FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

IN SUPPORT OF ZONING BYLAW AMENDMANT THROUGH TRANSIT ORIENTED COMMUNITIES PROGRAM

449, 469 & 471 Carlaw Avenue, M4K 3H9
City of Toronto – Toronto & East York District

8395 Jane Street, Suite 100
Vaughan, Ontario L4K 5Y2
Tel: (905) 326-1404
File Number: 20026

Prepared For:

Choice Properties Limited Partnership

No.	Revision	Date
1	Issued for ZBA Through TOC Program - Submission #1	July 19, 2022

TABLE OF CONTENTS

TABLE OF CONTENTS 2
LIST OF FIGURES, TABLES, APPENDICES & DRAWINGS 3
1.0 INTRODUCTION 5
1.1 Background 5
1.2 Study Parameters 8
2.0 STORMWATER MANAGEMENT 9
2.1 Existing Conditions 9
2.2 Stormwater Management Criteria 9
2.2.1 Quantity – Flood Flow Management Criteria 10
2.2.2 Quantity – Erosion Control Criteria 11
2.2.3 Discharge Criteria to Municipal Infrastructure 12
2.2.4 Water Balance Targets 13
2.2.5 Water Quality Targets–Total Suspended Solids (TSS) 14
2.3 Proposed Storm Servicing (Minor System) 15
2.4 Proposed Stormwater Management 15
2.4.1 Proposed Water Balance 15
2.4.2 Proposed Quality Control 17
2.4.3 Proposed Quantity Control and Modeling 19
3.0 SANITARY SERVICING 27
3.1 Existing Sanitary Servicing 27
3.2 Proposed Sanitary Release Rate And Servicing 27
3.3 Sanitary Capacity Analysis 28
4.0 GROUNDWATER MANAGEMENT 32
5.0 WATERMAIN SERVICING 33
5.1 Existing Water Servicing 33
5.2 Proposed Water Servicing Strategy 33
5.3 Water distribution system Modeling 35
6.0 CONCLUSIONS 37

LIST OF FIGURES, TABLES, APPENDICES & DRAWINGS

Figures

Figure 1: Key Plan
Figure 2: VO6 Model Post and Pre-Development 100-year Hydrographs
Figure 3: Offsite Combined Sewer Offset Plan

Tables

Table 1: Site Statistics
Table 2: Allowable Release Rate to Municipal Storm Sewer on Carlaw Avenue
Table 3: Comparison of Peak Flow Requirements
Table 4: Water Balance Calculation Results Summary
Table 5: Post-Development Water Quality/TSS Removal Calculation Results Summary
Table 6: Post-Development Drainage Characteristics and VO6 Modelling Results for Block 2
Table 7: City of Toronto Storm Design Parameters
Table 8: Water Quantity Calculation Results Summary (SWM Matrix)
Table 9: Water Quantity Summary to Site Outlets
Table 10: Summary of Equivalent Populations Based
Table 11: Peak Flow Summary
Table 12: Offsite Offsetting Summary
Table 13: Water Demand Summary

Appendices

Appendix A:

- Architectural Site Plan and Statistics. – Under Separate Cover.
- Buried Utility Map by Mark It Locates Inc.
- Topographic Survey by SVNG.

Appendix B:

- Stormwater Management Calculations
- V06 Model Output Files
- Existing Stormwater Drainage Assessment Report (I2S Infrastructure Inc.)

Appendix C:

- Sanitary Peak Flow Calculations.
- Offsite Offsetting Calculations.
- On-Site and Off-Site I/I Dye Testing Reports by Infrastructure Intelligence Services Inc.

Appendix D:

- Water Demand Summaries.
- EPANET Water Model.

Drawings

Public Utility Plan schematic – SW-PUP

Pre-Development SWM Drainage Plan – SWM1

Post-Development SWM Drainage Plan – SWM2

1.0 INTRODUCTION

1.1 BACKGROUND

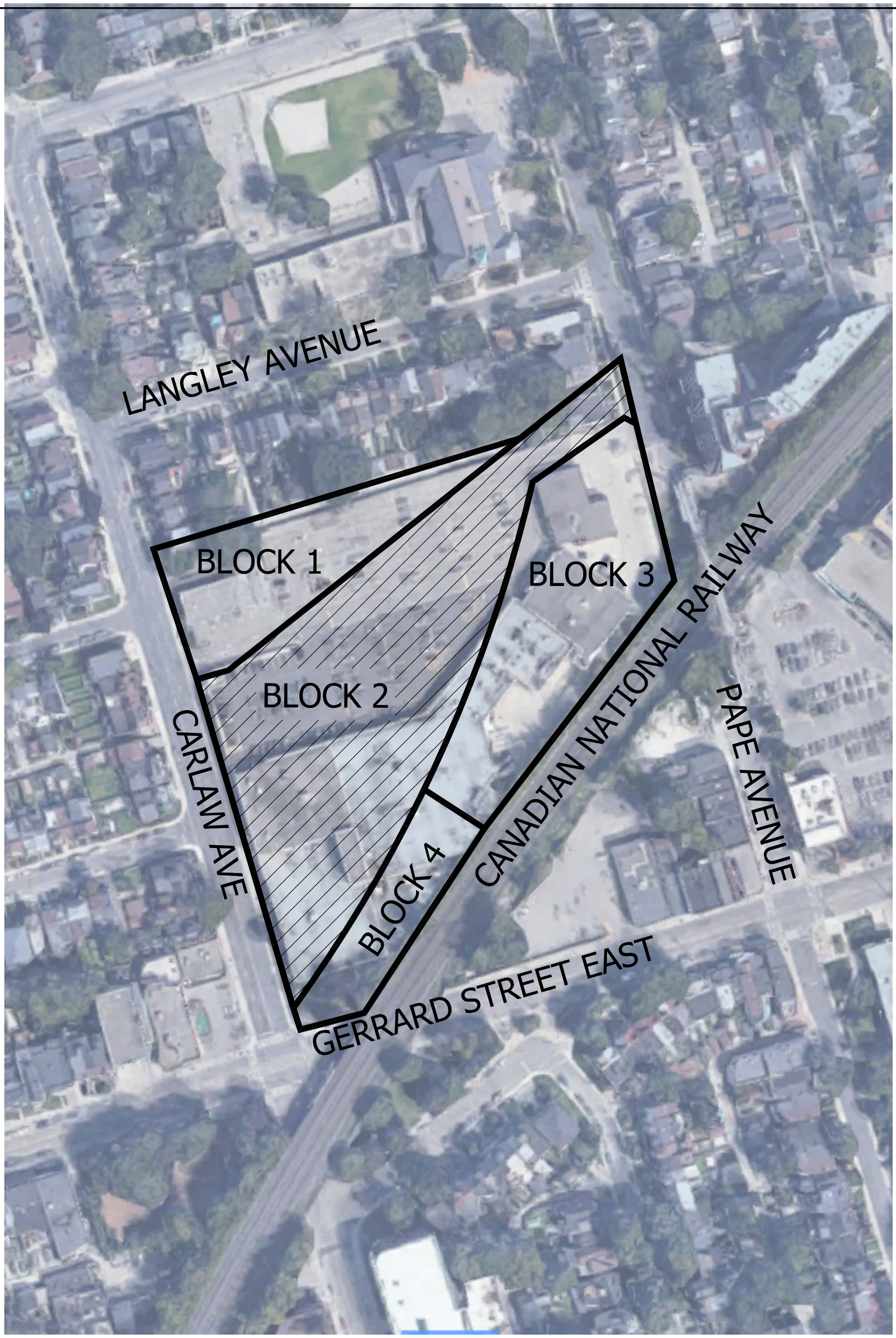
This Functional Servicing and Stormwater Management Report ('FSSR') has been prepared in support of a zoning bylaw amendment application through the Transit Oriented Communities ('TOC') program, (referenced in whole as 'ZBA') for the proposed development located at 449, 469 and 471 Carlaw Avenue within the City of Toronto ('The Site'). The 2.27 hectare subject site is located on the east side of Carlaw Avenue and north of Gerrard Street (and CNR railway) within the City of Toronto. The site is surrounded by residential uses to the north, west and east and the CNR railway to the south. The site currently consists of various commercial/retail uses and a paved parking lot. Refer to **Figure 1** for a key plan of the subject site relative to surrounding conditions.

The proposed re-development concept has been prepared by Hariri Pontarini Architects Inc. ('HPA'). One new public road ('New Street') is proposed that will bisect the site and will connect the terminus of Pape Avenue and Carlaw Avenue. A stratified parkland (referred to in this report as 'Block 1') is proposed for the created block north of New Street. Block 1 is proposed to have the top 1.5m dedicated to the City of Toronto for park use, and the land below this level to be retained by the owner. A Metrolinx station/tunnel area is proposed to be created that will not form part of the post-development area, at the south-west corner of the site (referred to in this report as 'Block 4' or 'OL Station'). A privately-owned, publicly accessible space ('POPS') is proposed south of New Street (referred to in this report as 'Block 3'). Similar to Block 1, this is proposed to be stratified with the upper 1.5m owned by the owner, and below grade transferred for the use of the future transit line and tunnel. Lastly, a residential/retail development block (referred to in this report as 'Block 2') is located south of New Street. This block will have it's below grade area predominately taken up with 3 levels of below grade parking structure.

Refer to **Appendix A** for architectural plans and statistics (provided under separate cover). Refer to **Table 1** for a summary of block and building statistics as provided by HPA.

Table 1: Site Statistics

Block	Building	Use	+/- Block Area (ha)	Residential Units
1	None	Stratified Parkland	0.337	0
2	Towers A/B/C	Residential/Retail	0.834	1,080
3	None	Stratified POPS	0.586	0
Sub-Total – Development Blocks:			**1.757**	**1,080**
n/a	None	New Street	0.306	0
Sub-Total – Public Roads:			**0.306**	**0**
Totals:			**2.063**	**1,080**



SITE LOCATION PLAN

counterpoint ENGINEERING
COUNTERPOINT ENGINEERING INC.
8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

PROPOSED MIXED USE DEVELOPMENT
CARLAW & GERRARD (CHOICE PROPERTIES)
TORONTO, ON.

COMMERCIAL DEVELOPMENT

DESIGNED BY: T.Z	DATE: JULY 18, 2022
CHECKED BY: G.D	PROJECT No. 20026
DRAWING BY: T.Z	
CHECKED BY: G.D	FIGURE No. 1
SCALE: N.T.S	

The purpose of this FSSR is to:

- Complete a concept design of new public infrastructure within the proposed development limits;
- Provide a high-level summary of on-site infrastructure requirements, at the block level and for the public roads, prior to the detailed design which would typically occur as part of a plan of subdivision application.

1.2 STUDY PARAMETERS

The background documents listed below have been considered in the preparation of this FSSR:

- Architectural plans and inputs prepared by Hariri Pontarini Architects Inc.
- City of Toronto Design Criteria for Sewers and Watermains, January 2021;
- City of Toronto Wet Weather Flow Management Guidelines ('WWFMG'), November 2006;
- Toronto Green Standard v4.
- Toronto Green Roof By-Law, 2009.
- Fire Underwriters Survey, 1999;
- Various plan and profile drawings obtained from the City of Toronto;
- DMOG information obtained from the City of Toronto;

2.0 STORMWATER MANAGEMENT

2.1 EXISTING CONDITIONS

The subject site is currently occupied by various commercial, retail and residential buildings with a paved parking lot. Based on a subsurface utility investigation (QL-B) performed by Mark It Locates Inc., onsite private storm sewer infrastructure was identified.

Based on this analysis there are two pre-development outlets, refer to drawing **SWM1**. Area 100 (1.91 ha) compromises the majority of the parking lot and buildings on the site, and drains to the existing storm sewer in Carlaw Avenue. Area 101 (0.14 ha) is captured by catchbasins and is connected to the existing combined sewer in Pape Avenue. The area of the existing site which is considered Block 4 in the proposed development will be excluded from the stormwater management calculations as this portion of land (0.22ha) will be expropriated by Metrolinx to facilitate the construction of the OL Station. External drainage does not appear to enter the site prior to discharge to public infrastructure.

The following sections summarize the various stormwater management requirements and commentary on how the subject site and internal development blocks will adhere to them.

2.2 STORMWATER MANAGEMENT CRITERIA

The City of Toronto's WWFMG document describes a 'hierarchical approach' that should be undertaken when designing an appropriate stormwater management system and controls for a land development project. The hierarchy is summarized as follows:

- **Source Control** - Source controls at the lot level are the preferred method for controlling the impacts of wet weather flow.
- **Conveyance Control** – Conveyance controls, such as roadside ditch/swale and/or infiltration systems, shall be implemented, where new roads are built, to the maximum practicable extent site conditions and soil conditions permit.

- **End-of-Pipe Control** – End-of-pipe controls shall be implemented after source controls and conveyance controls are unable to achieve the necessary level of stormwater quality and quantity control targets.

There are numerous methods for implementing each control in order to provide a 'treatment train' system. The following sections summarize the various stormwater management requirements and provides commentary on how the subject site and internal development blocks will adhere to them. It should be noted that the methods of achieving the stormwater criteria for the site will be further refined at the plan of subdivision level and the site plan level for each development block.

2.2.1 Quantity – Flood Flow Management Criteria

The City of Toronto's water quantity targets are intended to focus on flood flow management and erosion control measures, in order to reduce impacts to downstream infrastructure and outlets. Section 2.2.3.1 – Flood Flow Management Criteria of the WWFMG stipulate the following requirements:

- *The required level of peak flow control from a development site contributing flow to a specific watercourse at the point of discharge, shall follow Toronto and Region Conservation Authority (TRCA) Flood Flow Criteria Map (see Appendix C.1).*
- *For development sites within the City's chronic basement flooding areas (see City of Toronto Basement Flooding Relief Work Program Location Map & Schedule in Appendix D), the proponent shall consult Toronto Water - Sewer Asset Planning Section for details of requirements, where applicable.*
- *The City of Toronto has adopted the 100-year storm as the level of protection for properties, where feasible, against surface flooding from ponding on streets, particularly, in areas of the City experiencing chronic basement flooding and/or when a proper major overland flow stormwater drainage system does not exist (see Section 2.2.3.8 for overland flow drainage system requirements).*
- *For development sites < 2 ha, the proponent may use a simplified approach such as the Rational Method / IDF curves to compute peak flows.*

The subject site is located within a watershed that drains directly to Lake Ontario (e.g., Lake Ontario Waterfront). Appendix C.1 of the WWFMG identifies flood flow criteria for the subject site to control 2-year to 100-year post-development to pre-development levels.

