Storage Coeff.  (min)=       1.00 (ii)   8.26 (ii)
     Unit Hyd. Tpeak (min)=       1.00        8.00
     Unit Hyd. peak  (cms)=       1.08         .14
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .16         .00        .165 (iii)
     TIME TO PEAK    (hrs)=       1.33        1.45       1.333
     RUNOFF VOLUME    (mm)=      24.27        4.34      21.478
     TOTAL RAINFALL   (mm)=      25.27       25.27      25.268
     RUNOFF COEFFICIENT   =        .96         .17        .850

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
001:0008----------------------------------------------------------------------|
*#*****************************************************************************|
```

```
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>03:(203   )   |
| OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                          .000  .0000E+00    |     .012  .3410E-01
                          .006  .9000E-02    |     .047  .3590E-01
                          .008  .1790E-01    |     .100  .4490E-01
                          .010  .2690E-01    |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .165     1.333     21.478
     OUTFLOW<04: (SWM   )       1.17      .008     2.367     21.478
    OVERFLOW<05: (OFL-SE)        .00      .000      .000      .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    5.101
                  TIME SHIFT OF PEAK FLOW          (min)=    62.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.1838E-01

--------------------------------------------------------------------------------
001:0009----------------------------------------------------------------------
*#*****************************************************************************|
----------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
----------------------                     (ha)     (cms)   (hrs)   (mm)    (cms)
                    ID1 01:201              .08      .002    1.38   4.34    .000
                   +ID2 04:SWM             1.17      .008    2.37  21.48    .000
                   +ID3 05:OFL-SE           .00      .000     .00    .00    .000
                    ==========================================================
                    SUM 07:TOTAL           1.25      .009    1.52  20.38    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
001:0010----------------------------------------------------------------------
*#*****************************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
  ** END OF RUN :   1

*******************************************************************************




--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
          #  1=LINC3002.stm
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 5205 King Street
*#               BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*****************************************************************************|
*
--------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 2-Yr, 3hr - Town of Lincoln CHICAGO STOR
| Ptotal=  31.43 mm|    Comments: 2-Yr, 3hr - Town of Lincoln CHICAGO STOR
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   2.691 |   1.00  18.933 |   1.83   5.931 |   2.67   2.813
              .33   3.189 |   1.17  74.951 |   2.00   4.809 |   2.83   2.562
              .50   3.948 |   1.33  22.947 |   2.17   4.061 |   3.00   2.355
              .67   5.254 |   1.50  11.597 |   2.33   3.528 |
              .83   8.070 |   1.67   7.811 |   2.50   3.126 |

--------------------------------------------------------------------------------
002:0003----------------------------------------------------------------------
*
*#*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*****************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
---------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .023 (i)
     TIME TO PEAK    (hrs)=    1.400
     RUNOFF VOLUME    (mm)=    7.100
     TOTAL RAINFALL   (mm)=   31.429
     RUNOFF COEFFICIENT   =     .226

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0004----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .33           .01
     Dep. Storage     (mm)=        1.00          6.35
     Average Slope     (%)=        1.50          3.50
     Length            (m)=       40.00         10.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       74.95         16.90
               over (min)         2.00          7.00
     Storage Coeff.  (min)=        1.60 (ii)     6.89 (ii)
     Unit Hyd. Tpeak (min)=        2.00          7.00
     Unit Hyd. peak  (cms)=         .64           .16
                                                        *TOTALS*
     PEAK FLOW       (cms)=         .07           .00          .068 (iii)
     TIME TO PEAK    (hrs)=        1.17          1.25         1.167
     RUNOFF VOLUME    (mm)=       30.43          7.10        29.496
     TOTAL RAINFALL   (mm)=       31.43         31.43        31.429
     RUNOFF COEFFICIENT   =         .97           .23          .938

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
002:0005----------------------------------------------------------------------
*#*****************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*****************************************************************************|
*#*****************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
---------------------
| CALIB NASHYD       |   Area    (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
---------------------  U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .003 (i)
     TIME TO PEAK    (hrs)=    1.200
     RUNOFF VOLUME    (mm)=    7.099
     TOTAL RAINFALL   (mm)=   31.429
     RUNOFF COEFFICIENT   =     .226

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
002:0006----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         .04           .05
     Dep. Storage     (mm)=        1.00          6.35
     Average Slope     (%)=        1.50          3.50
     Length            (m)=       10.00         10.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       74.95         17.95
               over (min)         1.00          6.00
     Storage Coeff.  (min)=         .69 (ii)     5.86 (ii)
     Unit Hyd. Tpeak (min)=        1.00          6.00
     Unit Hyd. peak  (cms)=        1.30           .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=         .01           .00          .009 (iii)
     TIME TO PEAK    (hrs)=        1.13          1.23         1.167
     RUNOFF VOLUME    (mm)=       30.43          7.10        16.199
     TOTAL RAINFALL   (mm)=       31.43         31.43        31.429
     RUNOFF COEFFICIENT   =         .97           .23          .515

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
002:0007----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        1.01           .16
     Dep. Storage     (mm)=        1.00          6.35
     Average Slope     (%)=        2.50          3.50
     Length            (m)=       20.00         10.00
     Mannings n           =        .015          .250

     Max.eff.Inten.(mm/hr)=       74.95         17.95
               over (min)         1.00          6.00
     Storage Coeff.  (min)=         .90 (ii)     6.07 (ii)
     Unit Hyd. Tpeak (min)=        1.00          6.00
     Unit Hyd. peak  (cms)=        1.14           .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=         .21           .01          .213 (iii)
     TIME TO PEAK    (hrs)=        1.17          1.23         1.167
     RUNOFF VOLUME    (mm)=       30.43          7.10        27.163
     TOTAL RAINFALL   (mm)=       31.43         31.43        31.429
     RUNOFF COEFFICIENT   =         .97           .23          .864

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
         CN* =  80.0    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.

------------------------------------------------------------------------------
002:0008----------------------------------------------------------------------
*#*****************************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>03:(203   )   |
| OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00    |     .012  .3410E-01
                           .006  .9000E-02    |     .047  .3590E-01
                           .008  .1790E-01    |     .100  .4490E-01
                           .010  .2690E-01    |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .213     1.167     27.163
     OUTFLOW<04: (SWM   )       1.17      .010     2.350     27.163
    OVERFLOW<05: (OFL-SE)        .00      .000      .000      .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    4.602
                  TIME SHIFT OF PEAK FLOW        (min)=    71.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.2510E-01

------------------------------------------------------------------------------
002:0009----------------------------------------------------------------------
*#*****************************************************************************|
------------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)    (cms)
                        ID1 01:201          .08      .003    1.20   7.10    .000
                       +ID2 04:SWM         1.17      .010    2.35  27.16    .000
                       +ID3 05:OFL-SE       .00      .000     .00    .00    .000
                        ==========================================================
                        SUM 07:TOTAL       1.25      .012    1.22  25.88    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
002:0010----------------------------------------------------------------------
*#*****************************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
------------------------------------------------------------------------------
002:0002----------------------------------------------------------------------
*
  ** END OF RUN :   4

*******************************************************************************




--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on      0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
          #  1=LINC3005.stm
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 5205 King Street
*#               BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*****************************************************************************|
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 5-Yr, 3hr - Town of Lincoln CHICAGO STOR
| Ptotal=  42.51 mm|    Comments: 5-Yr, 3hr - Town of Lincoln CHICAGO STOR
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   3.434 |   1.00  26.424 |   1.83   7.895 |   2.67   3.597
               .33   4.105 |   1.17 101.508 |   2.00   6.328 |   2.83   3.260
               .50   5.140 |   1.33  32.152 |   2.17   5.296 |   3.00   2.985
               .67   6.948 |   1.50  15.952 |   2.33   4.565 |
               .83  10.919 |   1.67  10.548 |   2.50   4.020 |

------------------------------------------------------------------------------
005:0003----------------------------------------------------------------------
*
*#*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*****************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
----------------------
| CALIB NASHYD       |   Area     (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia       (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .045 (i)
     TIME TO PEAK    (hrs)=    1.383
     RUNOFF VOLUME    (mm)=   13.121
     TOTAL RAINFALL   (mm)=   42.513
     RUNOFF COEFFICIENT   =     .309

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0004----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .01
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      40.00        10.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     101.51        36.29
               over (min)        1.00         5.00
     Storage Coeff.  (min)=       1.41 (ii)    5.31 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .86          .22
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .09          .00          .093 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.22         1.167
     RUNOFF VOLUME    (mm)=      41.51        13.12        40.377
     TOTAL RAINFALL   (mm)=      42.51        42.51        42.513
     RUNOFF COEFFICIENT   =        .98          .31          .950

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
005:0005----------------------------------------------------------------------
*#*****************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*****************************************************************************|
*#*****************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
----------------------
| CALIB NASHYD       |   Area     (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia       (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .006 (i)
     TIME TO PEAK    (hrs)=    1.200
     RUNOFF VOLUME    (mm)=   13.120
     TOTAL RAINFALL   (mm)=   42.513
     RUNOFF COEFFICIENT   =     .309