2.2.2 Quantity – Erosion Control Criteria

The City of Toronto's water quantity targets are intended to focus on flood flow management and erosion control measures, in order to reduce impacts to downstream infrastructure and outlets. Section 2.2.3.3 – Flood Flow Management Criteria of the WWFMG stipulate the following requirements:

- *For Rouge River watershed (within City of Toronto), follow TRCA (Toronto and Region Conservation Authority) erosion control criteria for individual sites, which discharge directly to and/or are in proximity of natural watercourses.*
    - *Detain the post-development rainfall runoff from a 30 mm storm for a minimum of 24 hours for Tributary "B" of the little Rouge Creek.*
    - *Detain the post-development rainfall runoff from a 33 mm storm for a minimum of 48 hours for the Morningside Tributary of the Rouge River.*
- *For all other watersheds where new large development blocks (site area > 5 ha) discharge directly and/or in proximity (within 100 m) of natural watercourses, the proponents are required to complete an Erosion Analysis Report to determine the erosion control criteria for the sites.*
- *For sites where it is not feasible (this condition must be reviewed and agreed by City staff) to complete an Erosion Analysis Report, we typically require that runoff from a 25 mm design storm be detained on-site and released over a minimum of 24 hours.*
- *For small infill/redevelopment sites < 2 ha, erosion control in the form of stormwater detention is normally not required, provided the on-site minimum runoff retention from a small design rainfall event (typically 5 mm) is achieved under the Water Balance Criteria.*
- *New developments shall be designed to minimize the number of new storm outfalls in the valley and all new outfalls shall be designed to minimize potential erosion.*

The subject site has development blocks which are all less than 5 ha in area. In addition, subject site drains to Lake Ontario and not to a watercourse. As such, no erosion criteria apply. However, the water balance criteria will provide erosion control on a block level basis.

Each development block will be less than 2ha in area and will achieve at least the 5mm Water Balance Criteria.

2.2.3 Discharge Criteria to Municipal Infrastructure

Section 2.2.3.7 – Discharge Criteria to Municipal Infrastructure of the WWFMG stipulate the following requirements:

- *The allowable release rate to the municipal storm sewer system (minor system) from the development site during a 2-year design storm event must not exceed the peak runoff rate from the site under pre-development conditions during the same storm event, or existing capacity of the receiving storm sewer, whichever is less.*

Under post-development conditions, the entire site will drain to Carlaw Avenue. Since the site's overall imperviousness under existing condition is greater than 50%, and in accordance with WWFMG, a run-off coefficient of 0.50 and the 2-year storm event was used in calculating the pre-development storm peak runoff during the same event. **Table 2** below summarizes this calculation, which is used to determine the post-development allowable release rate from the subject site to Carlaw Ave storm sewer (not flood protection).

Table 2: Allowable Release Rate to Municipal Storm Sewer on Carlaw Avenue

$Q_A = C \times A \times i / 360$ (L/s)	
A - Site Area (ha)	1.91
C - Runoff Coefficient	0.5
Tc (min)	10
I - Rainfall Intensity (mm/hr)	88
Q - Rational Flow Rate (l/s)	234

Below in **Table 3** is a summary of the pre-development overall peak flow requirements to site's two outlet locations based on the discharge to municipal sewer and flood flow criteria (e.g., Rational flow rate based on run-off coefficient of 0.50 and 2-year storm event, and hydrologic modelling of 2 to 100-year storm events, respectively).

Table 3: Comparison of Peak Flow Requirements

	Carlaw Ave. Outlet		Pape Ave. Outlet	
Storm Event	**Allowable to Municipal Sewer (L/s)**	**Flood Flow Criteria (L/s)**	**Allowable to Municipal Sewer (L/s)**	**Flood Flow Criteria (L/s)**
2	234	407	17	32
5		627		49
10		798		60
25		942		71
50		1127		85
100		1265		95

The development shall ensure both criteria are achieved by the proposed stormwater management approach. As seen in the above **Table 3**, the municipal storm sewer discharge criteria will govern the post-development peak release rates.

In order to understand the breakdown of release rates within various components of the overall project, we have reviewed the discharge criteria at the block level. The parameters for each development block are discussed later in the report and are also summarized in **Table 8**. The release rates by block were calculated using the same method as described above and are included in **Appendix B**. Stormwater detention storage will be provided at the block level for Block 2 in order to ensure that post-development peak flows during 2-year to 100-year storm events are less than the 2-year peak flow at a run-off co-efficient of 0.50. Detailed input such as landscaped areas, uncontrolled drainage, orifice sizing and head values were assumed for the purpose of each block and will be further refined at the detailed design stage of the project. As such, the storage values presented in **Table 8** are not intended to be final and are subject to change.

2.2.4 Water Balance Targets

Section 2.2.1.1 – Water Balance Targets of the WWFMG stipulate the following requirements:

- *Retain stormwater on-site, to the extent practicable, to achieve the same level of annual volume of overland runoff (see Table 2 & Figure 2) allowable from the development site under pre-development (i.e. presently existing site conditions before the new proposed development) conditions.*
- *If the allowable annual runoff volume (see Table 2 & Figure 2) from the development site under post-development conditions is less than the pre-development conditions, then the more stringent runoff volume requirement becomes the governing target for the development site. The maximum allowable annual runoff volume from any development site is 50% of the total average annual rainfall depth.*
- *In most cases, the minimum on-site runoff retention requires the proponent to retain all runoff from a small design rainfall event - typically 5 mm (In Toronto, storms with 24-hour volumes of 5 mm or less contribute about 50% of the total average annual rainfall volume) through infiltration, evapotranspiration and rainwater reuse.*

At a minimum, 50% of the total average rainfall depth will be retained on site through infiltration, evapotranspiration & rainwater reuse.

2.2.5 Water Quality Targets–Total Suspended Solids (TSS)

Section 2.2.2.1 – Water Quality Target – Total Suspended Solids (TSS) of the WWFMG stipulate the following requirements:

- *The wet weather flow (WWF) water quality target is the long-term average removal of 80 % of Total Suspended Solids (TSS) on an annual loading basis from all runoff leaving the proposed development site based on the post-development level of imperviousness.*
- *Overall efficiency in TSS removal can be considered in combination with minimum on-site runoff retention and other conveyance & end-of-pipe controls (i.e., the treatment train)*

A TSS removal of 80% is required, calculated based on a treatment train approach.

Section 2.2.2.3 – Water Quality Target – E.Coli was not reviewed as part of this report as the site does not discharge into a new or existing headwall directly into the Lake or Waterfront area.

2.3 PROPOSED STORM SERVICING (MINOR SYSTEM)

A new storm sewer system is proposed along the new public road, New Street. The overall site will be fully captured and will connect into the existing 375mm diameter storm sewer on Carlaw Avenue. A small portion of the existing Pape Avenue right of way will be captured by New Street and has been identified as an external drainage area. For the purpose of this assessment, a single stormwater connection is provided for Block 2 (Blk 2), however it is understood that as part of detailed design that multiple connections may be required to meet the City's built form servicing requirements. Drainage areas for the Stratified Parkland (Blk 1) and the POPS (Blk 2) are considered uncontrolled. It is common practice to have a dedicated parkland be uncontrolled, and due to the transit infrastructure and lack of servicing depth in the POPS area, conventional stormwater quantity controls are likely not feasible. Refer to the post-development drainage plan, **SWM2.**

2.4 PROPOSED STORMWATER MANAGEMENT

2.4.1 Proposed Water Balance

Water balance efforts such as the use of green roofs, landscaped areas, and water reuse cisterns will be provided to achieve the required water balance objectives. As shown in **Table 4**, the proposed stormwater management approach will retain on average 5.0mm of rainfall on site. This achieves the 5.0mm water balance target, which equates to retaining about 50% of the annual rainfall volume on site. Refer to **Table 4** and **Appendix B** for more detail.

SWM DESIGN CALCULATIONS
Table 4: Water Balance Calculation Results Summary

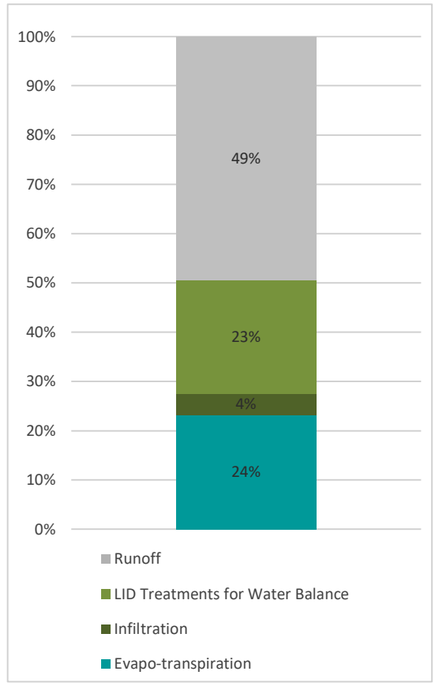
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

Block	Area (ha)	Per Individual Site				Per 2.11 ha Entire Site			
		Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff	Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff
Block 1 (Stratified Parkland)	0.3400	56%	17%	0%	26%	9.1%	2.8%	0.0%	4.2%
Block 2	0.8300	16%	1%	36%	47%	6.4%	0.4%	14.1%	18.5%
Block 3	0.5900	16%	1%	32%	51%	4.5%	0.3%	8.9%	14.3%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	22%	5%	0%	74%	3.6%	0.8%	0.0%	12.2%
Sub-Total	**2.1100**					**24%**	**4%**	**23%**	*** 49%**

* Therefore, overall the site is able to retain events up to 5.0mm, which is equal to 50% of annual rainfall depth..



Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

The water balance credits were calculated on a block level based on land-use and soil types, resulting in values for evapotranspiration, infiltration and runoff. A water reuse cistern is suggested as a low-impact development strategy for Block 2 that is sized to provide storage for the 5mm storm. The use of LID features that have an underground component within Block 3 will be limited, however, best efforts will be made to retain 5mm to achieve the water balance target. Preliminary proposed measures within Block 3 are pervious areas, to be further investigated during detailed design. Refer to **Appendix B** for the tables summarizing the water balance provided on an individual block level.

2.4.2 Proposed Quality Control

Each block has been evaluated based on land-use to determine the initial TSS removal credit and the amount of remaining TSS removal required. The 5mm water retention provided will capture an average of 50% of annual rainfall, therefore removing this volume out of the runoff discharged, and providing 50% TSS average removal. An OGS unit shall be provided for each combined sewer connection within the right-of-way prior to the system discharging onto Carlaw Avenue. This will provide an additional 50% TSS removal, to ensure treated flows are entering the storm sewer system within the municipal right-of-way. OGS units proposed in the right-of-way will be sized appropriately at detailed design. As shown in **Table 5**, these efforts will achieve the overall 80% TSS removal target.

SWM DESIGN CALCULATIONS
Table 5: Post-development Water Quality/TSS Removal Calculation Results Summary (using New Jersey Stormwater Best Management Practices Manual , Chapter 4 - TSS Removal Rates for BMP's in Series)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Checked by: R.K

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

TSS Removal Treatment Train Approach

Block	Area (ha)	Stage 1. Land Use (% of area) for TSS Removal Credits							Stage2. Block Level Additional TSS Removal Features						Complete TSS Removal Individual	TSS Removal Credit Per 2.11ha Entire Site
		Landscape (80% TSS Removal Credit)	Green Roof (80% TSS Removal Credit)	Roof (80% TSS Removal Credit)	Roof/Paved to Landscape (80% TSS Removal Credit)	% Paved Area (0% TSS Removal Credit)	Total On-site TSS Removal Credit *	Remained Untreated TSS	* 6 mm Runoff Retention - Minimum 50% TSS Removal Credit	Total Block Level TSS Removal	Remained Untreated TSS	OGS 50% TSS Removal Credit	Total TSS Removal for Blocks	Remained Untreated TSS		
Block 1 (Stratified Parkland)	0.3400	90%	10%	0%	0%	0%	80%	20%	-	80%	20%	50%	90%	10%	90%	14.5%
Block 2	0.8300	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	33.8%
Block 3	0.5900	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	24.0%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	25%	0%	0%	0%	75%	20%	80%	50%	60%	40%	50%	80%	20%	80%	13.3%
Sub-Total	**2.1100**															**86%**

* Water Balance Cisterns TSS credit based on 5mm rain event retention, which is equivalent to 50% of annual rainfall depth.
**TSS treatment of last OGS unitS, for ROW's, for upstream released flows from blocks has been ignored in this calculations for a conservative approach.

Reference: **New Jersey Stormwater Best Management Practices Manual**
Chapter 4 - TSS Removal Rates for BMP's in Series

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

2.4.3 Proposed Quantity Control and Modeling

The entire site will outlet to the municipal storm sewer on Carlaw Avenue, up to the target release rate (e.g., 2-year peak flow at a run-off co-efficient of 0.50). Development Block 2 will control post-development release rates for all storm events up to the 100-year storm down to allowable release rate for the block of 102L/s. This will be achieved by providing a stormwater storage tank on the block connected to the storm sewer on the road. Development Block 3 will drain uncontrolled to New Street due to limitations associated with depth of land ownership. To compensate for lack of controls on Block 3, pipe storage within the internal right-of-way (e.g., New Street ROW) will be utilized to ensure overall site release rate to the municipal infrastructure is less than allowable discharge. The blocks will discharge into storm sewer system within the New Street right-of-way, which will then be connected to the municipal storm sewer system on Carlaw Avenue. An orifice plate is proposed at the site outlet maintenance hole (CNTRL MH) to ensure flows to the minor system, will not exceed allowable release rate of 234 L/s. Sizing of the plate will be confirmed at detailed design. The orifice will also enhance the site quantity control during major storm events utilizing the available minor system submerged pipe and maintenance hole storage volume. It was calculated that there is about **63m^3** of total available storage within the storm pipes and maintenance holes. Refer to **Appendix B** for the proposed minor system available storage.

During major storms, Block 3 will discharge uncontrolled flows to New Pape Ave, while Block 2 will continue to control the 100-year storm to the 2-year storm level, as shown in **Table 6**. However, Block 2 grading will accommodate any emergency flow to New Street right-of-way. Any overland flows exceeding the minor system capacity will be conveyed safely downstream through the right-of-way towards Carlaw Avenue. The overland flows include emergency flows and uncontrolled flows from public roads, Block 3 and stratified parkland areas, which would not be captured by the minor system. Refer to the Post-Development Stormwater Management Drainage Plan **SWM2** for an illustration of the post development minor and major system drainage conditions. Note that the landscaped areas and imperviousness values are based on typical land cover assumptions.

Table 6: Post-Development Drainage Characteristics and VO6 Modelling Results for Block 2

Block ID	Area (ha)	XIMP	TIMP	2-year @ RC=0.50 Minor System Allowable Release Rate (L/s)	VO6 Model 100-year Release Rate to Minor System (L/s)
Block 2	0.83	85	85	102	101

As shown in the above **Table 6**, Block 2 is controlled to the 2-year storm at 0.50 runoff co-efficient. In addition, an orifice plate has been proposed in MH06 to ensure flows from the site to the Carlaw storm sewer system, in all design storm events, will not exceed the allowable rate of 0.234 m^3/sec. Therefore, City of Toronto quantity control requirements are satisfied.

The VISUAL-OTTHYMO Version ('VO6') Model has been employed to analyse the 2-year to 100-year storm events for both pre-development and post-development conditions. The design storm events used in this analysis are based on the 6-hour Chicago storm distribution. The 2-year to 100-year storm events were modelled with a 6-hour duration and a time step of 10 minutes, based on City of Toronto IDF curves, summarized in **Table 7**. Refer also to **Appendix B** for rainfall information inputted into VO6.

Table 7: City of Toronto Storm Design Parameters

2-year		5-year	10-year	25-year	50-year	100-year
T (min)	I (mm/hr)	I (mm/hr)	I (mm/hr)	I (mm/hr)	I (mm/hr)	I (mm/hr)
0	1	2	2	2	3	3
10	1	2	2	2	3	3
20	1	2	2	3	3	3
30	2	2	2	3	3	4
40	2	2	3	3	4	4
50	2	3	3	3	4	4
60	2	3	3	4	4	5
70	2	3	4	4	5	6
80	3	4	4	5	6	7
90	3	4	5	6	7	8
100	4	6	6	8	9	10
110	6	8	9	11	13	14
120	11	16	18	21	25	28
130	88	132	162	190	224	250
140	13	18	21	25	29	33
150	8	11	12	14	17	19
160	6	8	9	10	12	14
170	4	6	7	8	10	11
180	4	5	6	7	8	9
190	3	5	5	6	7	8
200	3	4	5	5	6	7
210	3	4	4	5	6	6
220	2	3	4	4	5	6
230	2	3	3	4	5	5
240	2	3	3	4	4	5
250	2	3	3	4	4	5
260	2	2	3	3	4	4
270	2	2	3	3	4	4
280	2	2	3	3	3	4
290	2	2	2	3	3	4
300	1	2	2	3	3	4
310	1	2	2	3	3	3

320	1	2	2	2	3	3
330	1	2	2	2	3	3
340	1	2	2	2	3	3
350	1	2	2	2	3	3

The proposed site development drainage areas have been modelled in VO6 using the STANHYD commands with the Modified SCS formula for areas with impervious areas, and NASHYD commands with CN values for landscaped and undeveloped areas. In the post-development conditions, flows from the Development Block 2 have been routed through an underground storage tank. The ROUTE RESERVOIR command has been used to model the SWM storage tank. Refer to **Appendix B** for post-development VO6 model calculations.

The required quantity storage for Block 2 has been provided in **Table 8** below. Refer to **Appendix B** for details and VO6 modeling used to arrive at these storage volumes.

SWM DESIGN CALCULATIONS
Table 8: Water Quantity Calculation Results Summary (SWM Matrix)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Block	Drainage Area [ha]	Total Roof Area (ha)	Imp. Side Walk Drain to Grass (ha)	Roof / Imp. Drain to Grass (%)	Green Roof (ha)	Green Roof (% of Roof)	Paved Surface Impervious Area (ha)	Landscape Assumed (ha)	Imperviousness (%)	X-Imperviousness (%)	Water Balance Target Including Ia (mm)	Water Balance/Cistern Storage Required (m^3)	Quantity Control Storage Utilized (m^3)	Blocks Target Release Rate (L/s)	VO6 Model 100-year Blocks Release Rate (L/s)	Quantity Storage Provided (m^3)
Block 1 (Stratified Parkland)	0.3400	0.0000	0.034	-	0.000	0%	0.034	0.306	10	10	-	-	-	42	103	-
Block 2	0.8300	0.4150	-	-	0.083	20%	0.374	0.041	85	85	6	35	353	102	100	360
Block 3	0.5900	0.2950	-	-	0.059	20%	0.266	0.030	85	85	5	20	-	-	391	-
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	0.0000	-	-	0.000	0%	0.263	0.088	75	75	N/A	N/A		-	-	63
The Site SubTotal	2.11	0.71			0.14		0.94	0.46				55	353			423

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

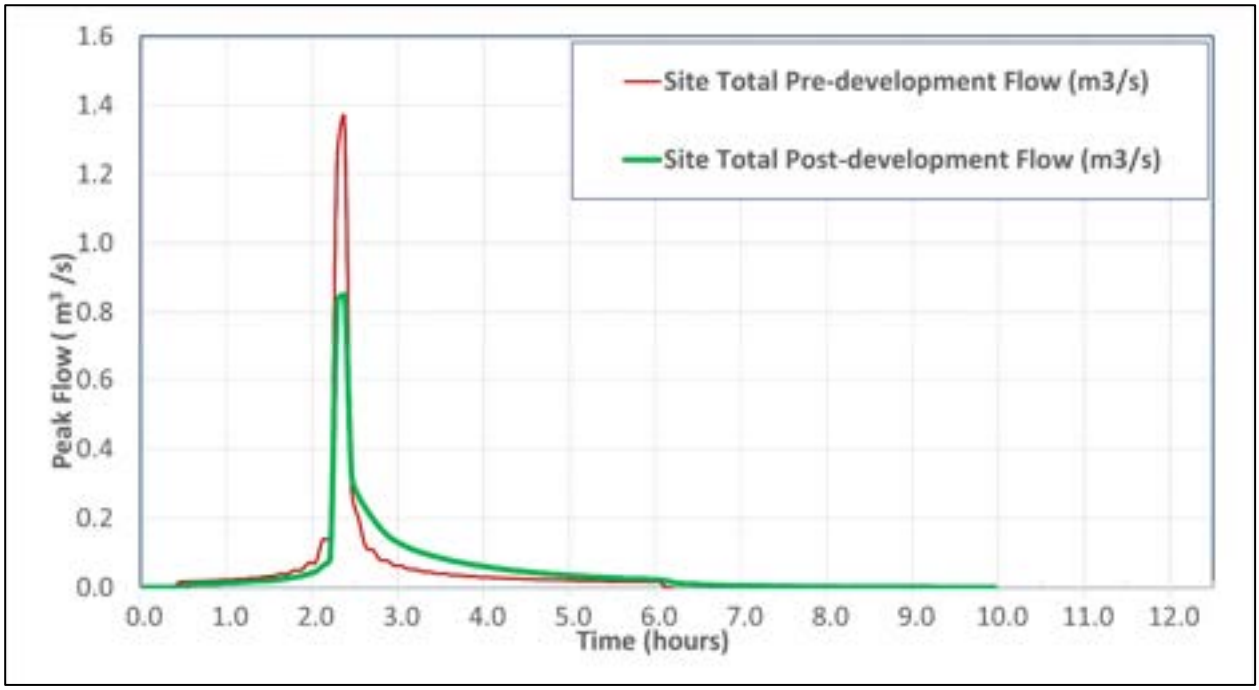
Table 9: Water Quantity Summary to Site Outlets

Return Period	Minor System Flows				Total Flow [Including Uncontrolled Areas]	
	Pre-development	Allowable Release Rate	Post-development Controlled Flows	Post to Pre Minor System	Post-development	Post to Pre
	(m^3/s)	(m^3/s)	(m^3/s)	Reduction / Enhancement	(m^3/s)	Reduction / Enhancement
Carlaw Ave. Outlet [at MH06]						
2-Year	407	**234**	192	-53%	192	-53%
5-Year	627		234	-63%	396	-37%
10-Year	798		234	-71%	502	-37%
25-Year	942		234	-75%	607	-36%
50-Year	1127		234	-79%	737	-35%
100-Year	1265		234	-82%	835	-34%
Pape Ave. Outlet						
2-Year	32	**17**	0	-100%	0	-100%
5-Year	49		0	-100%	0	-100%
10-Year	60		0	-100%	0	-100%
25-Year	71		0	-100%	0	-100%
50-Year	85		0	-100%	0	-100%
100-Year	95		0	-100%	0	-100%
Total Site [Including all External]						
2-Year	440	**251**	192	-56%	196	-55%
5-Year	676		234	-65%	403	-40%
10-Year	858		234	-73%	510	-41%
25-Year	1013		234	-77%	617	-39%
50-Year	1211		234	-81%	748	-38%
100-Year	1360		234	-83%	847	-38%

As shown in **Table 9**, there is a significant reduction in post-development peak flows compared to the corresponding pre-development storm flows to Carlaw Avenue outlet and on a site basis, which satisfies the TRCA criteria and the City's Flood Flow Criteria. Overall, on a site basis, quantity controls are achieved as the post-development release rates for all storms up to the 100-year storm are controlled to pre-development rates or less, and release rate to Carlaw Avenue

storm sewer system does not exceed 234 L/s during the 2-year storm event. The 100-year post/pre-development hydrographs have been shown in **Figure 2**. The proposed orifice plate on the downstream side of CNTRL MH, along with the **63m^3** of storage in the pipes and maintenance holes, shall adequately ensure flows during all storms to the minor system will not exceed allowable release rate of 234 L/s to the minor system, and keep flows up to 2-year storm event underground. Refer to **Appendix B** for the allowable and proposed release rates calculations, along with the VO6 modeling summary.

Figure 2: 100-year Post/Pre-Development Hydrographs



3.0 SANITARY SERVICING

3.1 EXISTING SANITARY SERVICING

The subject site is currently occupied by several commercial and residential buildings. The site consists of an onsite sanitary sewer system to collect sewage from the existing buildings which ultimately connects into the combined sewer on Carlaw Avenue. The existing servicing surrounding the site is summarized as follows:

- Carlaw Avenue contains a 900 x 600mm diameter brick combined sewer traveling south.
- Pape Avenue contains a 900 x 600mm diameter brick combined sewer traveling south, past the terminus of the travel portion of the road, under the CNR railway, to Pape Avenue.

The subject site is located in City of Toronto Basement Flooding Study Area 32 whose Class EA is complete.

The existing site generates a peak flow including infiltration of **0.86 L/s**. Refer to **Appendix C** for sanitary calculations.

3.2 PROPOSED SANITARY RELEASE RATE AND SERVICING

A new 250mm diameter sanitary sewer is proposed within New Street to service the subject lands. One connection into the combined sewer in Carlaw Avenue is required to adequately service the lands

A total of four sanitary connections are provided to Block 2 to meet the City's servicing requirements for this type of built form. However, it should be noted that the number of connections will be re-confirmed at detailed design, once the built-form has been finalized. Additional service connections can be provided to Block 1 and 3 if required. The exact locations and depths of block level connections will be developed at the detailed design stage. Refer to drawing **SW-PUP** for a graphic depiction of the proposed sanitary sewer system including connections into existing municipal services.

The following table provides a summary of equivalent populations per building.

Table 10: Summary of Equivalent Populations

Connection	Units	Residential Population	Non-Residential Population
Block 1 (Parkland)	0	1	0
Block 2 – TOC	1,080	1,896	83
Block 3 – POPS	0	0	0
Totals:	**1,080**	**1,897**	**83**

For the purpose of sizing new sewers, an average wastewater flow rate of 450 L/cap/day was used. Populations were calculated for each use and peaked in accordance with City standards. Refer to **Appendix C** for further details as well as a sanitary sewer design sheet.

For the review of the external systems, the above population counts, and 240 L/cap/day for residential use and 250 L/cap/day was used for retail use. Peak flows were determined to be as follows for the external study, refer to **Appendix C** for further details.

Based on the below, the net increase of peak sanitary flow is **18.90 L/s.**

Table 11: Peak Flow Summary

Sewer Leg	Res. Equivalent Population	Res. Peak. Flow (L/s)	Retail Average Flow (L/s)	Infiltration [0.26 L/s/ha] (L/s)	Total Peak Flow (L/s)
New Sewer	1,897	18.98	0.24	0.54	19.76

3.3 SANITARY CAPACITY ANALYSIS

The existing site will have a net increase in sanitary peak flow and will connect into the existing combined sewer in Carlaw Avenue. In order to satisfy MECP procedure F-5-5, a peak flow offset is required.

The subject site was dye tested by Infrastructure Intelligence Services Inc. ('I2S') and determined the following:

- The majority of the subject site drains to the storm sewer in Carlaw Avenue.
- A portion of the site drains to the combined sewer in Pape Avenue.

Given that the site can not be serviced by the existing sewer in Pape Avenue, due the grade of the site, a suitable on-site offset is not available.

A comprehensive search for potential inflow/infiltration ('I/I') reduction opportunities, outside of the subject site, was undertaken by I2S. To meet City criteria, any off-site stormwater offset into the same receiving combined sewer must equal 2 times the net increase in peak sanitary contribution during the 2-year storm event. As such, an offsite stormwater offset must be equal to at least **37.8 L/s** during the 2-year storm event.