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0006----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .05
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      10.00        10.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     101.51        37.73
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .62 (ii)    4.45 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.36          .26
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .01          .00          .014 (iii)
     TIME TO PEAK    (hrs)=       1.13         1.20         1.167
     RUNOFF VOLUME    (mm)=      41.51        13.12        24.194
     TOTAL RAINFALL   (mm)=      42.51        42.51        42.513
     RUNOFF COEFFICIENT   =        .98          .31          .569

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
005:0007----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
----------------------
| CALIB STANDHYD     |   Area     (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01          .16
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       2.50         3.50
     Length            (m)=      20.00        10.00
     Mannings n            =       .015         .250

     Max.eff.Inten.(mm/hr)=     101.51        36.29
               over (min)        1.00         5.00
```

```
     Storage Coeff.  (min)=       .80 (ii)    4.70 (ii)
     Unit Hyd. Tpeak (min)=      1.00         5.00
     Unit Hyd. peak  (cms)=      1.21          .24
                                                *TOTALS*
     PEAK FLOW       (cms)=       .28          .01          .294 (iii)
     TIME TO PEAK    (hrs)=      1.17         1.22         1.167
     RUNOFF VOLUME    (mm)=     41.51        13.12        37.538
     TOTAL RAINFALL   (mm)=     42.51        42.51        42.513
     RUNOFF COEFFICIENT   =       .98          .31          .883

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
005:0008----------------------------------------------------------------------
*#*************************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>03:(203   )   |
| OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .012  .3410E-01
                           .006  .9000E-02   |     .047  .3590E-01
                           .008  .1790E-01   |     .100  .4490E-01
                           .010  .2690E-01   |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .294     1.167     37.538
     OUTFLOW<04: (SWM   )       1.17      .020     1.900     37.538
    OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=    6.699
                  TIME SHIFT OF PEAK FLOW          (min)=    44.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.3451E-01

------------------------------------------------------------------------------
005:0009----------------------------------------------------------------------
*#*************************************************************************|
------------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)    (cms)
                        ID1 01:201           .08      .006    1.20  13.12     .000
                       +ID2 04:SWM          1.17      .020    1.90  37.54     .000
                       +ID3 05:OFL-SE        .00      .000     .00    .00     .000
                        ==========================================================
                        SUM 07:TOTAL        1.25      .021    1.88  35.97     .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
005:0010----------------------------------------------------------------------
*#*************************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
005:0002----------------------------------------------------------------------
*
  ** END OF RUN :   9

********************************************************************************




--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 010
    NSTORM=   1
          #  1=LINC3010.stm
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*#*************************************************************************|
*#  Project Name: 5205 King Street
*#               BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*************************************************************************|
*
------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 10-Yr, 3hr - Town of Lincoln CHICAGO STO
| Ptotal=  49.74 mm|    Comments: 10-Yr, 3hr - Town of Lincoln CHICAGO STO
--------------------
            TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
             hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
             .17   3.778 |   1.00  31.828 |   1.83   9.088 |   2.67   3.968
             .33   4.561 |   1.17 119.010 |   2.00   7.198 |   2.83   3.577
             .50   5.781 |   1.33  38.857 |   2.17   5.966 |   3.00   3.260
             .67   7.946 |   1.50  18.971 |   2.33   5.100 |
             .83  12.780 |   1.67  12.323 |   2.50   4.460 |

------------------------------------------------------------------------------
010:0003----------------------------------------------------------------------
*
*#*************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
---------------------
| CALIB NASHYD      |   Area    (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .063 (i)
     TIME TO PEAK    (hrs)=    1.383
     RUNOFF VOLUME    (mm)=   17.614
     TOTAL RAINFALL   (mm)=   49.742
     RUNOFF COEFFICIENT   =     .354

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
010:0004----------------------------------------------------------------------
*#*************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD    |   Area    (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .01
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      40.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     119.01        49.34
               over (min)          1.00         5.00
     Storage Coeff.  (min)=       1.33 (ii)    4.77 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=        .90          .23
                                                *TOTALS*
     PEAK FLOW       (cms)=        .11          .00          .109 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.22         1.167
     RUNOFF VOLUME    (mm)=      48.74        17.61        47.497
     TOTAL RAINFALL   (mm)=      49.74        49.74        49.742
     RUNOFF COEFFICIENT   =        .98          .35          .955

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
010:0005----------------------------------------------------------------------
*#*************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*************************************************************************|
*#*************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
---------------------
| CALIB NASHYD      |   Area    (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.200
     RUNOFF VOLUME    (mm)=   17.613
     TOTAL RAINFALL   (mm)=   49.742
     RUNOFF COEFFICIENT   =     .354

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
010:0006----------------------------------------------------------------------
*#*************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD    |   Area    (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .05
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      10.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     119.01        51.06
               over (min)          1.00         4.00
     Storage Coeff.  (min)=        .58 (ii)    3.98 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.40          .28
                                                *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .017 (iii)
     TIME TO PEAK    (hrs)=       1.12         1.20         1.167
     RUNOFF VOLUME    (mm)=      48.74        17.61        29.754
     TOTAL RAINFALL   (mm)=      49.74        49.74        49.742
     RUNOFF COEFFICIENT   =        .98          .35          .598

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
010:0007----------------------------------------------------------------------
*#*************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
```

```
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01          .16
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       2.50         3.50
     Length            (m)=      20.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     119.01        51.06
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .75 (ii)    4.15 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.25          .28
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .33          .02          .349 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.20         1.167
     RUNOFF VOLUME    (mm)=      48.74        17.61        44.384
     TOTAL RAINFALL   (mm)=      49.74        49.74        49.742
     RUNOFF COEFFICIENT   =        .98          .35          .892

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
010:0008----------------------------------------------------------------------
*#*****************************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
----------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>03:(203   )    |
| OUT<04:(SWM   )    |    =========  OUTLFW STORAGE TABLE  =========
--------------------     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)     (ha.m.)   |    (cms)     (ha.m.)
                            .000  .0000E+00    |     .012  .3410E-01
                            .006  .9000E-02    |     .047  .3590E-01
                            .008  .1790E-01    |     .100  .4490E-01
                            .010  .2690E-01    |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .349     1.167     44.384
     OUTFLOW<04: (SWM   )       1.17      .051     1.517     44.384
    OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   14.555
                    TIME SHIFT OF PEAK FLOW          (min)=    21.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3655E-01

--------------------------------------------------------------------------------
010:0009----------------------------------------------------------------------
*#*****************************************************************************|
------------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)    (cms)
                     ID1 01:201            .08      .009    1.20  17.61    .000
                    +ID2 04:SWM           1.17      .051    1.52  44.38    .000
                    +ID3 05:OFL-SE         .00      .000     .00    .00    .000
                     ==========================================================
                     SUM 07:TOTAL         1.25      .053    1.50  42.67    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
010:0010----------------------------------------------------------------------
*#*****************************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
--------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
--------------------------------------------------------------------------------
010:0002----------------------------------------------------------------------
*
  ** END OF RUN :  24

********************************************************************************




--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 025
    NSTORM=   1
          #  1=LINC3025.stm
--------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 5205 King Street
*#               BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*****************************************************************************|
*
--------------------------------------------------------------------------------
025:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 25-Yr, 3hr - Town of Lincoln CHICAGO STO
| Ptotal=  58.67 mm|    Comments: 25-Yr, 3hr - Town of Lincoln CHICAGO STO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   4.395 |   1.00  37.556 |   1.83  10.634 |   2.67   4.617
               .33   5.312 |   1.17 141.352 |   2.00   8.409 |   2.83   4.160
               .50   6.744 |   1.33  45.894 |   2.17   6.960 |   3.00   3.789
               .67   9.289 |   1.50  22.308 |   2.33   5.944 |
               .83  14.990 |   1.67  14.449 |   2.50   5.194 |

--------------------------------------------------------------------------------
025:0003----------------------------------------------------------------------
*
*#*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*****************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .087 (i)
     TIME TO PEAK    (hrs)=    1.383
     RUNOFF VOLUME    (mm)=   23.632
     TOTAL RAINFALL   (mm)=   58.666
     RUNOFF COEFFICIENT   =     .403

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
025:0004----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .01
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      40.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     141.35        69.27
               over (min)        1.00         4.00
     Storage Coeff.  (min)=       1.24 (ii)    4.25 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=        .94          .27
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .13          .00          .130 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.20         1.167
     RUNOFF VOLUME    (mm)=      57.67        23.63        56.304
     TOTAL RAINFALL   (mm)=      58.67        58.67        58.666
     RUNOFF COEFFICIENT   =        .98          .40          .960

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

--------------------------------------------------------------------------------
025:0005----------------------------------------------------------------------
*#*****************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*****************************************************************************|
*#*****************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
----------------------
| CALIB NASHYD       |   Area    (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .012 (i)
     TIME TO PEAK    (hrs)=    1.200
     RUNOFF VOLUME    (mm)=   23.630
     TOTAL RAINFALL   (mm)=   58.666
     RUNOFF COEFFICIENT   =     .403

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
025:0006----------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .05
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      10.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     141.35        69.27
               over (min)        1.00         4.00
     Storage Coeff.  (min)=        .54 (ii)    3.55 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.43          .31
```

```
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .01          .01          .022 (iii)
     TIME TO PEAK    (hrs)=       1.12         1.18         1.167
     RUNOFF VOLUME    (mm)=      57.67        23.63        36.905
     TOTAL RAINFALL   (mm)=      58.67        58.67        58.666
     RUNOFF COEFFICIENT   =        .98          .40          .629