A summary of offsite opportunities is provided in **Appendix B**. The options are:

- The most viable solution is to address the stormwater connection from the laneway north of Victor Avenue, which is connected into the Carlaw combined sewer. This sewer could be connected into the Carlaw Avenue storm sewer. The benefit of this option is that the connection is located very close to the proposed site connection, as such, there is little to no local variation between the contributing new peak sanitary flow and the stormwater offset correction. However, the stomwater contribution is insufficient to meet the offsetting requirement.
- A second solution is to address the stormwater connections at the intersection of Bain Avenue and Carlaw Avenue. Two catchbasins at the end of Bain Avenue were determined to be connected into the Carlaw Avenue combined sewer. These catchbasins could be re-connected into the Carlaw Avenue storm sewer.

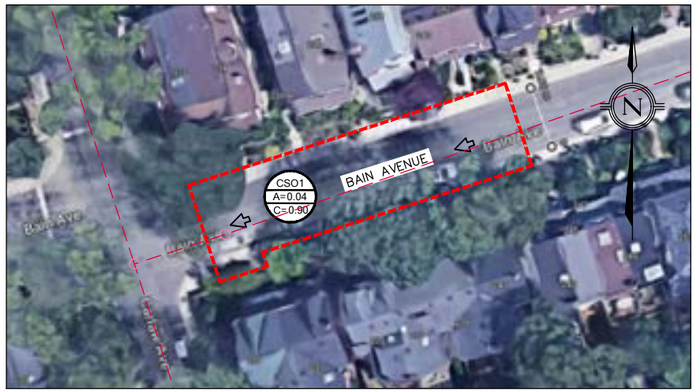
A summary of estimated 2-year peak flows from the two options are, based on **Figure 3**:

Table 12: Offsite Offsetting Summary

Location	Contributing Area	2-Year Storm Peak Flow
Laneway North of Victor Avenue	0.136	29.98
End of Bain Avenue	0.043	9.55
Totals:	**0.179**	**39.54**

Based on the above summary, corrections to the two sources of I/I into the Carlaw Avenue combined sewer is sufficient to create capacity to develop the subject lands. It is recommended

to seek general consensus on the options prior to obtaining additional survey, CCTV (to confirm no sanitary connections) and undertaking detailed design to confirm technical feasibility. Refer to **Appendix C** for additional supporting material.



COMBINED SEWER OFFSET DRAINAGE PLAN #1

SCALE 1:500

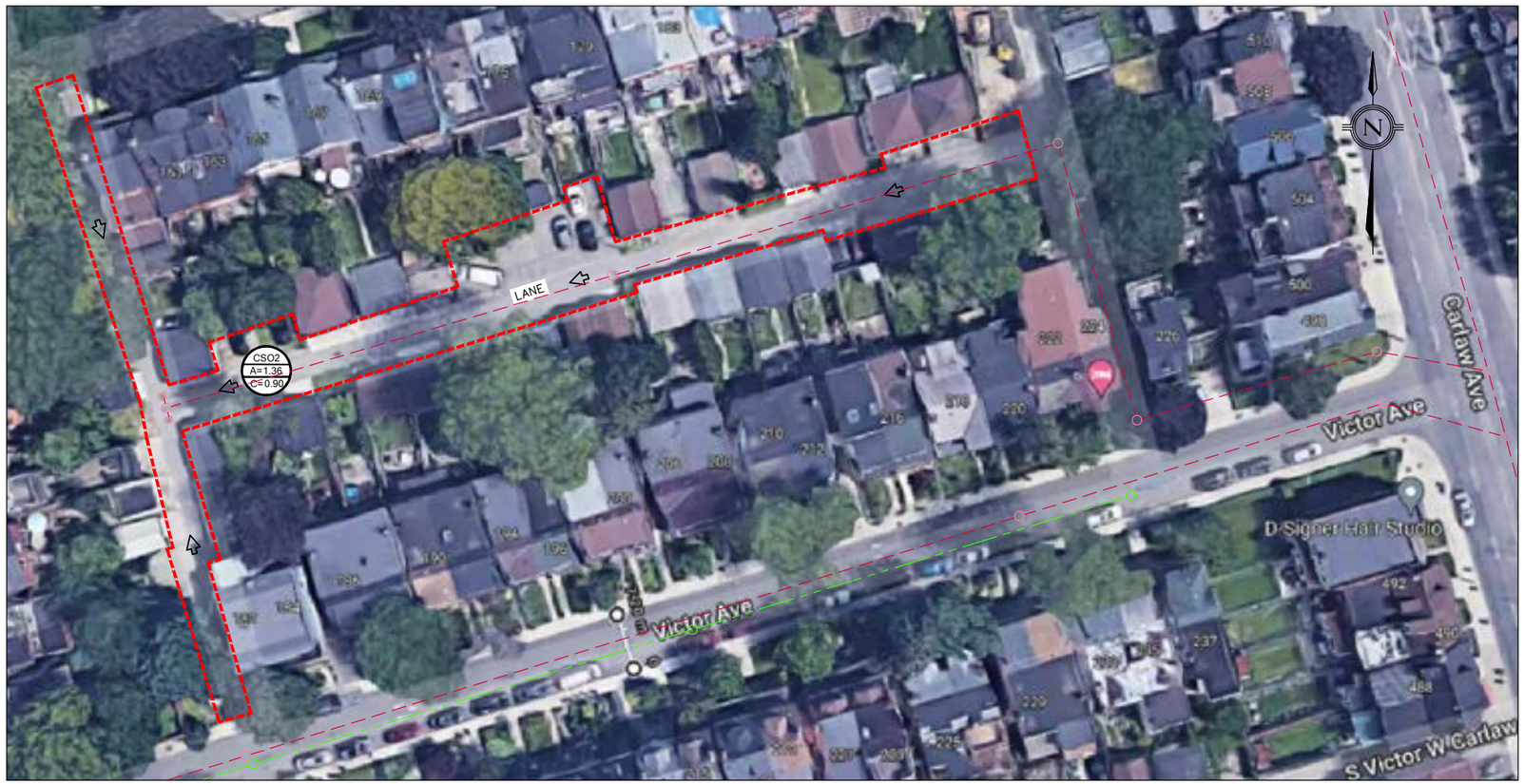
LEGEND

EX. OVERLAND FLOW DIRECTION

DRAINAGE AREA BOUNDARY

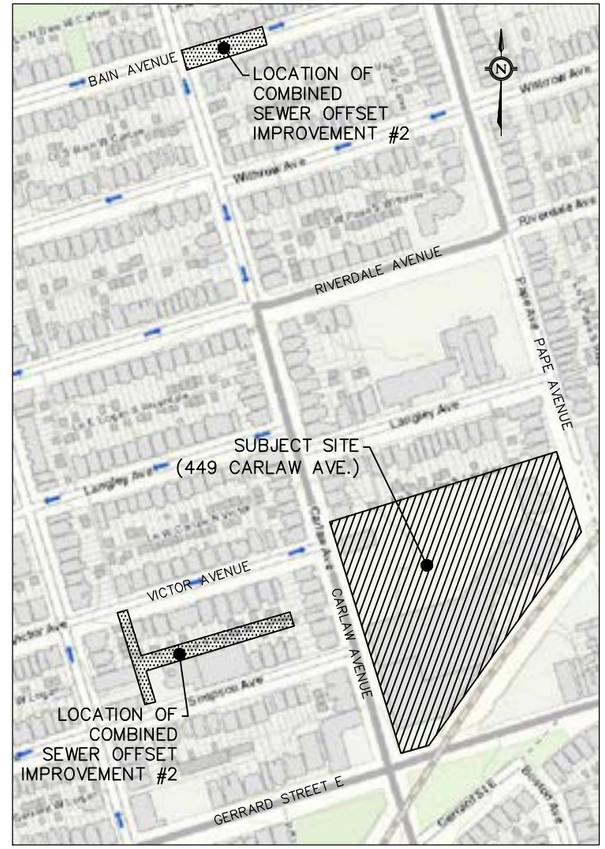
100
A=0.380
C=0.76

AREA ID
AREA (ha)
RUNOFF COEFFICIENT



COMBINED SEWER OFFSET DRAINAGE PLAN #2

SCALE 1:500



COMBINED SEWER OFFSET LOCATION PLAN

NOT TO SCALE

counterpoint ENGINEERING

COUNTERPOINT ENGINEERING INC.

8395 Jane St., Suite 100, Vaughan, ON L4K 5Y2 Phone 905.326.1404 Fax 905.326.1405

PROPOSED MIXED USE DEVELOPMENT
CARLAW & GERRARD (CHOICE PROPERTIES)
TORONTO, ON.

OFFSITE COMBINED SEWER OFFSET PLAN

DESIGNED BY: G.D.	DATE: JULY 2022
CHECKED BY: J.Y.	PROJECT No. 20026
DRAWING BY: A.P.	
CHECKED BY: J.Y.	FIGURE No. FIGURE 3
SCALE: AS SHOWN	

4.0 GROUNDWATER MANAGEMENT

Discharge of groundwater and foundation drains to municipal sewers must be in accordance with Toronto Municipal Code, Chapter 681 Sewers. The quality limits for discharge in the sewers must satisfy the limits as listed in Table 1 – Limits for Sanitary and Combined Sewer Discharge and/or Table 2 – Limits for Storm Sewer Discharge of Chapter 681.

A Permit to Take Water (PTTW) from the Ontario Ministry of the Environment, Conservation and Parks (MECP) is required for short term water taking over 400 m^3/day. An Environmental Activity and Sector Registry (EASR) is required from the MECP for short term water taking between 50 m^3/day and 400 m^3/day. A PTTW is required for long term water taking from a permanent drainage system greater than 50 m^3/day.

Based on the City's Foundation Drainage Policy, foundation drain connections are no longer permitted. No allowances were made in the sanitary analysis for long term groundwater flows.

A hydrogeological investigation is currently underway. The report will be required to determine short term/construction dewatering rates for the development blocks. The I/I reduction improvements proposed in Section 3.3 will be required to be at a higher rate that the dewatering rates that occur at any given time, plus any new peak sanitary flows that are generated as the project progresses.

5.0 WATERMAIN SERVICING

5.1 EXISTING WATER SERVICING

Municipal water servicing is adjacent to the subject site as follows:

- A 300mm diameter watermain in Carlaw Avenue.
- A 150mm diameter watermain in Pape Avenue.

According to the Buried Utility Map, the existing buildings on the subject site are serviced through connections into both of the above two municipal watermains.

5.2 PROPOSED WATER SERVICING STRATEGY

The proposed development will have a new 300mm diameter PVC watermain that is located in the New Street right of way, connecting to both the above noted Carlaw Avenue and Pape Avenue watermains. New fire hydrants will be located along the length of the right of way as required by City standards. Refer to drawing **SW-PUP** for the concept servicing plan.

The City of Toronto's Design Criteria states that governing flows shall be the greater of: a) maximum day demand plus fire flow, or b) maximum hour demand. Fire flows for residential areas are not to be less than 4,800 L/min for a 2-hour duration, delivered with a residual pressure of not less than 140 kPa (20 psi).

Domestic water demands for the various blocks were calculated using City criteria and by calculating equivalent populations by type of housing and land use and applying the multi-unit per capita demand of 190 l/cap/day.

Fire flows were estimated using FUS methodology. The following considerations were made as part of estimating fire flows:

- Fire Resistive type of construction for all buildings, including adequately protected vertical openings.
- Limited Combustible content factor.
- All system type reductions in place.
- Entire building in Block 2 as a single structure.

Table 13: Summary of Water Demands

Block	Building	Daily Water Demand (L/sec)	Max Day Water Demand (L/sec)	Peak Hour Water Demand (L/sec)	Fire Demand Required (L/sec)	Max Day plus Fire Demand (L/sec)
2	A/B/C	4.41	5.69	10.71	233.33	239.02

Based on these results, it is anticipated that Building 1 will govern the overall maximum day plus fire flow demand requirement, at **239.02 L/s**. Refer to **Appendix D** for supporting calculations.

In addition to preferable ranges, the City of Toronto Design Criteria sets out watermain pressure requirements and can be summarized as follows:

1. Under normal conditions the maximum static pressure shall not exceed 690 kPa (100 psi).
2. The minimum pressure under any non-fire demand scenario will not be less than 275 kPa (40 psi).
3. Under conditions of simultaneous maximum day and fire flow demands, the pressure shall not drop below 140 kPa (20 psi) at any point in the water system.

Hydrant flow tests were completed by Lozzi Aqua Check on June 8, 2022 on hydrants that are connected into both the 300mm diameter Carlaw Avenue watermain and the 150mm diameter Pape Avenue watermain. The results of the test indicate that the watermains can deliver **269.42 L/s** and **167.41 L/s** at a pressure of 20 psi or 140 kPa. As such, the Carlaw Avenue watermain can support the proposed development, however it is recommend to model the distribution system as part of a subsequent submission given the grade change of the development. Refer to **Appendix D** for supporting calculations.

5.3 WATER DISTRIBUTION SYSTEM MODELING

The proposed water distribution system within the new municipal road ('New Street) was modelled using the EPANET hydraulic modelling program. The program was used to model the domestic demands as well as fire flow scenarios.

Boundary conditions at the future connections on Carlaw Avenue and Pape Avenue were established based on the conducted hydrant flow testing on both streets (refer to Hydrant Fire Flow Testing Results calculation sheet in Appendix D). The results of the EPANET modelling are provided in Appendix D and summarized in Tables 14 and 15.

Table 14 – Residual Pressures During Non-Fire Flow Scenarios

Scenario	Lowest Pressure			Satisfies Pressure Requirements?
	Pressure (m H_2O)	Pressure (psi)	Pressure (kPa)	
Max. Day	62.83	89	616	Yes
Peak Hour	62.25	89	610	Yes

Table 15 – Residual Pressures During Fire Flow Scenarios

Fire Flow at Node	Max. Velocity (m/s)	Lowest Pressure			Satisfies Fire Flow Requirements?
		Pressure (m H_2O)	Pressure (psi)	Pressure (kPa)	
A/B/C	2.07	44.50	63	436	Yes

From Table 14, it can be seen that the lowest pressure in the system during non-fire demand scenarios equals 610 kPa, thus meeting the minimum requirement of 275 kPa. The minimum pressure during fire-flow scenarios is shown in Table 15 to be 436 kPa which exceeds the minimum 140 kPa requirement. The maximum flow velocity during the fire-flow scenarios equals 2.07 m/s. The maximum velocity is less than the 3 m/s maximum threshold, specified by the City of Toronto. The EPANET output for all modelled scenarios is included in Appendix D.

The above analysis demonstrates that the proposed water distribution system meets the City of Toronto requirements pertaining to residual pressures and flow velocities within water distribution systems. A double connection to the adjacent watermain system will provide the desired level of

redundancy. The site can therefore be adequately serviced by the proposed watermain layout. Internal (private) watermains and service connections within the proposed development will be sized during the detail design stage.

6.0 CONCLUSIONS

This report presents a site servicing strategy for the proposed development that addresses the requirements of the applicable design guidelines and provides the basis for detailed servicing design.

We trust this report sufficiently addresses the site servicing requirements in support of the proposed official plan amendment.

Sincerely,
Counterpoint Engineering Inc.

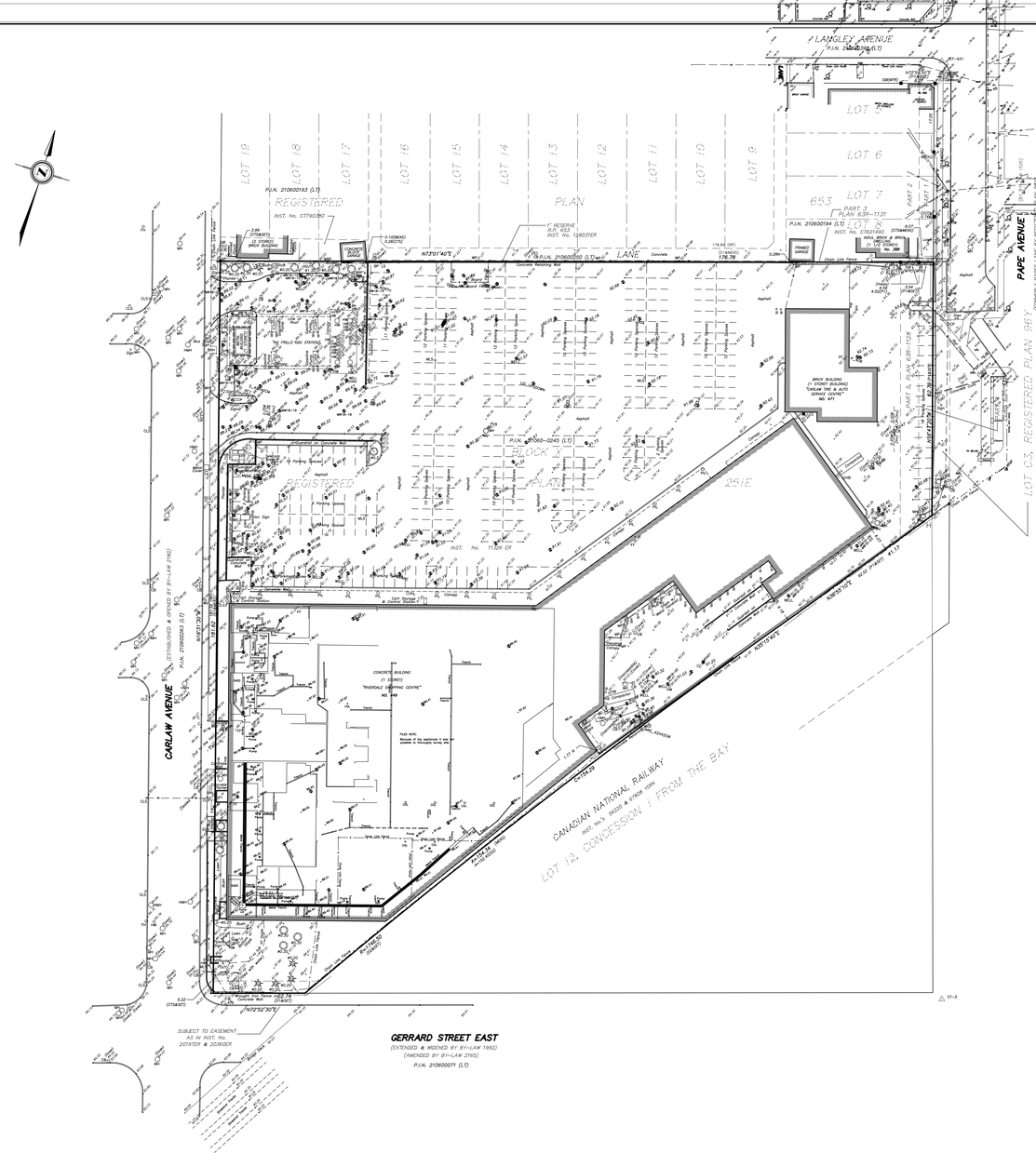




Gian-Michael Di Luca, P.Eng.
Project Engineer
Direct: (416) 886-1075
Email: gdiluca@counterpointeng.com

Reza Kazemi, M.A.Sc. Eng., P.Eng.
Water Resources Manager, Associate
Direct: (416) 732-8504
Email: rkazemi@counterpointeng.com

APPENDIX A



PLAN OF SURVEY WITH TOPOGRAPHY OF
BLOCK X
REGISTERED PLAN 251E
CITY OF TORONTO
SCALE 1 : 500

10 5 0 10 20 30 40 50 metres

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
2016

© THE REPRODUCTION, ALTERATION OR USE OF THIS PLAN, IN WHOLE OR IN PART, WITHOUT THE EXPRESS PERMISSION OF SPEIGHT, VAN NOSTRAND & GIBSON LIMITED IS STRICTLY PROHIBITED.

ELEVATION NOTE

ELEVATIONS ARE BASED ON THE CANADIAN GEODETIC DATUM AND WERE DERIVED FROM CITY OF TORONTO BENCH MARK 912, HAVING A PUBLISHED ELEVATION OF 89.498 metres.

BEARING NOTE

BEARINGS HEREON ARE GRID BEARINGS AND ARE DERIVED FROM HORIZONTAL CONTROL MONUMENTS NO.
3–CT E 317644.73 N 4836262.87
931–CT E 317576.42 N 4836485.30
AND ARE REFERRED TO THE CENTRAL MERIDIAN 79°30' WEST LONGITUDE, ZONE 10.

METRIC

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND

■	DENOTES	SURVEY MONUMENT FOUND
□	-	SURVEY MONUMENT PLANTED
WIT	-	WITNESS MONUMENT
SIB	-	STANDARD IRON BAR
SSIB	-	SHORT STANDARD IRON BAR
IB	-	IRON BAR
CC	-	CUT CROSS
N,S,E,W	-	NORTH, SOUTH, EAST, WEST
OU	-	ORIGIN UNKNOWN
SVN	-	SPEIGHT AND VAN NOSTRAND LIMITED, O.L.S.
RP	-	REGISTERED PLAN 251E
#	-	ROUND
P1	-	PLAN 63R–1131
D1	-	INST. No. 111326
D2	-	INST. No. 67808 YORK
C	-	CURB
CB	-	CATCH BASIN
B	-	BOLLARD
ATS	-	AUTOMATIC TRAFFIC SIGNAL
CLS	-	CONCRETE LIGHT STANDARD
CC	-	CUT CROSS
FH	-	FIRE HYDRANT
HB	-	HYDRO BOX
GV	-	GAS VALVE
CP	-	COLUMN
COL	-	CONCRETE POLE
HMH	-	HYDRO TRANSFORMER
MET	-	METER
HYT	-	HAND WELL
MH	-	MANHOLE
HW	-	HYDRO MANHOLE
ICV	-	IRRIGATION CONTROL VALVE
MLS	-	METAL POLE
MP	-	METAL LIGHT STANDARD
WV	-	WATER VALVE
WP	-	WOODEN POLE
FF	-	FINISHED FLOOR
BIN	-	GARBAGE BIN
BRP	-	BREATHER PIPE
FP	-	FLAGPOLE
GM	-	GAS METER
WELL	-	MONITORING WELL
PIL	-	PILLAR
WBP	-	WOODEN BELL POLE
GMH	-	GAS MANHOLE
	-	DECIDUOUS TREE
	-	CONIFEROUS TREE
	-	CONCRETE
	-	BRICK
	-	FLAGSTONE

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON APRIL 18th, 2016.

DATE : _____

D.A.WILTON
ONTARIO LAND SURVEYOR

SPEIGHT, VAN NOSTRAND & GIBSON LIMITED
ONTARIO LAND SURVEYORS
750 OAKDALE ROAD, Units 65 & 66
TORONTO, ONTARIO M3N 2Z4
TEL. 416 749–SVNG(7864) FAX 416 749–7866
E–MAIL: toronto@svng.on.ca

DRAWN :	E. D. /B.B./JD	FILE NAME :	A0010384.DWG
CHECKED :	D. A. W.	PLOT SCALE :	MET.1=0.50
JOB No. :	001–0384	PLOTTED :	
REF. No. :	2–251E	UPDATED :	APRIL 8, 2016

2–251E

A1 (594x840)

INST. No. CT790350

1' RESERVE
PLAN 6387
INST. No. 1285311R

PART 1
PLAN 63R-11131

PART OF BLOCK X
PLAN 216E
LOT 8
INST. No. CT621490

CC(OU)
0.16E

6.07
(CTS&MEAS)

INSUL BRICK & BRICK
DWELLING
(1 1/2 STOREY)
NO. 459

Lawn

SIB
(MTR)

3.54
(F1&SET)

(meas)
4.59
4.52(P1)

3.99
(CTS&SET)

(2 STOREY)
BRICK BUILDING

CIB
(OU)
0.03E

Framed Porch

Framed Porch

0.10(MEAS)
0.26(CTS)

CONCRETE BLOCK GARAGE

N73°01'40"E

PART 2
PLAN 63R-11131

LANE

Concrete

176.84 (RP)
(D1&MEAS)
176.78

0.28N

FRAMED GARAGE

Chain Link Fence

Concrete Retaining Wall

Board Fence

Double Board Fence

Asphalt

BRICK BUILDING
(1 STOREY BUILDING)
"CARLAW TIRE & AUTO
SERVICE CENTRE"
NO. 471

PART 3
PLAN 63R-11131

PART 4
PLAN 63R-11131

PAPE AVENUE

(FORMERLY PAPES LANE BY REGISTERED PLAN 96Y)

LOT C3, REGISTERED PLAN 96Y

RECORD AS BY-LAW 1587

Chain Link Fence

Sign

Planter

Board Fence

Concrete Retaining Wall

Asphalt

Line of Roof

Gasoline Pump

Canopy

"NO FRILLS GAS STATION"

Gasoline Pump

Canopy

Gasoline Pump

Asphalt/Concrete Retaining Wall

Guardrail

11 Parking Spaces

12 Parking Spaces

Asphalt

Bus Stop Sign

Planter

METAL BUILDING
(1 STOREY)

Air Pump

Sign

Pylon Sign

BROKEN HINGES

Guardrail on Concrete Wall

Telecom Tower

10 Parking Spaces

Guardrail on Concrete Wall
Metal Steps

Metal Cover

Planter

Guardrail on Concrete Wall

3 Parking Spaces

Pylon Sign

9 Parking Spaces

Asphalt

REGISTERED PLAN 251E

BLOCK X

PART 1, 21R-22141 (LT)

Canopy

Compactor

Guardrail on Concrete Wall

4 Parking Spaces

8 Parking Spaces

Concrete Wall

Cart Storage & Control Station

Canopy

INST. No. 11328 ER

Steps w/ Metal Handrail

Handrail

Canopy

Guardrail on Concrete Wall

Guardrail on Concrete Wall

N35°54'40"E 92.52 (P1&SET) 41.17

N35°19'40"E

Chain Link Fence

Concrete Retaining Wall

CARLAW AVENUE

N16°38'20"W

Concrete Wall

Concrete Planter

Lawn

Bush

Concrete Wall

Pylon Sign

Bottom of Slope

Top of Slope

Planter

Chain Link Fence

Chain Link Fence

R=1146.30
(D2&SET)

HOLE IN THE GROUND

Wrought Iron Fence on Concrete Wall

2.74
(D1&SET)

5.22
(CTS&SET)

N72°52'30"E

CONCRETE BUILDING
(1 STORY)
"RIVERDALE SHOPPING CENTRE"
NO. 449

FILED NOTE:
Because of big appliances it was not possible to thoroughly survey site.

Trench

Pump

Pump Lid

Metal Trench

SHED

Chain Link Fence

Concrete Wall

Concrete Planter

Lawn

Bush

Concrete Wall

Pylon Sign

Bottom of Slope

Top of Slope

Planter

Chain Link Fence

Chain Link Fence

R=1146.30
(D2&SET)

Concrete Retaining Wall

1.77 N

CANADIAN NATIONAL RAILWAY

INST. No.'s 56220 & 47808 YORK

LOT 12, CONCESSION 1 FROM THE BAY

A=458.54
A=152.40(D2) (MEAS)

C-216449

Compactor

Handrail
Canopy

Steps w/
Metal Handrail

Guardrail on
Concrete Wall

Guardrail on
Concrete Wall

Concrete Curb

Chain Link Fence

Rail Fence

Asphalt

Sign

Concrete Curb

18 Parking Spaces

TELUS

Chain Link Fence

SYMBOLS LEGEND

- MANHOLE
- CATCH BASIN
- POLE
- CLEAN OUT
- STREET LIGHT
- HYDRANT
- VALVE
- TRANSFORMER
- HAND WELL
- PEDESTAL
- CONTROL BOX / PLUG
- VALVE CHAMBER
- TRAFFIC BOX (TB)
- AIR PUMP (AP)
- SIGN
- BUS SHELTER (BUS SHELTER)
- TRAFFIC CONTROL BOX (TRFC CB)
- FLUSH TO GRADE VAULT (FG)
- HEADWALL
- FLOW
- UTILITY CONTINUES
- TEST PIT

UTILITY CODES LEGEND

W	WATER
E	ELECTRIC
T	TELEPHONE
C	COMMUNICATION CABLES/DUCT
ALL	ALL STREAM
F/O	FIBER OPTIC
GS	GAS SERVICE
GM	GAS MAIN
DZL	DIESEL
TNPL	TRANS NORTHERN PIPELINE
FL	FUEL LINE
SAN	SANITARY SEWER
ST	STORM SEWER
Wt	WEEPING TILE
COMB	COMBINATION SEWER
IR	IRRIGATION
U	UNKNOWN SERVICE
TC	TRAFFIC CONTROL

MARK IT
LOCATES INC.