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

-------------------------------------------------------------------------------
025:0007---------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
--------------------
| CALIB STANDHYD     |   Area    (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01          .16
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       2.50         3.50
     Length            (m)=      20.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     141.35        69.27
               over (min)          1.00         4.00
     Storage Coeff.  (min)=        .70 (ii)    3.71 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=       1.29          .30
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .40          .02          .419 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.18         1.167
     RUNOFF VOLUME    (mm)=      57.67        23.63        52.901
     TOTAL RAINFALL   (mm)=      58.67        58.67        58.666
     RUNOFF COEFFICIENT   =        .98          .40          .902

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

-------------------------------------------------------------------------------
025:0008---------------------------------------------------------------------
*#*****************************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>03:(203   )    |
| OUT<04:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)     (ha.m.)   |    (cms)     (ha.m.)
                           .000  .0000E+00    |     .012  .3410E-01
                           .006  .9000E-02    |     .047  .3590E-01
                           .008  .1790E-01    |     .100  .4490E-01
                           .010  .2690E-01    |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .419     1.167     52.901
     OUTFLOW<04: (SWM   )       1.17      .075     1.383     52.901
    OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   17.821
                  TIME SHIFT OF PEAK FLOW          (min)=    13.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4062E-01

-------------------------------------------------------------------------------
025:0009---------------------------------------------------------------------
*#*****************************************************************************|
------------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                        ID1 01:201          .08      .012    1.20  23.63    .000
                       +ID2 04:SWM         1.17      .075    1.38  52.90    .000
                       +ID3 05:OFL-SE       .00      .000     .00    .00    .000
                        ==========================================================
                        SUM 07:TOTAL       1.25      .081    1.35  51.03    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
025:0010---------------------------------------------------------------------
*#*****************************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
-------------------------------------------------------------------------------
025:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
025:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
025:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
025:0002---------------------------------------------------------------------
*
  ** END OF RUN :  49

*******************************************************************************



--------------------
```

```
| START              |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on       0
    METOUT=   2 (output = METRIC)
    NRUN  = 050
    NSTORM=   1
           #  1=LINC3050.stm
-------------------------------------------------------------------------------
050:0002---------------------------------------------------------------------
*#*****************************************************************************|
*#  Project Name: 5205 King Street
*#                BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#*****************************************************************************|
*
-------------------------------------------------------------------------------
050:0002---------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 50-Yr, 3hr - Town of Lincoln CHICAGO STO
| Ptotal=  65.82 mm|    Comments: 50-Yr, 3hr - Town of Lincoln CHICAGO STO
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .17   4.753 |   1.00  43.242 |   1.83  11.924 |   2.67   5.004
               .33   5.791 |   1.17 156.811 |   2.00   9.344 |   2.83   4.489
               .50   7.426 |   1.33  52.889 |   2.17   7.674 |   3.00   4.073
               .67  10.363 |   1.50  25.573 |   2.33   6.511 |
               .83  17.009 |   1.67  16.375 |   2.50   5.657 |

-------------------------------------------------------------------------------
050:0003---------------------------------------------------------------------
*
*#*****************************************************************************|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#*****************************************************************************|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=80.00
| 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .107 (i)
     TIME TO PEAK    (hrs)=    1.383
     RUNOFF VOLUME    (mm)=   28.759
     TOTAL RAINFALL   (mm)=   65.818
     RUNOFF COEFFICIENT   =     .437

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
050:0004---------------------------------------------------------------------
*#*****************************************************************************|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
----------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .33          .01
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      40.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     156.81        83.19
               over (min)          1.00         4.00
     Storage Coeff.  (min)=       1.19 (ii)    3.98 (ii)
     Unit Hyd. Tpeak (min)=       1.00         4.00
     Unit Hyd. peak  (cms)=        .97          .28
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .14          .00          .145 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.18         1.167
     RUNOFF VOLUME    (mm)=      64.82        28.76        63.375
     TOTAL RAINFALL   (mm)=      65.82        65.82        65.818
     RUNOFF COEFFICIENT   =        .98          .44          .963

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

-------------------------------------------------------------------------------
050:0005---------------------------------------------------------------------
*#*****************************************************************************|
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*****************************************************************************|
*#*****************************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
----------------------
| CALIB NASHYD       |   Area    (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------  U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .014 (i)
     TIME TO PEAK    (hrs)=    1.200
     RUNOFF VOLUME    (mm)=   28.757
     TOTAL RAINFALL   (mm)=   65.818
     RUNOFF COEFFICIENT   =     .437

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
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```
050:0006----------------------------------------------------------------------
*#####################################################################|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .04          .05
     Dep. Storage     (mm)=      1.00         6.35
     Average Slope     (%)=      1.50         3.50
     Length            (m)=     10.00        10.00
     Mannings n           =      .015         .250

     Max.eff.Inten.(mm/hr)=    156.81        85.32
               over (min)        1.00         3.00
     Storage Coeff.  (min)=       .52 (ii)    3.28 (ii)
     Unit Hyd. Tpeak (min)=      1.00         3.00
     Unit Hyd. peak  (cms)=      1.45          .35
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .02          .01          .026 (iii)
     TIME TO PEAK    (hrs)=      1.12         1.18         1.167
     RUNOFF VOLUME    (mm)=     64.82        28.76        42.822
     TOTAL RAINFALL   (mm)=     65.82        65.82        65.818
     RUNOFF COEFFICIENT   =       .98          .44          .651

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
050:0007----------------------------------------------------------------------
*#####################################################################|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      1.01          .16
     Dep. Storage     (mm)=      1.00         6.35
     Average Slope     (%)=      2.50         3.50
     Length            (m)=     20.00        10.00
     Mannings n           =      .015         .250

     Max.eff.Inten.(mm/hr)=    156.81        85.32
               over (min)        1.00         3.00
     Storage Coeff.  (min)=       .67 (ii)    3.44 (ii)
     Unit Hyd. Tpeak (min)=      1.00         3.00
     Unit Hyd. peak  (cms)=      1.31          .34
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .44          .03          .470 (iii)
     TIME TO PEAK    (hrs)=      1.17         1.18         1.167
     RUNOFF VOLUME    (mm)=     64.82        28.76        59.770
     TOTAL RAINFALL   (mm)=     65.82        65.82        65.818
     RUNOFF COEFFICIENT   =       .98          .44          .908

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
050:0008----------------------------------------------------------------------
*#####################################################################|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>03:(203   )   |
| OUT<04:(SWM   )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                          .000  .0000E+00    |     .012  .3410E-01
                          .006  .9000E-02    |     .047  .3590E-01
                          .008  .1790E-01    |     .100  .4490E-01
                          .010  .2690E-01    |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .470     1.167     59.770
     OUTFLOW<04: (SWM   )       1.17      .098     1.350     59.769
    OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   20.794
                    TIME SHIFT OF PEAK FLOW         (min)=    11.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.4458E-01

------------------------------------------------------------------------------
050:0009----------------------------------------------------------------------
*#####################################################################|
------------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)    (cms)
                    ID1 01:201             .08      .014    1.20  28.76    .000
                   +ID2 04:SWM            1.17      .098    1.35  59.77    .000
                   +ID3 05:OFL-SE          .00      .000     .00    .00    .000
                    ================================================================
                    SUM 07:TOTAL          1.25      .106    1.35  57.78    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
050:0010----------------------------------------------------------------------
*#####################################################################|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
------------------------------------------------------------------------------
050:0002----------------------------------------------------------------------
*
  ** END OF RUN :  99

************************************************************************




--------------------
| START            |  Project  dir.: T:\PROJECTS\22035\SWMHYMO\
--------------------  Rainfall dir.: T:\PROJECTS\22035\SWMHYMO\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 100
    NSTORM=   1
           #  1=LINC3100.stm
------------------------------------------------------------------------------
100:0002----------------------------------------------------------------------
*#####################################################################|
*#  Project Name: 5205 King Street
*#                BEAMSVILLE, ONTARIO
*#
*#  JOB NUMBER  : 22035
*#       Date   : Nov 2024
*#    Revised   :
*#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
*#       File   : 22035.DAT
*#####################################################################|
*
------------------------------------------------------------------------------
100:0002----------------------------------------------------------------------
*
--------------------
| READ STORM       |    Filename: 100-Yr, 3hr - Town of Lincoln CHICAGO ST
| Ptotal=  71.42 mm|    Comments: 100-Yr, 3hr - Town of Lincoln CHICAGO ST
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .17   5.108 |   1.00  46.942 |   1.83  12.870 |   2.67   5.379
              .33   6.229 |   1.17 170.937 |   2.00  10.074 |   2.83   4.823
              .50   7.998 |   1.33  57.452 |   2.17   8.266 |   3.00   4.374
              .67  11.178 |   1.50  27.698 |   2.33   7.007 |
              .83  18.390 |   1.67  17.700 |   2.50   6.084 |

------------------------------------------------------------------------------
100:0003----------------------------------------------------------------------
*
*#####################################################################|
*#
*#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ==============================================
*#
*#####################################################################|
*# CATCHMENT 101 -  DRAINAGE TO REALLIGHED EX.WATERCOURSE
---------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number    (CN)=80.00
| 01:101    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
---------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .191