Utility Mapping Quality Levels as per ASCE C-I 38-02

QL-A – Locating exact vertical and horizontal position of underground utilities using appropriate safe excavation techniques and recording these data.

QL-B – Designating the horizontal position of underground utilities by the application of appropriate surface geophysical methods.
– Limited in scope to verification of provided level D information.
– Utilities may escape detection. (See Notes)

QL-C – Survey of surface features.

QL-D – Records and plans research including record collection and review.

Notes:

1. This information is provided for design purposes only.
2. This information is not a substitute for sanctioned locates as provided by the utility owner.
3. Prior to any excavation, all utility owners must be contacted to obtain sanctioned locates, as stipulated by the Occupational Health & Safety Act.
4. Inferred utility depths indicated on this drawing are only estimates and should be verified by direct physical exposure.
5. Underground infrastructure shown on this drawing was obtained on a best-effort, best-practices basis, within the technical limitations of the instrumentation.
6. The spatial accuracy of the plotted information is dependent on the accuracy of the base map information as provided by others.
7. This information is provided on a best effort basis within the limitations of the technology. Consequently some utilities may escape detection (i.e. non-conductive, inaccessible, incomplete Level D information provided by the Client and/or physical expression not reasonably identifiable at the time of the survey, etc.)
8. The information herein documents the position of suspected or known utilities existing at this site as of the drawing date.
9. Quality Level "D" information was obtained by MARK IT Locates Inc. during the course of this investigation.

Buried Utility Map

For: CHOICE PROPERTIES	Site: 449 CARLAW AVENUE, TORONTO, ON
Project#2020-10006	Date: MAY 11, 2020 | Checked: AC / SI

APPENDIX B

SWM DESIGN CALCULATIONS
Table 4: Water Balance Calculation Results Summary

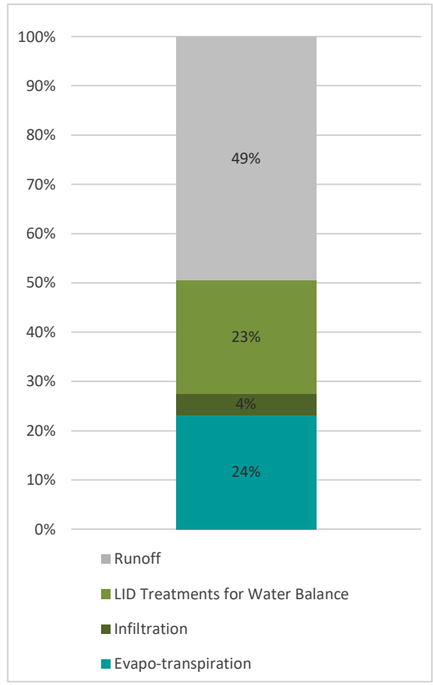
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

Block	Area (ha)	Per Individual Site				Per 2.11 ha Entire Site			
		Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff	Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff
Block 1 (Stratified Parkland)	0.3400	56%	17%	0%	26%	9.1%	2.8%	0.0%	4.2%
Block 2	0.8300	16%	1%	36%	47%	6.4%	0.4%	14.1%	18.5%
Block 3	0.5900	16%	1%	32%	51%	4.5%	0.3%	8.9%	14.3%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	22%	5%	0%	74%	3.6%	0.8%	0.0%	12.2%
Sub-Total	**2.1100**					**24%**	**4%**	**23%**	*** 49%**

* Therefore, overall the site is able to retain events up to 5.0mm, which is equal to 50% of annual rainfall depth..



Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Table 5: Post-development Water Quality/TSS Removal Calculation Results Summary (using New Jersey Stormwater Best Management Practices Manual , Chapter 4 - TSS Removal Rates for BMP's in Series)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Checked by: R.K

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

TSS Removal Treatment Train Approach

Block	Area (ha)	Stage 1. Land Use (% of area) for TSS Removal Credits							Stage2. Block Level Additional TSS Removal Features						Complete TSS Removal Individual	TSS Removal Credit Per 2.11ha Entire Site
		Landscape (80% TSS Removal Credit)	Green Roof (80% TSS Removal Credit)	Roof (80% TSS Removal Credit)	Roof/Paved to Landscape (80% TSS Removal Credit)	% Paved Area (0% TSS Removal Credit)	Total On-site TSS Removal Credit *	Remained Untreated TSS	* 6 mm Runoff Retention - Minimum 50% TSS Removal Credit	Total Block Level TSS Removal	Remained Untreated TSS	OGS 50% TSS Removal Credit	Total TSS Removal for Blocks	Remained Untreated TSS		
Block 1 (Stratified Parkland)	0.3400	90%	10%	0%	0%	0%	80%	20%	-	80%	20%	50%	90%	10%	90%	14.5%
Block 2	0.8300	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	33.8%
Block 3	0.5900	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	24.0%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	25%	0%	0%	0%	75%	20%	80%	50%	60%	40%	50%	80%	20%	80%	13.3%
Sub-Total	**2.1100**															**86%**

* Water Balance Cisterns TSS credit based on 5mm rain event retention, which is equivalent to 50% of annual rainfall depth.
**TSS treatment of last OGS unitS, for ROW's, for upstream released flows from blocks has been ignored in this calculations for a conservative approach.

Reference: **New Jersey Stormwater Best Management Practices Manual**
Chapter 4 - TSS Removal Rates for BMP's in Series

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Table 8: Water Quantity Calculation Results Summary (SWM Matrix)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Block	Drainage Area [ha]	Total Roof Area (ha)	Imp. Side Walk Drain to Grass (ha)	Roof / Imp. Drain to Grass (%)	Green Roof (ha)	Green Roof (% of Roof)	Paved Surface Impervious Area (ha)	Landscape Assumed (ha)	Imperviousness (%)	X-Imperviousness (%)	Water Balance Target Including Ia (mm)	Water Balance/Cistern Storage Required (m^3)	Quantity Control Storage Utilized (m^3)	Blocks Target Release Rate (L/s)	VO6 Model 100-year Blocks Release Rate (L/s)	Quantity Storage Provided (m^3)
Block 1 (Stratified Parkland)	0.3400	0.0000	0.034	-	0.000	0%	0.034	0.306	10	10	-	-	-	42	103	-
Block 2	0.8300	0.4150	-	-	0.083	20%	0.374	0.041	85	85	6	35	353	102	100	360
Block 3	0.5900	0.2950	-	-	0.059	20%	0.266	0.030	85	85	5	20	-	-	391	-
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	0.0000	-	-	0.000	0%	0.263	0.088	75	75	N/A	N/A		-	-	63
The Site SubTotal	2.11	0.71			0.14		0.94	0.46				55	353			423

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Available Storage Calculations

Project Name: 449 Carlaw Avenue
Municipality: Toronto
Project No.: 20026
Date: 13-Jul-22

Prepared by: L.W.
Last Revised: 13-Jul-22

Available Storage Underground in Sewer (Assumed Full)

From	To	Length of Pipe (m)	Length Below HWL (m)	Diameter (mm)	Volume (m^3)
MH7	MH6	7.5	7.5	375	0.83
MH6	MH5	30.3	30.3	450	4.82
MH5	MH4	72.0	72.0	450	11.45
MH4	MH3	23.3	23.3	450	3.71
MH3	MH2	12.5	12.5	450	1.99
MH2	CNTRL MH	2.8	2.8	525	0.61
DCB4	MH6	26.0	26.0	250	1.28
DCB3	MH6	25.5	25.5	250	1.25
CB4	MH5	5.6	5.6	200	0.18
CB3	MH5	2.3	2.3	200	0.07
CB2	MH5-MH4 PIPE	5.6	5.6	200	0.18
CB1	MH5-MH4 PIPE	2.3	2.3	200	0.07
DCB2	CNTRL MH	6.0	6.0	250	0.29
DCB1	CNTRL MH	2.6	2.6	250	0.13
Total Storage Underground in Sewers (m^3):					**26.8**

Available Storage Underground in Sewer Catchbasins & Manholes

MH	Manhole Top Elevation or HWL (m)	Low Invert Elevation (m)	Diameter (m)	Volume (m^3)
MH7	93.45	89.64	1.20	4.31
MH6	93.26	89.12	1.20	4.68
MH5	92.09	88.18	1.20	4.42
MH4	88.62	85.97	1.20	3.00
MH3	87.72	85.47	1.20	2.54
MH2	87.39	85.33	1.50	3.64
CNTRL MH	87.37	85.28	1.50	3.69
DCB4	93.49	92.55	(1.2 x 1.2)	1.35
DCB3	93.49	92.55	(1.2 x 1.2)	1.35
CB4	92.05	90.54	(0.6 x 0.6)	0.54
CB3	92.05	90.54	(0.6 x 0.6)	0.54
CB2	89.18	87.68	(0.6 x 0.6)	0.54
CB1	89.11	87.61	(0.6 x 0.6)	0.54
DCB2	87.32	85.57	(1.2 x 1.2)	2.52
DCB1	87.32	85.57	(1.2 x 1.2)	2.52
Total Storage Underground in CB's & MH's (m^3):				**36.2**

Total Available Underground Storage (m^3): 63.0
(In Sewer, Manholes and Catchbasins)

Counterpoint Engineering Inc.

Infrastructure Intelligence Services Inc.

INTEGRITY | COLLABORATION | PERFORMANCE

Servicing Confirmation
Carlaw Avenue and Gerrard Street East

Study Areas



Project # 2020-411I
October 27, 2020

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca

October 27, 2020

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100
Vaughan, ON
L4K 5Y2

I2S Infrastructure Intelligence Services Inc.
INTEGRITY | COLLABORATION | PERFORMANCE

Att: David Di Iorio, P.Eng.

RE: Servicing Confirmation
Carlaw Avenue and Gerrard Street East
Toronto, Ontario

Infrastructure Intelligence Services Inc. (I2S Inc.) is pleased to submit the attached results of the servicing confirmation investigation completed at properties located near the intersection of Carlaw Avenue and Gerrard Street East. Dye testing was undertaken at the commercial plaza (onsite) located at the northeast corner of Carlaw Avenue and Gerrard Street East (north of the railway tracks) to confirm stormwater connections (roof and surface drains). In addition, catch basin connectivity was documented through dye testing at various offsite catch basins located in the road allowance within the limits of Gerrard Street East between Carlaw Avenue and Pape Avenue, and Gerrard Street East between Carlaw Avenue and Boston Avenue. The fieldwork was undertaken on August 12, 19 and 21, 2020, and the findings are as follows:

Onsite

Commercial Plaza:

- Nine catch basins and two manholes were identified on the property. In addition, four roof drains were identified.
- Through dye testing, six catch basins were documented to be connected to the storm sewer (catch basins CB1, CB2, CB3, CB5, CB6 and CB7). The dye was observed in either manhole MH1 located behind the strip mall building on the property, or MH3 located on Carlaw Avenue.
- One catch basin (CB4) was documented to be connected to the storm sewer through line of sight due to a vehicle being parked over the catch basin.
- Through dye testing, catch basin CB9 was documented to be connected to CB8.
- Catch basin CB8 was inspected using a push camera in an effort to document the discharge location due to the dye testing being inconclusive. The push camera documented connection to a sewer line of brick construction. Evidence of sanitary flow was not observed; however, based on the City of Toronto sewer data, the combined sewer to the east of the property is brick construction.
- Several scuppers, discharging to surface, were identified just below the roof of the strip mall building in the loading dock area.

Off-Site

Gerrard Street East between Carlaw Avenue and Pape Avenue:

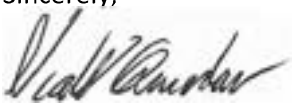
- Eight catch basins, two of which were double catch basins (DCB14 and DCB16) were identified on Gerrard Street East between Carlaw Avenue and Pape Avenue.
- Through dye testing, all eight catch basins were documented to be connected to the combined sewer (CB9, CB10, CB11, CB13, DCB14, CB15 and DCB16). Dye was observed in either manhole MH07, in the intersection of Carlaw Avenue and Gerrard Street East or MH08, located on the south side of Gerrard Street East, west of Pape Avenue. Based on City of Toronto data, MH07 is within the 300 mm dia circular combined sewer flowing west along Gerrard St East, and MH08 is within the 300 mm dia circular combined sewer flowing southwest along the Gerrard St East side road.

Gerrard Street East between Carlaw Avenue and Boston Avenue:

- Eight catch basins were identified in the area of the side street of Gerrard Street East between Carlaw Avenue and Boston Avenue.
- Through dye testing, seven catch basins were documented to be connected to the combined sewer (CB1, CB2, CB3, CB4, CB5, CB7 and CB8). Dye was observed in manholes MH01, MH03 and MH05. Based on City of Toronto data, MH01 and MH03 are within the 300 mm dia circular combined sewer running southwest along the Gerrard St East side road, and MH05 is within the 900x600 mm dia egg shaped combined sewer on Carlaw Avenue.
- One catch basin (CB6) was documented to be connected to the storm sewer through dye testing. Dye was observed in STM MH located on Boston Avenue which, based on the City of Toronto data, STM MH is within the 300 mm dia circular storm sewer.

Please feel free to contact the undersigned if you have questions/comments.

Sincerely,



Niall Quinlan
Manager, I&I Services
Tel.: 647-229-9175
Email: niall.quinlan@i2sinc.ca

CC'd:
Attached: Servicing Confirmation

Appendix A

Investigation Maps

Auto Service Centre - No internal roof access

CB4 - CB4 to MH3

CB8 - Push camera

CB9 - CB9 to CB8

CB5 - CB5 to MH3

MH3 - End of investigation limits

MH2 - MH2 to MH3

D1 - D1 to MH2

CB6 - CB6 to MH3

CB7 - CB7 to MH3

D2 - D2 to MH2

CB1 - CB1 to MH1

MH1 - MH1 to STMMH

CB2 - CB2 to MH1

CB3 - CB3 to MH1

D4 - D4 to MH2

D3 - D3 to MH2

STMMH - Storm Sewer observed on far west side of Carlaw St. Alignment does not match available record drawings.

Onsite

Offsite

Langley Avenue

Lane East Carlaw South Langley

Lane West Carlaw North Victor

Victor Avenue

Carlaw Avenue

Lane South Victor West Carlaw

Simpson Avenue

Gerrard Street East

Lane South Gerrard West Pape

Pape Avenue

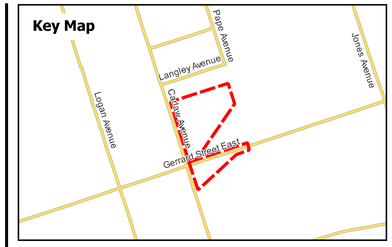
Lane South Riverdale East Pape

Logan Avenue

Jones Avenue

0 10 20 30 m

Key Map



General Notes

The estimated drainage areas are based on dye testing results and observed site features such as interpreted overland flow direction. A detailed topographic survey may be required to confirm drainage areas.

Dye Testing Results - Drainage Area Estimates

Given_ID	Outlet	Area (m2)	Comment
Offsite	COMB	7240.5	
Onsite	STM	20919.8	
Onsite	COMB	1405.4	

Map Legend

- Extent

Drainage Features
- CB
- Manhole
- Drain

Sewer Lines
- Combined
- Sanitary
- Storm
- CSO
- DUAL
- Storm CSO
- SSO

Drainage Area - Outlet
- Combined Sewer
- Surface Overland
- Storm Sewer

Sources:
Projection System: NAD 83 UTM ZONE 17N

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: A.Ambrose Oct 27, 2020

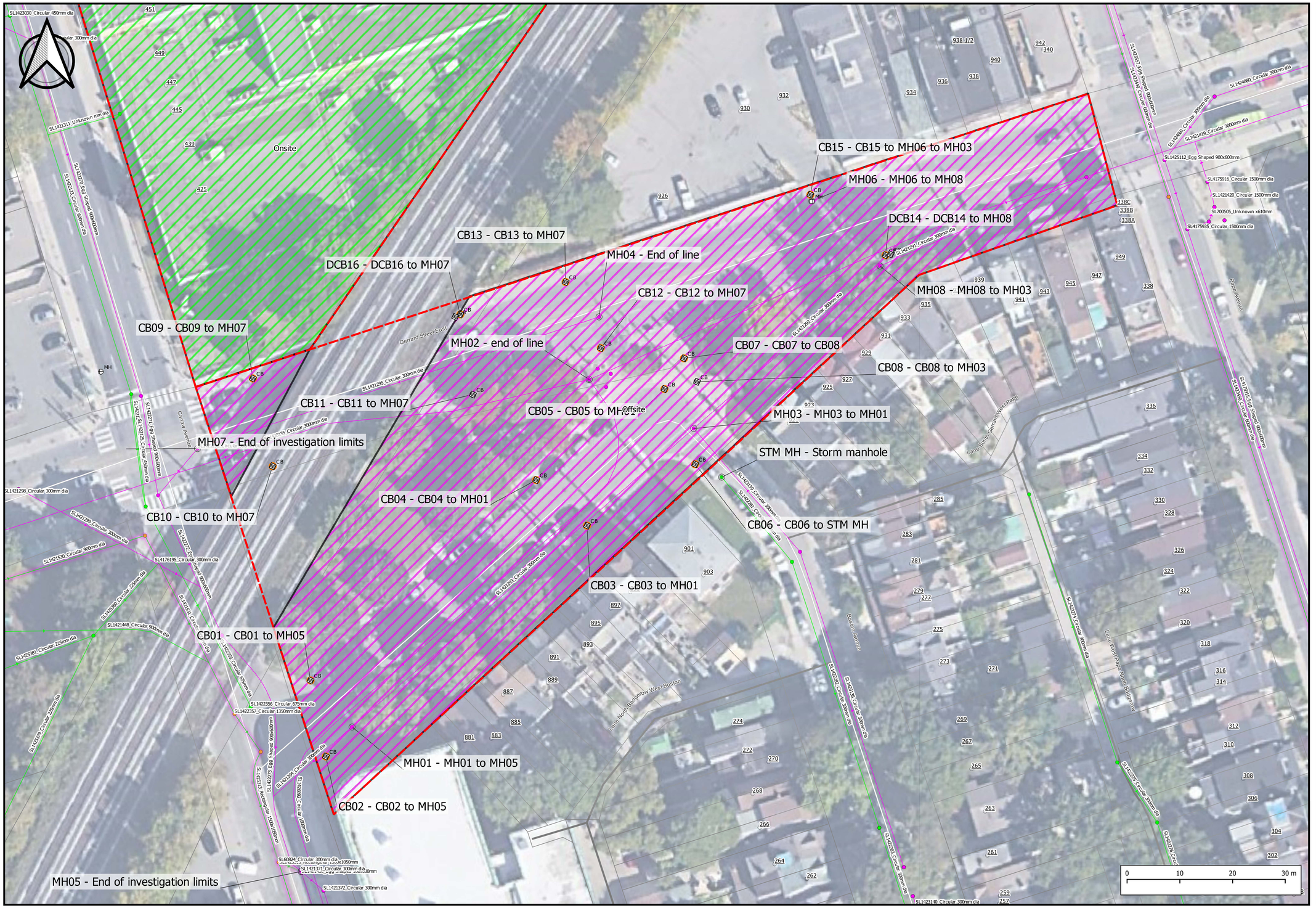
Checked: Niall Quinlan

Approved:

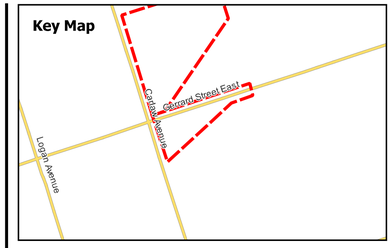
Revision History

Project: Site Servicing - Carlaw and Gerrard - Onsite

Project #: 2020-411I



Key Map



General Notes

The estimated drainage areas are based on dye testing results and observed site features such as interpreted overland flow direction. A detailed topographic survey may be required to confirm drainage areas.

Dye Testing Results - Drainage Area Estimates

Given_ID	Outlet	Area (m2)	Comment
Offsite	COMB	7240.5	
Onsite	STM	20919.8	

Map Legend

- Extent
- Drainage Features
  - CB
  - Manhole
  - Drain
- Sewer Lines
  - Combined
  - Sanitary
  - Storm
  - CSO
  - DUAL
  - Storm CSO
  - SSO
- Drainage Area - Outlet
  - Combined Sewer
  - Surface Overland
  - Storm Sewer

Sources:

Projection System: NAD 83 UTM ZONE 17N

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: A.Ambrose Oct 27, 2020

Checked: Niall Quinlan

Approved:

Revision History

Project: Site Servicing - Carlaw and Gerrard - Offsite

Project #: 2020-411I

Appendix B

Digital Package of Files

Inspection Videos & Photos

SWM DESIGN CALCULATIONS
Water Balance Daily Event Rainfall Target Depth Calculation 5mm

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 15-Jul-22

Input Parameters:

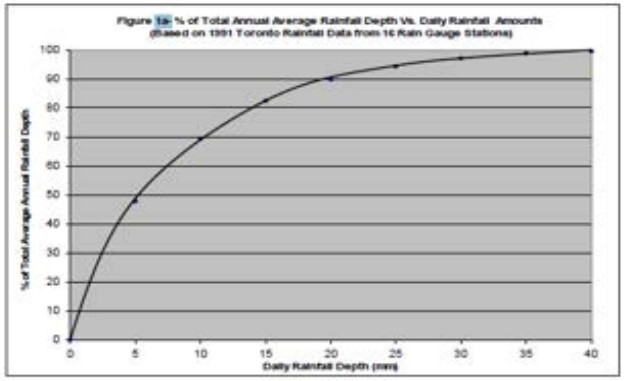
Daily Rainfall Depth (mm)	**5**
Total Annual Precipitation (mm)	**840**

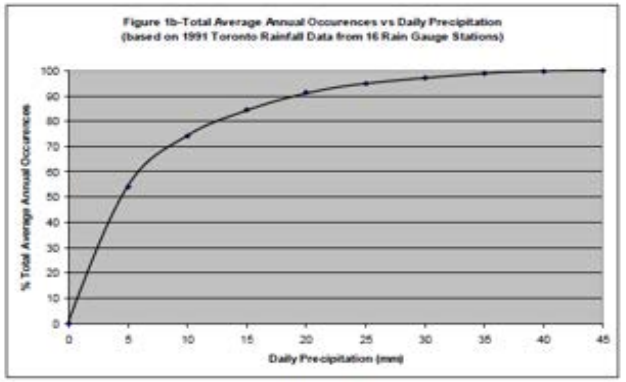
Calculated Parameters:

Portion of Total Annual Rainfall Depth (%)	**49**
Portion of Total Annual Rainfall Depth (mm)	**412**
Total Average Annual Occurrences (%)	**55**

Daily Rainfall Depth (mm)	% of Total Annual Rainfall Depth	% Total Average Annual Occurrences
0.0	0	0
5.0	49	55
10.0	70	75
15.0	82	85
20.0	90	91
25.0	95	95
30.0	97	97
35.0	98	99
40.0	100	100
Source: Wet Weather Flow Management Guidelines, City of Toronto **Figure 1a, 1b**		

City of Toronto 8





Wet Weather Flow Management Guidelines November 2006

\\CPE-FDS2\projects\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[COUNTERPOINT SWM Standard Sheet for Figure 1.a.xlsx]Water Balance Daily 5mm

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Water Balance Daily Event Rainfall Target Depth Calculation 6mm

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 15-Jul-22

Input Parameters:

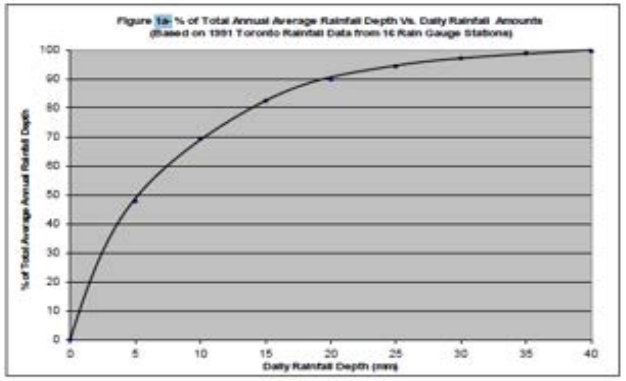
Daily Rainfall Depth (mm)	**6**
Total Annual Precipitation (mm)	**840**

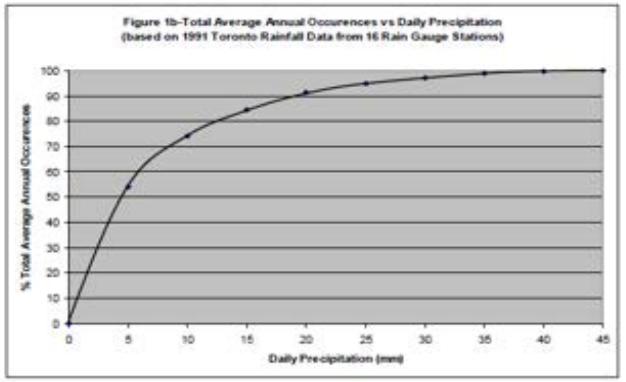
Calculated Parameters:

Portion of Total Annual Rainfall Depth (%)	**53**
Portion of Total Annual Rainfall Depth (mm)	**447**
Total Average Annual Occurrences (%)	**59**

Daily Rainfall Depth (mm)	% of Total Annual Rainfall Depth	% Total Average Annual Occurrences
0.0	0	0
5.0	49	55
10.0	70	75
15.0	82	85
20.0	90	91
25.0	95	95
30.0	97	97
35.0	98	99
40.0	100	100
Source: Wet Weather Flow Management Guidelines, City of Toronto **Figure 1a, 1b**		

City of Toronto 8





Wet Weather Flow Management Guidelines November 2006

\\CPE-FDS2\projects\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[COUNTERPOINT SWM Standard Sheet for Figure 1.a.xlsx]Water Balance Daily 5mm

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Pre-development Water Balance Calculation Results Summary (Lump)

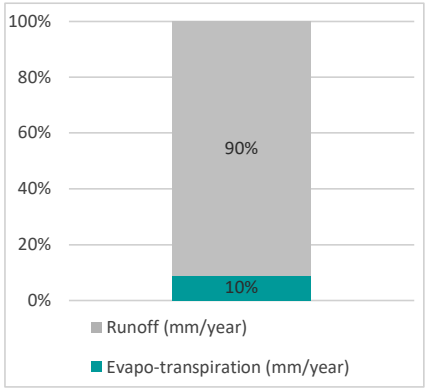
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 15-Jul-22

Soil Type **Silty Loam**

Rainfall (mm) **840**

Land use	Area (ha)	Area (%)	Evapo-transpiration (mm/year)	Infiltration (mm/year)	Runoff (mm/year)	Runoff (%)
Landscape	0.00	0%	0	0	0	-
Roof	0.85	42%	34	0	315	90%
Paved	1.20	58%	48	0	443	90%
Subtotal / Average	**2.05**	**100%**	**82**	**0**	**758**	**90%**



P:\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[20026_SWM Water Balance Calculations.xlsx]Post-development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Water Balance Analysis Block 1 Stratified Parkland

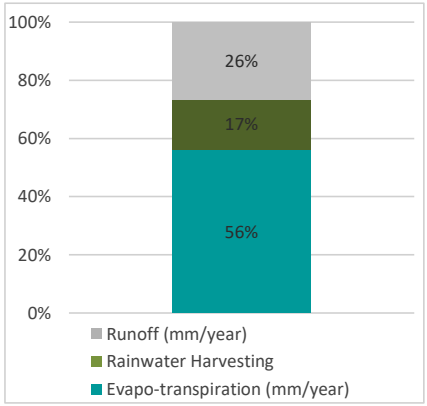
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 15-Jul-22