     PEAK FLOW       (cms)=     .124 (i)
     TIME TO PEAK    (hrs)=    1.367
     RUNOFF VOLUME    (mm)=   32.931
     TOTAL RAINFALL   (mm)=   71.418
     RUNOFF COEFFICIENT   =     .461

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
100:0004----------------------------------------------------------------------
*#####################################################################|
*# CATCHMENT 102 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
---------------------
| CALIB STANDHYD     |   Area    (ha)=     .34
| 02:102    DT= 1.00 |   Total Imp(%)=   96.00   Dir. Conn.(%)=   96.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .33          .01
     Dep. Storage     (mm)=      1.00         6.35
     Average Slope     (%)=      1.50         3.50
     Length            (m)=     40.00        10.00
     Mannings n           =      .015         .250

     Max.eff.Inten.(mm/hr)=    170.94        95.75
               over (min)        1.00         4.00
     Storage Coeff.  (min)=      1.15 (ii)    3.79 (ii)
     Unit Hyd. Tpeak (min)=      1.00         4.00
     Unit Hyd. peak  (cms)=       .99          .29
                                                    *TOTALS*
     PEAK FLOW       (cms)=       .15          .00          .158 (iii)
     TIME TO PEAK    (hrs)=      1.17         1.18         1.167
     RUNOFF VOLUME    (mm)=     70.42        32.93        68.919
     TOTAL RAINFALL   (mm)=     71.42        71.42        71.418
     RUNOFF COEFFICIENT   =       .99          .46          .965

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

------------------------------------------------------------------------------
100:0005----------------------------------------------------------------------
*#####################################################################|
```

```
*#
*#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
*#        ===============================================
*#
*#*********************************************************************|
*#*********************************************************************|
*# CATCHMENT 201 -  UNCONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
----------------------
| CALIB NASHYD       |   Area    (ha)=     .08   Curve Number   (CN)=80.00
| 01:201    DT= 1.00 |   Ia      (mm)=   6.350   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .070

     Unit Hyd Qpeak  (cms)=     .044

     PEAK FLOW       (cms)=     .017 (i)
     TIME TO PEAK    (hrs)=    1.183
     RUNOFF VOLUME    (mm)=   32.930
     TOTAL RAINFALL   (mm)=   71.418
     RUNOFF COEFFICIENT   =     .461

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
100:0006---------------------------------------------------------------------
*#*********************************************************************|
*# CATCHMENT 202 -  UNCONTROLLED DRAINAGE TO EX.STORM SEWER LINCOLN AVE
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .09
| 02:202    DT= 1.00 |   Total Imp(%)=   39.00   Dir. Conn.(%)=   39.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .04          .05
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       1.50         3.50
     Length            (m)=      10.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     170.94        98.05
               over (min)          1.00         3.00
     Storage Coeff.  (min)=        .50 (ii)    3.12 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.47          .37
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .02          .01          .029 (iii)
     TIME TO PEAK    (hrs)=       1.12         1.18         1.167
     RUNOFF VOLUME    (mm)=      70.42        32.93        47.551
     TOTAL RAINFALL   (mm)=      71.42        71.42        71.418
     RUNOFF COEFFICIENT   =        .99          .46          .666

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

-------------------------------------------------------------------------------
100:0007---------------------------------------------------------------------
*#*********************************************************************|
*# CATCHMENT 203 -  CONTROLLED DRAINAGE TO REALLIGNED WATERCOURSE
*
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.17
| 03:203    DT= 1.00 |   Total Imp(%)=   86.00   Dir. Conn.(%)=   86.00
----------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.01          .16
     Dep. Storage     (mm)=       1.00         6.35
     Average Slope     (%)=       2.50         3.50
     Length            (m)=      20.00        10.00
     Mannings n           =       .015         .250

     Max.eff.Inten.(mm/hr)=     170.94        98.05
               over (min)          1.00         3.00
     Storage Coeff.  (min)=        .65 (ii)    3.27 (ii)
     Unit Hyd. Tpeak (min)=       1.00         3.00
     Unit Hyd. peak  (cms)=       1.33          .35
                                                    *TOTALS*
     PEAK FLOW       (cms)=        .48          .04          .515 (iii)
     TIME TO PEAK    (hrs)=       1.17         1.18         1.167
     RUNOFF VOLUME    (mm)=      70.42        32.93        65.170
     TOTAL RAINFALL   (mm)=      71.42        71.42        71.418
     RUNOFF COEFFICIENT   =        .99          .46          .913

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  80.0    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.

-------------------------------------------------------------------------------
100:0008---------------------------------------------------------------------
*#*********************************************************************|
*#
*# ROUTE FLOWS FROM CATCHMENT 203 THROUGH ORIFICE PLATE
*#
--------------------
| ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
|  IN>03:(203   )    |
| OUT<04:(SWM   )    |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .012  .3410E-01
                           .006  .9000E-02   |     .047  .3590E-01
                           .008  .1790E-01   |     .100  .4490E-01
                           .010  .2690E-01   |     .119  .4990E-01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     ---------------           (ha)     (cms)     (hrs)       (mm)
     INFLOW >03: (203   )       1.17      .515     1.167     65.170
     OUTFLOW<04: (SWM   )       1.17      .111     1.350     65.170
    OVERFLOW<05: (OFL-SE)        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.490
                  TIME SHIFT OF PEAK FLOW         (min)=    11.00

                  MAXIMUM  STORAGE   USED       (ha.m.)=.4779E-01

-------------------------------------------------------------------------------
100:0009---------------------------------------------------------------------
*#*********************************************************************|
----------------------
| ADD HYD (TOTAL     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
----------------------                    (ha)     (cms)   (hrs)   (mm)    (cms)
                        ID1 01:201          .08      .017    1.18  32.93    .000
                       +ID2 04:SWM         1.17      .111    1.35  65.17    .000
                       +ID3 05:OFL-SE       .00      .000     .00    .00    .000
                        ==========================================================
                        SUM 07:TOTAL       1.25      .120    1.35  63.11    .000

   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
100:0010---------------------------------------------------------------------
*#*********************************************************************|
*#
* RUN REMAINING DESIGN STORMS (LINCOLN 2 TO 100-YR)
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
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100:0002---------------------------------------------------------------------
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100:0002---------------------------------------------------------------------
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100:0002---------------------------------------------------------------------
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100:0002---------------------------------------------------------------------
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100:0002---------------------------------------------------------------------
*
-------------------------------------------------------------------------------
100:0002---------------------------------------------------------------------
*
      FINISH
-------------------------------------------------------------------------------
*********************************************************************************
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2024-11-26     at 12:31:28
=================================================================================
```

APPENDIX C
WATER AND WASTEWATER ANALYSIS INFORMATION

Technical Memorandum

1266 South Service Road, Unit C31 ● Stoney Creek, ON L8E 5R9 ● 905-643-6688

To: Jeremy Korevaar

From: Nicolas Chan, Joy Liu, Alyssa Kochanski

Date: Friday, April 11, 2025

Re: Sewer Analysis – Development Proposal – 5205 King Street, Beamsville
Development Review
Lincoln, ON

Project No.: 2407418

1. Project Scope

The assessment of the downstream system leverages the analysis completed as part of the 2021 Baker Road Wastewater Treatment Plant Pollution Prevention Control Plan (PPCP) and the subsequent assessment of:

- 2021 – Ontario Street and General Recommendations Sewer System Capacity Review;
- 2023 – Niagara Region 2021 Master Servicing Plan Update (MSPU); and
- 2023 – Ontario Street Sewershed Capacity Analysis

It is noted that the servicing review is limited to the sewer network upstream of the Ontario Street sewer. The capacity of the Ontario Street sewer is governed by the capacity allocations and upgrade triggers outlined in the prior analysis.

2. Proposed Development

Figure 1 identifies the approximate location of the proposed development. The proposed buildings located at 5205 King Street comprises of 161 residential units and 675 m^2 of planned commercial space in Building 1 and 85 units and 396 m^2 of commercial space in Building 2.



Figure 1: Development Location

2.1. Growth Projections

Table 1 summarizes the growth projections of the proposed development. The post-development sanitary flows were calculated by S. Llewellyn & Associates Limited and reviewed against the typical Town Criteria.

The design flow calculated from the corrected S. Llewellyn & Associates Limited Functional Servicing Report is more conservative than the values generated using the Town criteria. This review was completed using the corrected **7.15 L/s** development flows generated using the S. Llewellyn & Associates Limited criteria with consideration of the infiltration allowance from the site that is partially outside of the existing model catchment boundaries. The proposed development flow is equivalent to approximately 605 people, which is 405 people greater the Town's 2021 DC Update allocation of a total of 200 people and jobs.

Table 1: Growth Projection Comparison

	S. Llewellyn & Associates Ltd.	GEI Review
Area (ha)	1.60	
Residential Population	418 (246 Residential Units @ 1.7 ppu)	418 (246 Residential Units @ 1.7 ppu)
Average Residential Dry Weather Flow (L/s)	*1.64* (@338 L/c/d)	*1.23* *(@255 L/c/d from Town Municipal Design and Quality Standards)*
Residential Peaking Factor	*4.10 for Building 1* *4.20 for Building 2* *(4.00)*[1] *(Harmon's Peaking Factor)*	*4.00* *(Harmon's Peaking Factor)*
Peak Residential Dry Weather Flow (L/s)	6.76 (6.54)[1]	4.94
Commercial Area (ha)	0.107	
Average Commercial Dry Weather Flow (L/s)	0.06 (@5.0 L/m^2/d)	0.06 (@5.0 L/m^2/d)
Commercial Jobs	-	17[2]
Commercial Peaking Factor	*9.5 (4.00)*[1]	*4.00* *(Harmon's Peaking Factor)*
Peak Commercial Dry Weather Flow (L/s)	*0.59 (0.25)*[1]	*0.25*
RDII (L/s)	0.029 (@0.018 L/s/ha) (0.36)[3,4]	0.36[3] (@0.286 L/s/ha from Town Municipal Design and Quality Standards)
Total Design Flow (L/s)	**7.37 (7.15)**[1,2,3]	**5.54**[3]

1. Corrected Harmon's Peaking Factor.
2. Commercial job population calculated using the Town of Lincoln Municipal Design and Quality Standards criteria of 310 L/jobs/d and 5 L/m^2/d.
3. Partial area lot is included in the existing catchment and therefore contributes some additional RDII.
4. Corrected to 0.286 L/s/ha wet weather flow allowance as per Town of Lincoln Municipal Design and Quality Standards

2.2. Proposed Development Servicing

2.2.1. Summary of Existing Wastewater System

The proposed development will tie-in to the existing 300mm sanitary sewer located on Lincoln Avenue. Downstream of the site, the flows follow the sewer alignment as shown in **Figure 2** as follows:

- 88m of 200mm Town sewer from the proposed development tie-in point on Lincoln Avenue to Oakwood Avenue.
- 1185m of 200-250mm Town sewer between Lincoln Avenue and Oakwood Avenue to Friesen Boulevard and Ontario Street.
- 630m of 750mm Town sewer on Ontario Street from Friesen Boulevard to Greenlane.

- 1570m of 600-750mm Region sewer on Ontario Street from Greenlane to Ontario Street Sanitary Pump Station (SPS).

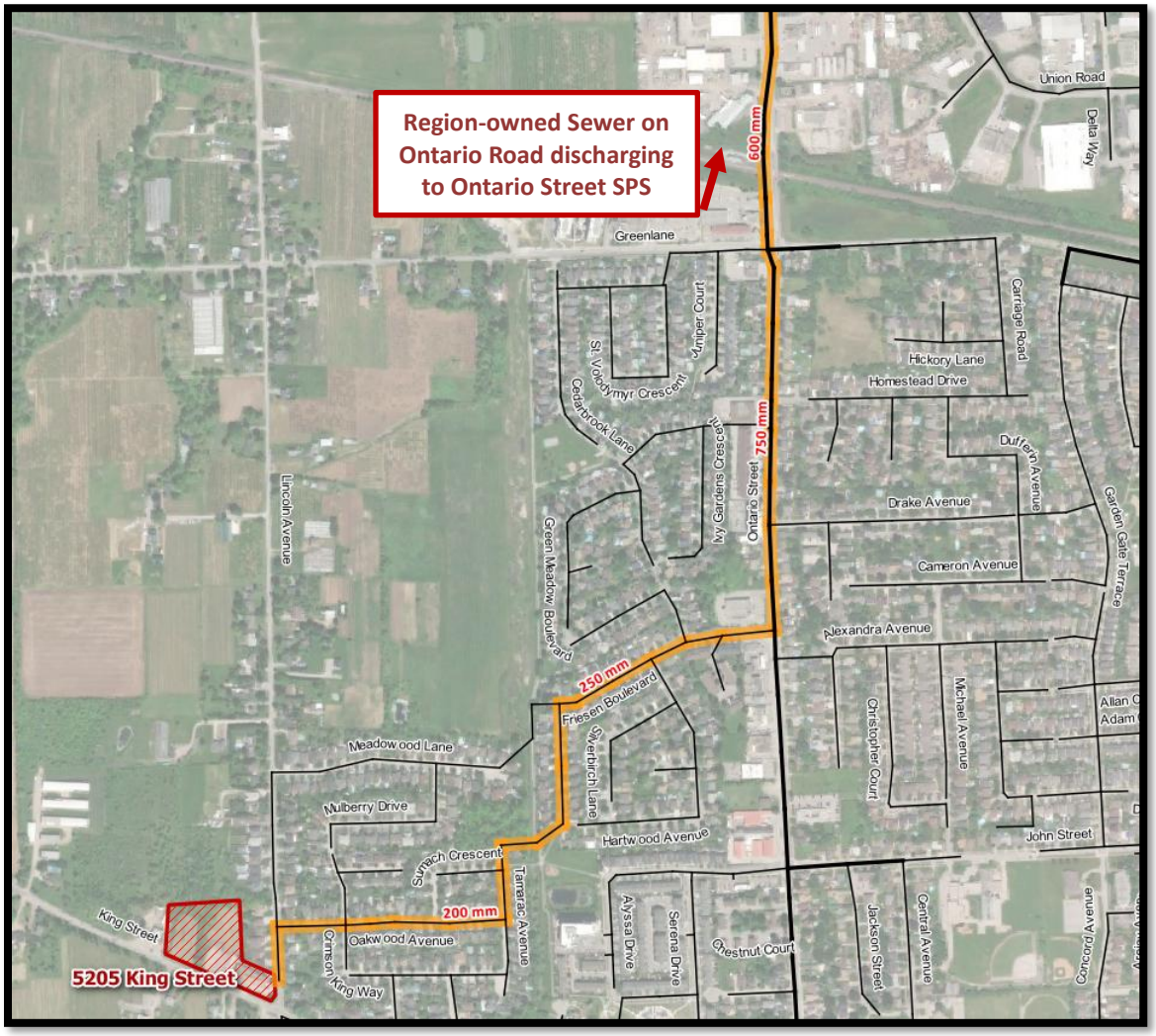


Figure 2: Development Flow Path

2.3. Summary of Past Recommendations

Through the 2021 Baker Road WWTP PPCP, several upgrades within Beamsville are identified. First, reducing flows to the Friesen Boulevard sewer by targeting inflow and infiltration (I&I) reduction in the upstream residential area by 20 L/s and targeting a 2-year design storm peak flow of 55 L/s in the sewer at Friesen Boulevard and Ontario Street. In addition, through the 2021 PPCP and confirmed in the 2021 Region MSPU, deficiencies along the Ontario Street trunk sewer were identified and upgrades were recommended. Through the *Ontario Street and General Recommendations (2021)*, the impacts of increased growth on the recommended Ontario Street sewer upgraded were further identified. **Table 2** below and **Figure 3** summarize the findings of the Ontario Street Sewer assessment.

Since the report, the following upgrades have been completed:

- Existing 250mm Town sewer on Queen Street between Mountain Street and King Street has been upgraded to 375mm, which was greater than the recommended 300mm upgrade.
- Existing 450mm Town sewer on Ontario Street between King Street to John Street was upgraded to 525mm.
- Existing 450mm Town sewer on Ontario Street between John Street to Alexandra Avenue was upgraded to 600mm.
- Existing 600mm Town sewer on Ontario Street between Alexandra Avenue to Greenlane was upgraded to 750mm.

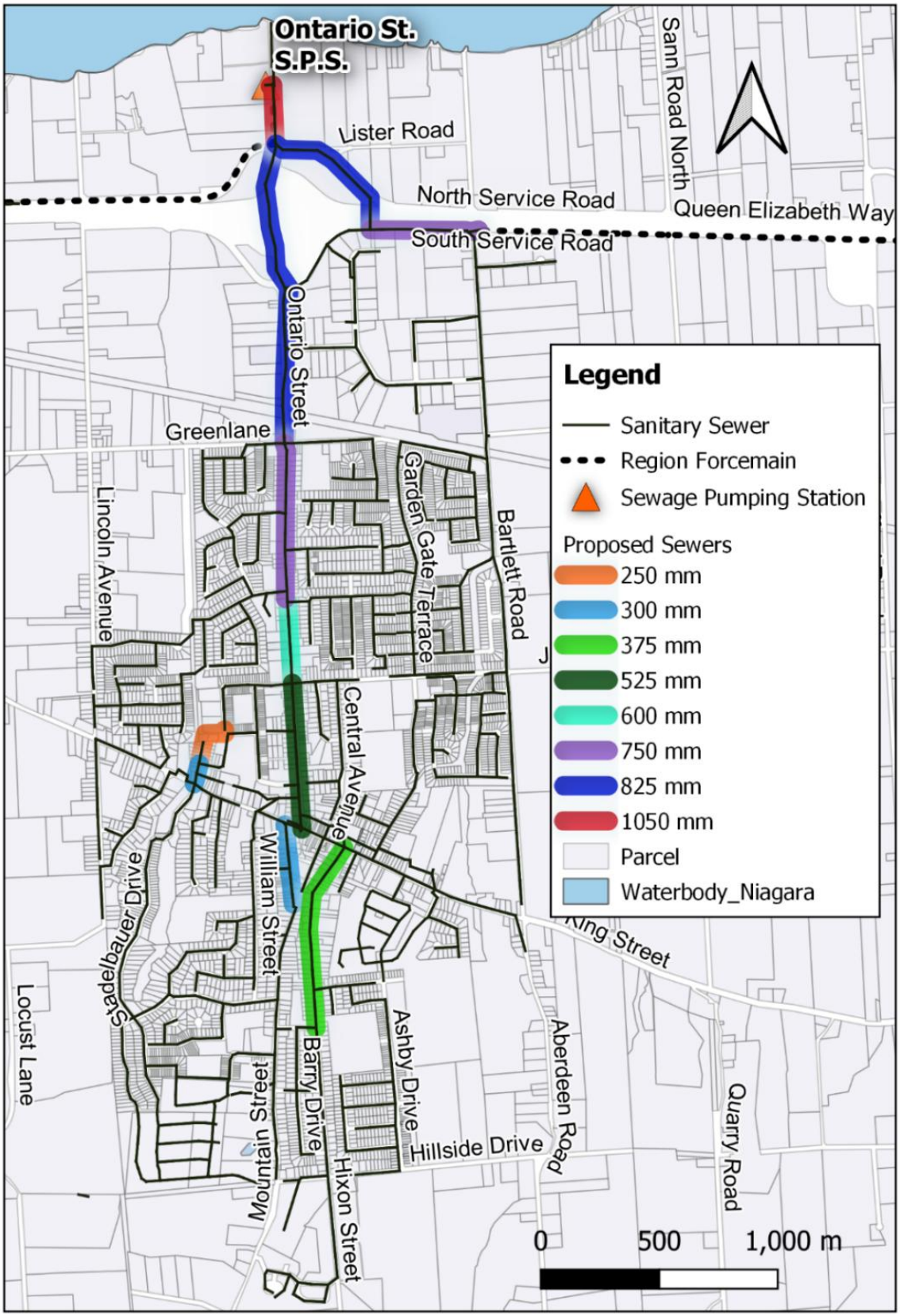


Figure 3: Ontario Street Sewer Upgrade Recommendation

Table 2: Ontario Street Sewer Upgrades

Ontario Street Trunk Segment	Length (m)	Existing Sewer Size (mm)	Total Existing Sewer Capacity (L/s)	Existing 5 Year Flows (L/s)	Existing Sewer Infill Growth Capacity (People and Jobs)	Proposed PPCP Sewer Size (mm)	PPCP Total Upgraded Sewer Capacity (L/s)	PPCP 5Year & Growth Flows (L/s)	Additional Infill Growth Capacity (People and Jobs)[1]	DC Review Proposed Size (mm)	DC Review Total Upgraded Sewer Capacity (L/s)	DC Review Future 5 Year Storm & Growth Flows (L/s)	Additional Infill Growth Capacity (People and Jobs)[2]	Summary of Issues	DC Upgrade Justification
King Street to Alyssa Drive Assumed 0.9% slope.	620	450	270.5	228	4,448	450	270.5	255.0	1,621	**525**	408.0	276.0	13,823	Insufficient capacity for 2021 DC growth projections with minor surcharging.	Upgrade required to accommodate 2021 DC growth projections.
Alyssa Drive to Alexandra Avenue Assumed 0.6% slope.	350	450	220.8	319	0	**600**	475.6	376.0	10,432	**600**	475.6	425	5,300	Insufficient capacity for growth with risks of basement flooding from 2 year design storm	Upgrade required to accommodate 2021 DC growth projections.
Alexandra Avenue to Greenlane Assumed 0.8% slope.	660	600	549.2	474	7,874	600	549.2	531.0	1,905	**750**	995.7	564	45,215	This segment was not triggered for upgrades based on the PPCP criteria; the sewer surcharged within allowable freeboard. The latest growth flows exceed the sewer capacity.	Upgrading this sewer takes advantage of the concurrent construction and provides flexibility for future flows. Alternatively, I&I reduction could potentially avoid the need for the sewer upgrade.
Greenlane to Lister Road Assumed 0.4% slope.	1,300	600	388.3	474	0	600	388.3	531.0	0[3]	**750**	704.1	662	4,407	Insufficient capacity for growth with risks of basement flooding from 2 year design storm	Upgrade required to accommodate 2021 DC growth projections. Sized to accommodate Beamsville GO Station Secondary Plan buildout to 15,000 people. 750 mm upgrades marginally sufficient, utilizing 94 % of available capacity. 825 mm upgrade is recommended.
										825	907.8	662	25,745		
Lister Road to Ontario St SPS Assumed 0.3% slope[4]	260	750	609.8	718	0	**900**[4]	991.5	1028.0	0[3]					Insufficient capacity for growth with risks of basement flooding from 2 year design storm, triggered by growth in Ontario St catchment and Victoria Ave SPS upgrade	

1. Additional capacity beyond the growth projected with the PPCP study
2. Additional capacity beyond the growth projected with the 2021 DC review
3. The PPCP preferred solution targeted 80-100 L/s of I&I reduction in the Ontario St SPS, to reduce trunk impacts and extent of sewer upsizing
4. Region MSPU upgrades of Ontario Street Sewer downstream of Greenlane was 825 mm based on MSPU growth projection and use of 0.4 L/s/ha wet weather flow allowance

2.4. Summary of Ontario Street Sewershed Capacity

The risk and capacity of the Ontario Street Sewer was further assessed through the *Ontario Street Sewershed Capacity Analysis (2023)*. Under this review it was found that basement elevations in the Ontario Street sewer downstream of Greenlane were higher than the 1.8 m freeboard target; as such; there was capacity allow for phased development approvals within the Ontario Street SPS, inline with I&I reduction works, in an effort to mitigate against the potential risk of basement flooding and to minimize the increase in short-term overflow volumes. The phased release of allocation within the Ontario Street catchment would consist of:

- 2,000 people and jobs equivalent can be accommodated under current conditions while minimizing the potential for basement flooding in the downstream sewer.
- An additional 2,500 (total 4,500) people and jobs equivalent can be accommodated following the completion of all identified I&I works (including all identified sewer rehabilitation/replacement, manhole sealing, and lateral repairs) for Elizabeth, Friesen, Hixon, Victoria, and West subcatchments.
- An additional 2,000 (total 6,500) people and jobs equivalent can be accommodated following the completion of all identified I&I works (including all identified sewer rehabilitation/replacement, manhole sealing, and lateral repairs) for Elizabeth, Friesen, Hixon, Victoria, West, and William subcatchments.
- There is potential for the full allocation of 9,000 people and jobs to be accommodated prior to the completion the Ontario Street SPS, provided there is sufficient post-reduction flow monitoring of the complete I&I works to demonstrate that the full projected I&I reduction has been achieved.
- The capacity restrictions below 9,000 people and job equivalent can be lifted following the completion of the planned Ontario Street SPS upgrades.

Implementation of the Town sewer upgrades south of Greenlane has the potential to benefit system performance south of Greenlane under the 2-year storm; however, it also has the potential to increase downstream flooding and overflow risk if completed prior to the planned Ontario Street SPS upgrades.

3. Performance Objectives

The sewer needs were based on providing the following performance objectives:

- d/D: the ratio of hydraulic depth over full pipe depth is <1.0; if failing to do so then,
- Maintain system hydraulic grade line (HGL) of a surcharging sewer below the Region's basement protection freeboard of 1.8 .m
- Performance is based on the 2-year design storm as defined in the PPCP

For new gravity sewer, sizing will be based on:

- d/D: the ratio of hydraulic depth over full pipe depth is <0.7, when considering buildout flows
- Performance is based on the 5-year design storm as defined in the PPCP

3.1. Gravity Sewer Capacity

3.1.1. Existing Sewer Performance

Table 3 summarizes the impacts of the proposed development on the performance of the existing downstream sewer under 2 and 5-year design storms with the upgrades on Ontario Street as described in **Section 2.3**.

Based on the model results:

- The existing 200mm Town-owned sewers from the development tie-in point on Lincoln Avenue to Oakwood Avenue have sufficient capacity to safely convey existing flows under the 2-year and 5-year design storms. The sewer also has sufficient capacity to safely convey the proposed development under the 2-year design storm without surcharging.
    - Under the 5-year design storm, the sewers experience surcharging above the 1.8 m basement flooding risk protection elevation with proposed development flows. Surcharging is due to downstream backflow conditions.
    - Surcharging due to backflow conditions will be resolved following actions to alleviate surcharging downstream.
- The existing 200-250mm Town-owned sewer between Lincoln Avenue and Oakwood Avenue to Friesen Boulevard and Ontario Street experiences surcharging with risk of surface flooding for the 2-year and 5-year design storms under existing and post-development flows due to undersized sewers on Friesen Boulevard.
    - The addition of the proposed development flows increases the risk of surface flooding and backflow under the 2-year and 5-year design storms.
    - To alleviate existing and post-development surcharging, there may be opportunity for inflow and infiltration reduction to reduce I&I by 20 L/s. Otherwise, upsizing the following sewers can also alleviate surcharging:
        - Tamarack Avenue north of Oakwood Avenue to Hartwood Avenue at Friesen Boulevard should be upsized from 200mm to 300mm
        - Friesen Boulevard from Hartwood Avenue to Ontario street from 250mm to 375mm
- The existing 750mm Town-owned sewer on Ontario Street between Friesen Boulevard to Greenlane have sufficient capacity to accommodate the existing and proposed development flows under the 2-year design storm without surcharging.
    - Under the 5-year design storm, the sewers experience surcharging above the 1.8m basement flooding risk protection elevation with existing flows. The addition of the proposed development flows increases the risk of surcharging to surface, due to downstream backflow conditions.
    - Surcharging due to backflow conditions will be resolved following planned upgrades to the Ontario Street SPS.

- The existing 600-750mm Region-owned sewer on Ontario Street between Greenlane to the Ontario Street SPS experiences surcharging under 2-year and 5-year design storm under existing and post-development flows above the 1.8 m basement flooding risk protection elevation due to downstream backflow conditions. However, there is no risk of basement flooding based on the *Ontario Sewershed Capacity Assessment.*
    - Surcharging due to backflow conditions will be resolved following planned upsizing per the *Ontario Street and General Recommendations (2021)* to 825mm and upgrades to the Ontario Street SPS.

Given the existing deficiencies in the sewers downstream of the development with risk of surface flooding under the 2-year design storm with existing flows, the addition of the proposed development flows would further increase the risk of surface flooding. Prior to the allowance of additional flows, surcharging in the Friesen Boulevard catchment must be alleviated by:

- Successful I&I reduction of at least 20 L/s
- Upsizing the deficient sewers to accommodate existing and development flows.

Surcharging in the Ontario Street sewers should be managed by capacity allocation detailed in **Section 3.2**.

Table 3: Peak d/D Capacity Results in Sewers from the Tie-in Point to the Region Trunk Sewer

Scenario		Proposed Development tie-in point on Lincoln Ave to Oakwood Ave (200mm Town Sewer)		Lincoln Ave and Oakwood Ave to Friesen Blvd and Ontario St (200-250mm Town Sewer)		Ontario St from Friesen Blvd to Greenlane (750mm Town Sewer)		Ontario St from Greenlane to Ontario St SPS (600-750mm Region-owned Sewer)	
		d/D	Freeboard (m)	d/D	Freeboard (m)	d/D	Freeboard (m)	d/D	Freeboard (m)
1:2 Year	Pre-Dev	0.58	2.66	≥1.00	<0.3m Risk of Surface Flooding	0.97	2.94	≥1.00	0.78
	Post-Dev	0.77	2.20	≥1.00		0.97	2.94	≥1.00	0.79
1:5 Year	Pre-Dev	0.59	2.38	≥1.00		≥1.00	1.20	≥1.00	0.65
	Post-Dev	≥1.00	1.47	≥1.00		≥1.00	<0.3m Risk of Surface Flooding	≥1.00	0.36

3.2. Ontario Street Sanitary Pumping Station

The existing capacity of the Ontario Street SPS is 420 L/s and 265 m^3 of storage, the PPCP identified an upgrade to the station of 746 L/s while also removing 50-70 L/s of I&I flows. The 2021 Region MSPU recommended an upgrade to 840 L/s. **Table 4** provides a summary of the flows to the station based on the Region's 0.286 L/s/ha design allowance and the 5-year design storm.

Table 4: Ontario Street Sanitary Pumping Station Flows

Scenario	Pump Station Capacity (L/s)	Peak Dry Weather Flow (L/s)	RDII Design Allowance Flow (L/s)	Peak 5-Year Design Storm Flows (L/s)
Existing	420	153.6	599.6	515.6
Existing + Development	420	160.8	606.8	522.8
Baker Road PPCP (Buildout)(1)	746	395.5	746.3	815.3
2021 Development Charges Study Update – Excluding Development	N/A	320.9	682.2	844.4
2021 Development Charges Study Update – Including Development	N/A	328.1	689.4	851.6
2021 Region MSPU (2051 Growth)	840	326.6	787.9	703.9

Based on the SPS capacity analysis:

- Under existing conditions, the station's existing capacity of 420 L/s is exceeded based on the Region's design allowance and 5-year design storm flows under existing and post-development flows.
- With the 2021 Region MSPU recommendation of increasing the station capacity to 840 L/s, there is sufficient capacity for both the design allowance and 5-year design storm flows under existing and post-development flows.
- Once the planned Region's sewer north of Greenlane and SPS upgrades are implemented, it is anticipated that the surcharging sewers on Ontario Street as a result of backflow from the SPS will be alleviated and will be confirmed by the upcoming 2026 Region Master Servicing Plan.
- Until the Region's sewer and SPS upgrades are implemented, it is recommended that the phased release of allocation within the Ontario Street catchment be followed as outlined in the *Ontario Sewershed Capacity Assessment (2023).*
    - The proposed development would contribute to an equivalent of approximately 605 people for the purposes of tracking capacity allocation.

4. Conclusion

The development at 5205 King Street, Beamsville, Ontario has the following impacts on the existing wastewater system:

- The existing Town-owned sewers downstream of the development has sufficient capacity to safely convey existing flows under the 2-year and 5-year design storms with the exception of:
    - The existing 200-250mm Town-owned sewer between Lincoln Avenue and Oakwood Avenue to Friesen Boulevard and Ontario Street experiences surcharging with risk of surface flooding for the 2-year and 5-year design storm due to undersized sewers on Friesen Boulevard.
    - The existing 750mm Town-owned sewer on Ontario Street between Friesen Boulevard to Greenlane surcharge above the 1.8m basement flooding risk protection elevation in the 5-year design storm.
    - The existing 600-750mm Region-owned sewer on Ontario Street between Greenlane to the Ontario Street SPS experiences surcharging above the 1.8m basement flooding risk protection elevation under the 2-year and 5-year design storm, however there is no risk of basement flooding based on the *Ontario Sewershed Capacity Assessment*.
- Given the existing deficiencies in the sewers downstream of the development with risk of surface flooding under the 2-year design storm with existing flows, the addition of the proposed development flows would further increase the risk of surface flooding. Prior to the allowance of additional flows, surcharging and backflows in the Friesen Boulevard catchment must be alleviated by:
    - Successful I&I reduction of at least 20 L/s or upsizing the deficient sewers to accommodate existing and development flows:
        - Tamarack Avenue north of Oakwood Avenue to Hartwood Avenue at Friesen Boulevard should be upsized from 200mm to 300mm
        - Friesen Boulevard from Hartwood Avenue to Ontario street from 250mm to 375mm
- Surcharging due to backflows in the Ontario Street sewers north of Friesen Boulevard should be managed by the Town and the Region based on the capacity allocations recommended in the *Ontario Sewershed Capacity Assessment (GEI Canada Ltd., formerly GM BluePlan, February 2022).*
    - The proposed development would contribute an equivalent of 605 people for the purposes of tracking available capacity within the downstream Ontario Street trunk sewer and SPS.
    - Surcharging due to backflow conditions will be resolved following planned upsizing per the *Ontario Street and General Recommendations (2021)* to 825mm and upgrades to the Ontario Street SPS.

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Project Number: 22035
Project Name: 22035 King Street
Date: Nov-24

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 2020).

An estimate of the fire flow required is given by the following formula:

$$F = 220\,C\sqrt{A} \qquad (1)$$

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 Type V for wood frame construction .
= 0.8 Type IV-A Mass Timber Construction
= 0.9 Type IV-B Mass Timber Construction
= 1.0 Type IV-C Mass Timber Construction
= 1.5 Type IV-D Mass Timber Construction
= 1.0 Type III Ordinary Construction
= 0.8 Type II Non Combustible Construction
= 0.6 Type I Fire Resistive Construction

A = Total floor area in square metres

				(1)		(2)			(3)		(4)		Final Adjusted Fire Flow	
Building / Location	# of Storeys	Total GFA (m^2)	Type of Construction	*Fire Flow "F"* (l/min)	(l/s)	*Occupancy* %	Adjustment (l/min)	Adjusted Fire Flow (l/min)	*Sprinkler* %	Adjustment (l/min)	*Exposure* %	Adjustment (l/min)	(l/min)	(l/s)
7-Storey Building 1	**7**	**8808**	**0.6**	12000	200.0	**-15**	-1800.0	**10200.0**	**-50**	-5100.0	30	3060.0	**8000**	**133**

Total Area Calculation Building A:

Two largest ajoining floors plus 50% of any floors immediately above them up to eight floors

Floor	Area	Tot. Area	Cumm. Area
1	2174	2174	2174
2	2026	2026	4200
3-4	2026	2026	6226
5-6	2026	2026	8252
7	1112	556	8808

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No Charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

Minimum credit for systems designed to NFPA 13 is 30%.

If the domestic and fire services are supplied by the same municipal water system, then take an additional 10%.

If the sprinkler system is fully supervised (ie. annunciator panel that alerts the Fire Dept., such as a school), then an additional 10% can be taken. Maximum credit = 50%.

(4) Exposure

0 to 3m	25%	
3.1 to 10m	20%	Calculate for all
10.1 to 20m	15%	sides. Maximum
20.1 to 30m	10%	charge shall not
Greater than 30	0%	exceed 75%

BLDG B Side	Exposure (m)	Charge (%)
North =	**>30**	**0**
East =	**10.1-20**	**20**
South =	**>30**	**0**
West =	**20.1-30**	**10**
Total Expoure =		***30***

QUOTE # 10127

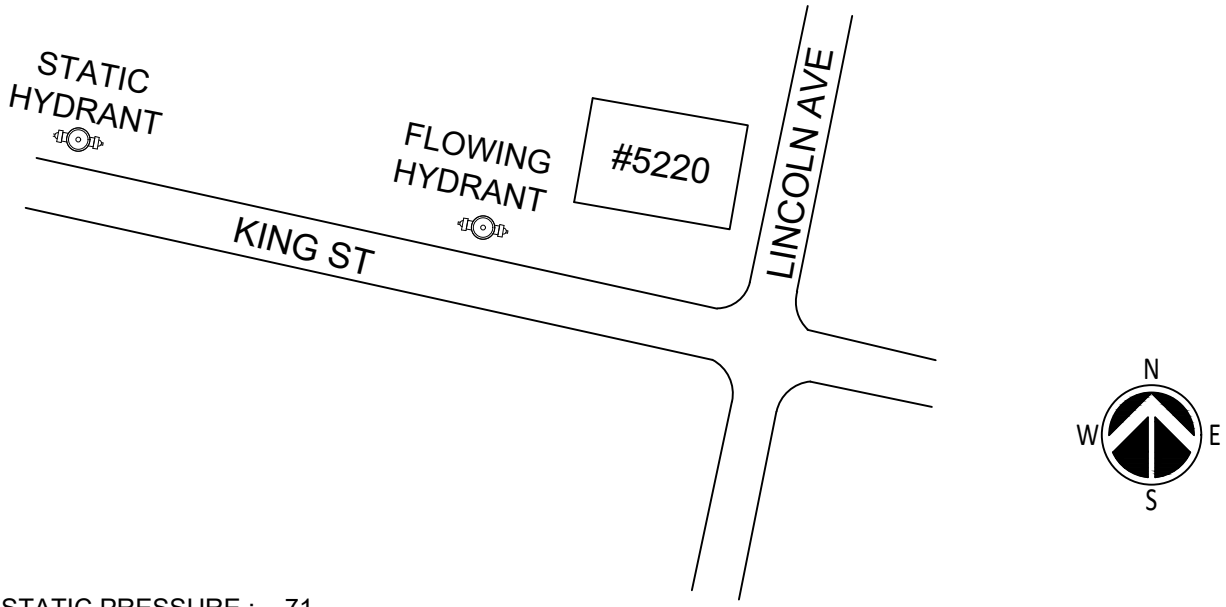
FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

FLOW TEST RESULTS

DATE : 12 MARCH 2025 TIME : 8:30 AM

LOCATION : 5220 KING STREET
LINCOLN, ONTARIO

TEST BY : VIPOND & LINCOLN PUBLIC WORKS



STATIC PRESSURE : 71 ---------- PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	2-1/2"	0.9	71	45	1131
2	2	2-1/2"	0.9	65	38 + 38	1040+ 1040
						2080

NOTE:

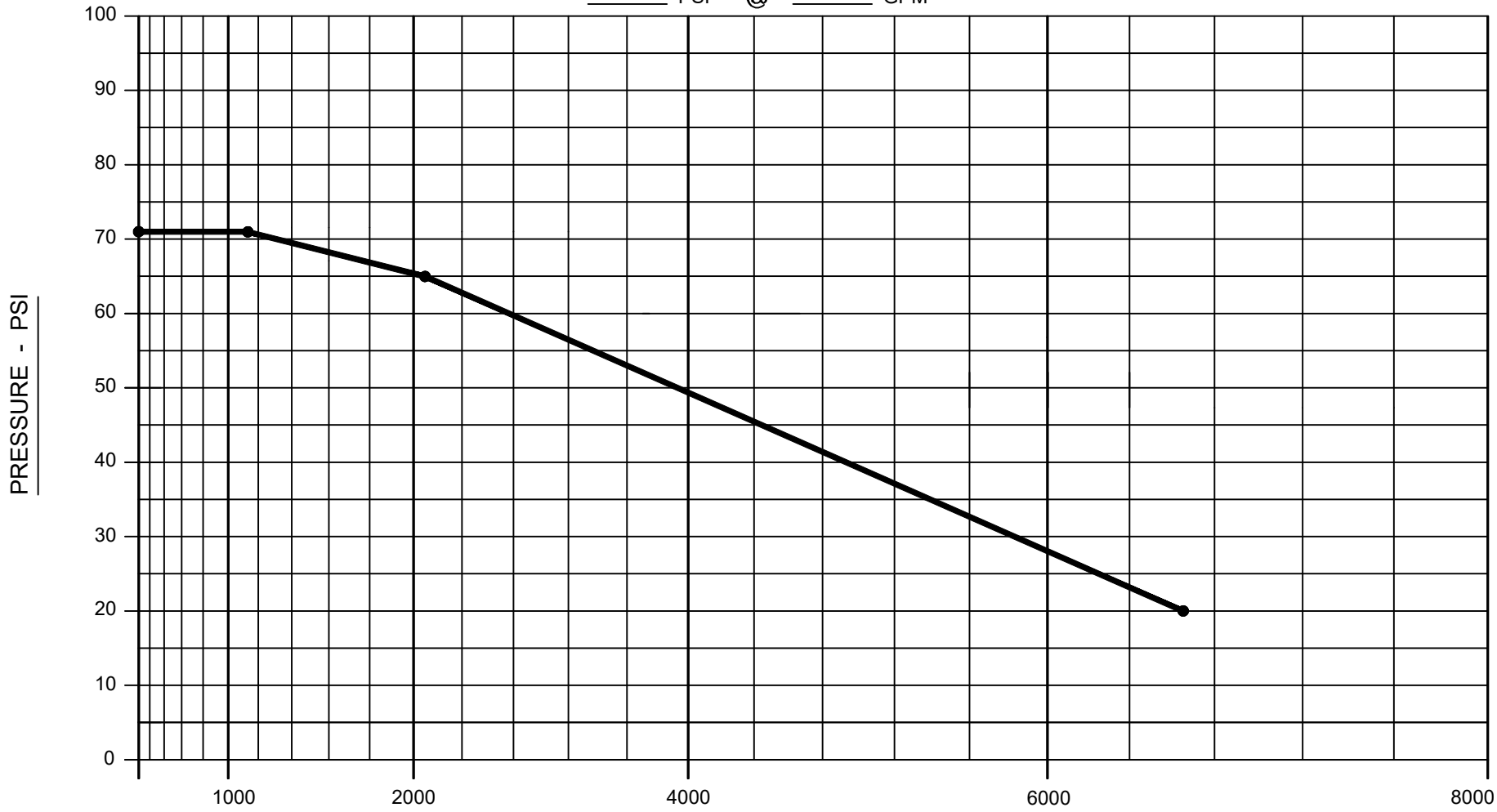
QUOTE # 10127

FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

5220 KING STREET	BY : R. DOWD	JOB # : 4V4555
LINCOLN, ONTARIO	OFFICE : VIPOND STONEY CREEK	
	TEST BY : VIPOND PERSONNEL	
	LINCOLN WATER WORKS	

STATIC : 71 PSI

71	PSI	@	1131	GPM
65	PSI	@	2080	GPM
20	PSI	@	6606	GPM (THEORETICAL FLOW)
	PSI	@		GPM



VIP-DES-FO5-C

QUOTE # 10127

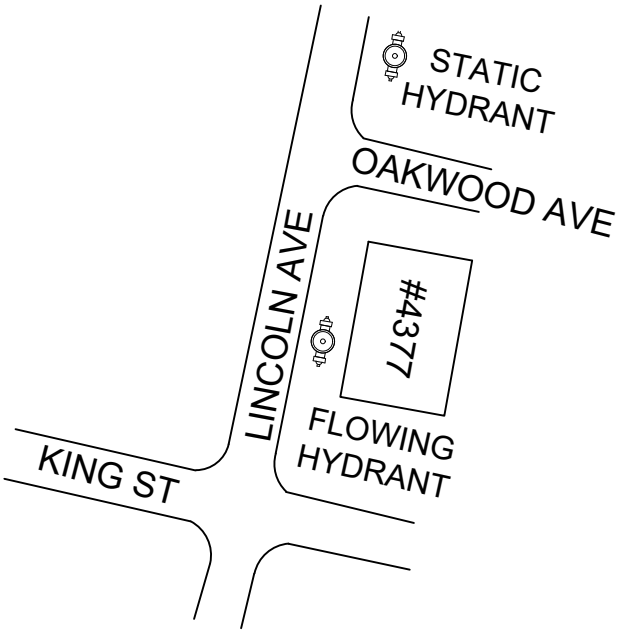
FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

FLOW TEST RESULTS

DATE : 12 MARCH 2025 TIME : 9:00AM

LOCATION : 4377 LINCOLN AVE
LINCOLN, ONTARIO

TEST BY : VIPOND & LINCOLN PUBLIC WORKS





STATIC PRESSURE : 85 ---------- PSI

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	2-1/2"	0.9	81	38	1040
2	2	2-1/2"	0.9	75	25+25	843+ 843
						1686

NOTE:

QUOTE # 10127

FIRST FOR FIRE PROTECTION
VIPOND INC
est. 1945

4377 LINCOLN AVE	BY : R. DOWD	JOB # : 4V4555
LINCOLN, ONTARIO	OFFICE : VIPOND STONEY CREEK	
	TEST BY : VIPOND PERSONNEL	
	LINCOLN WATER WORKS	

STATIC : 85 PSI
81 PSI @ 1040 GPM
75 PSI @ 1686 GPM
20 PSI @ 4633 GPM (THEORETICAL FLOW)
_____ PSI @ _____ GPM



VIP-DES-FO5-C