Soil Type **Silty Loam**

Rainfall (mm) **840**

Land use	Area (ha)	Area (%)	Evapo-transpiration (mm/year)	Infiltration (mm/year)	Runoff (mm/year)	Runoff (%)
Landscape	0.3060	90%	431	146	179	24%
Sidewalk to Landscape	0.0340	10%	42	0	42	50%
Roof	0.0000	0%	0	0	0	-
Paved	0.0000	0%	0	0	0	-
Subtotal / Average	0.3400	100%	473	146	221	26%



P:\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[20026_SWM Water Balance Calculations.xlsx]Post-development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Water Balance Analysis Block 2

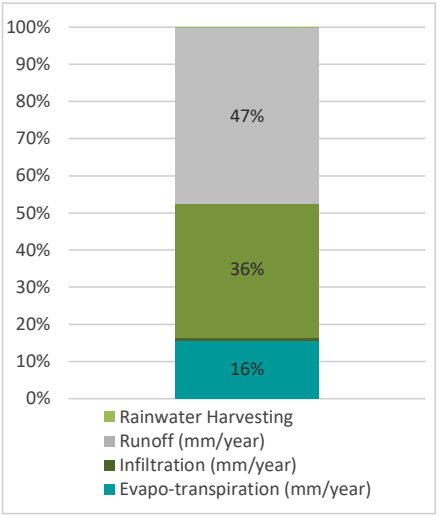
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 15-Jul-22

Soil Type **Silty Loam**

Rainfall (mm) **840**

Land use	Area (ha)	Area (%)	Evapo-transpiration (mm/year)	Infiltration (mm/year)	Runoff (mm/year)	Runoff (%)
Landscape	0.0415	5%	24	8	10	24%
Green Roof	0.0830	10%	42	0	42	50%
Roof	0.3320	40%	33	0	303	90%
Paved	0.3735	45%	37	0	341	90%
Subtotal / Average	0.8300	100%	136	8	696	83%
6 mm Rainwater Harvesting Application	0.0000	0%	0	* 301	(-301)	0%
Total	0.8300	100%	136	310	395	47%



P:\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[20026_SWM Water Balance Calculations.xlsx]Post-development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Water Balance Analysis Block 3

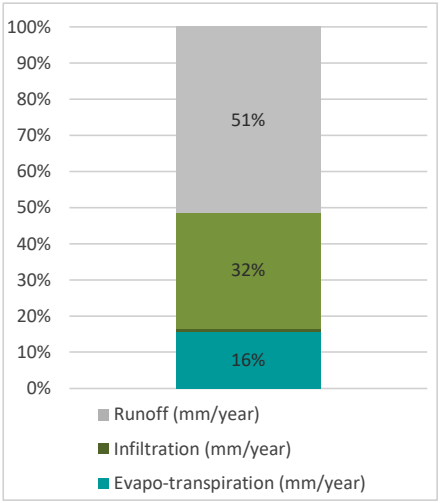
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 15-Jul-22

Soil Type **Silty Loam**

Rainfall (mm) **840**

Land use	Area (ha)	Area (%)	Evapo-transpiration (mm/year)	Infiltration (mm/year)	Runoff (mm/year)	Runoff (%)
Landscape	0.0295	5%	24	8	10	24%
Green Roof	0.0590	10%	42	0	42	50%
Roof	0.2360	40%	33	0	303	90%
Paved	0.2655	45%	37	0	341	90%
Subtotal / Average	0.5900	100%	136	8	696	83%
5 mm Rainwater Harvesting Application	0.0000	0%	0	* 268	(-268)	0%
Total	0.5900	100%	136	276	428	51%



P:\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[20026_SWM Water Balance Calculations.xlsx]Post-development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Water Balance Analysis Right of Way

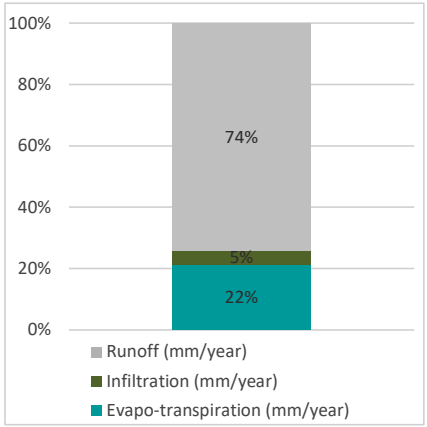
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 15-Jul-22

Soil Type **Silty Loam**

Rainfall (mm) **840**

Land use	Area (ha)	Area (%)	Evapo-transpiration (mm/year)	Infiltration (mm/year)	Runoff (mm/year)	Runoff (%)
Landscape	0.0875	25%	120	41	50	24%
Side-walk to Landscape	0.0000	0%	0	0	0	-
Roof	0.0000	0%	0	0	0	-
Paved	0.2625	75%	62	0	569	90%
Subtotal / Average	**0.3500**	**100%**	**181**	**41**	**618**	**74%**



Note: Imperviousness Asumed to be 90% in Street Right-of-Ways and 70% in Future Proposed Street Areas.

P:\Projects\2020\20026_Choice_Carlaw & Gerrard\Design\Design\Stormwater Management\[20026_SWM Water Balance Calculations.xlsx]Post-development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Table 4: Water Balance Calculation Results Summary

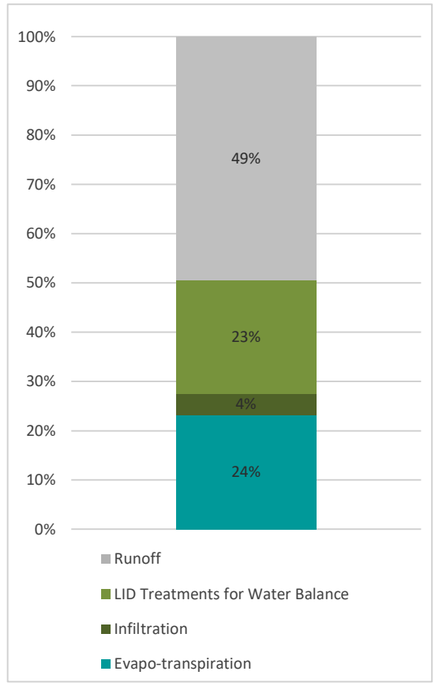
Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

Block	Area (ha)	Per Individual Site				Per 2.11 ha Entire Site			
		Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff	Evapo-transpiration	Infiltration	LID Treatments for Water Balance	Runoff
Block 1 (Stratified Parkland)	0.3400	56%	17%	0%	26%	9.1%	2.8%	0.0%	4.2%
Block 2	0.8300	16%	1%	36%	47%	6.4%	0.4%	14.1%	18.5%
Block 3	0.5900	16%	1%	32%	51%	4.5%	0.3%	8.9%	14.3%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	22%	5%	0%	74%	3.6%	0.8%	0.0%	12.2%
Sub-Total	**2.1100**					**24%**	**4%**	**23%**	*** 49%**

* Therefore, overall the site is able to retain events up to 5.0mm, which is equal to 50% of annual rainfall depth..



Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Table 5: Post-development Water Quality/TSS Removal Calculation Results Summary (using New Jersey Stormwater Best Management Practices Manual , Chapter 4 - TSS Removal Rates for BMP's in Series)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Checked by: R.K

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Soil Type **Silty Loam**
Rainfall (mm) **840**

TSS Removal Treatment Train Approach

Block	Area (ha)	Stage 1. Land Use (% of area) for TSS Removal Credits							Stage2. Block Level Additional TSS Removal Features						Complete TSS Removal Individual	TSS Removal Credit Per 2.11ha Entire Site
		Landscape (80% TSS Removal Credit)	Green Roof (80% TSS Removal Credit)	Roof (80% TSS Removal Credit)	Roof/Paved to Landscape (80% TSS Removal Credit)	% Paved Area (0% TSS Removal Credit)	Total On-site TSS Removal Credit *	Remained Untreated TSS	* 6 mm Runoff Retention - Minimum 50% TSS Removal Credit	Total Block Level TSS Removal	Remained Untreated TSS	OGS 50% TSS Removal Credit	Total TSS Removal for Blocks	Remained Untreated TSS		
Block 1 (Stratified Parkland)	0.3400	90%	10%	0%	0%	0%	80%	20%	-	80%	20%	50%	90%	10%	90%	14.5%
Block 2	0.8300	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	33.8%
Block 3	0.5900	5%	10%	40%	0%	45%	44%	56%	50%	72%	28%	50%	86%	14%	86%	24.0%
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	25%	0%	0%	0%	75%	20%	80%	50%	60%	40%	50%	80%	20%	80%	13.3%
Sub-Total	**2.1100**															**86%**

* Water Balance Cisterns TSS credit based on 5mm rain event retention, which is equivalent to 50% of annual rainfall depth.
**TSS treatment of last OGS unitS, for ROW's, for upstream released flows from blocks has been ignored in this calculations for a conservative approach.

Reference: **New Jersey Stormwater Best Management Practices Manual**
Chapter 4 - TSS Removal Rates for BMP's in Series

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
2-Year @RC=0.5 Flow Rate Calculations - Block 1 Stratified Parkland

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	0.34
Runoff Coefficient	0.5
AC	0.17
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	42

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
2-Year @RC=0.5 Flow Rate Calculations - Block 2 Controlled

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 14-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	0.83
Runoff Coefficient	0.5
AC	0.42
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	102

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
2-Year @RC=0.5 Flow Rate Calculations - Block 3 Controlled

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 14-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	0.59
Runoff Coefficient	0.5
AC	0.30
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	72

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
2-Year@RC=0.5 Flow Rate Calc (to Carlaw Ave.)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 14-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	1.91
Runoff Coefficient	0.5
AC	0.96
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	234

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
2-Year@RC=0.5 Flow Rate Calc (To Combined sewer on Pape Ave.)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 14-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	0.14
Runoff Coefficient	0.5
AC	0.07
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	17

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
2-Year @RC=0.5 Flow Rate Calculations (Entire Site Area)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 14-Jul-22

Prepared by: Y.K
Checked by: R.K.
Last Revised: 14-Jul-22

Rainfall Data

Location:	City of Toronto	a	21.8
Event	2-year	b	0
		c	0.78

Site Data

Area (ha)	2.05
Runoff Coefficient	0.5
AC	1.03
Tc (min)	10
Rainfall Intensity (mm/hr)	88
Rational Flow Rate (l/s)	251

The Rational Equation:

$$Q = \frac{(C)(i)(A)}{360}$$

where,

Q = the design flow (m^3/s)
C = the site specific runoff coefficient
A = the drainage area (ha)
i = rainfall intensity (mm/hr)

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
VO2 Model Characteristics (CN Determination)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 15-Jul-22

Proposed Blocks

SCS Curve Number (CN) Determination

TABLE OF CURVE NUMBERS (CN)							
Land Use	Hydrologic Soil Type						
	A	AB	B	BC	C	CD	D
Meadow	50	54	58	64.5	71	74.5	78
Woodlot	50	55.3	60.5	67	73.5	76.8	80
Long Grass	55	60	65	72	79	81.5	84
Lawns	60	65.5	70	77	83	86	89
Pasture/Range	58	61.5	65	70.5	76	78.5	81
Crop	66	70	74	78	82	84	86
Fallow (Bare)	77	82	86	89	91	93	94
Built-up	60	65.5	71	77	83	86	90

Pre/Post-Development

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

counterpoint ENGINEERING

SWM DESIGN CALCULATIONS
VO2 Model Characteristics CN* Calculations

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: R.K.
Last Revised: 15-Jul-22

Pre-development Conditions	
Estimation of CN* based on API	
CN_{AMCII} =	**86**
CN_{AMCIII} =	94
S =	16.5 mm
Ia =	3.30 mm
Total 100yr Rainfall, P =	99 mm
Q =	81.74 mm
Standard Ia =	5 mm
S* =	14.2 mm
CN^*_{AMCIII} =	95
CN^*_{AMCII} =	**87**

Post-development Conditions	
Estimation of CN* based on API	
CN_{AMCII} =	**86**
CN_{AMCIII} =	94
S =	16.5 mm
Ia =	3.30 mm
Total 100yr Rainfall, P =	99 mm
Q =	81.74 mm
Standard Ia =	5 mm
S* =	14.2 mm
CN^*_{AMCIII} =	95
CN^*_{AMCII} =	**87**

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

SWM DESIGN CALCULATIONS
Available Storage Calculations

Project Name: 449 Carlaw Avenue
Municipality: Toronto
Project No.: 20026
Date: 13-Jul-22

Prepared by: L.W.
Last Revised: 13-Jul-22

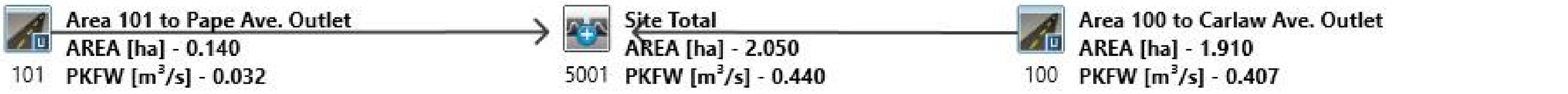
Available Storage Underground in Sewer (Assumed Full)

From	To	Length of Pipe (m)	Length Below HWL (m)	Diameter (mm)	Volume (m^3)
MH7	MH6	7.5	7.5	375	0.83
MH6	MH5	30.3	30.3	450	4.82
MH5	MH4	72.0	72.0	450	11.45
MH4	MH3	23.3	23.3	450	3.71
MH3	MH2	12.5	12.5	450	1.99
MH2	CNTRL MH	2.8	2.8	525	0.61
DCB4	MH6	26.0	26.0	250	1.28
DCB3	MH6	25.5	25.5	250	1.25
CB4	MH5	5.6	5.6	200	0.18
CB3	MH5	2.3	2.3	200	0.07
CB2	MH5-MH4 PIPE	5.6	5.6	200	0.18
CB1	MH5-MH4 PIPE	2.3	2.3	200	0.07
DCB2	CNTRL MH	6.0	6.0	250	0.29
DCB1	CNTRL MH	2.6	2.6	250	0.13
Total Storage Underground in Sewers (m^3):					**26.8**

Available Storage Underground in Sewer Catchbasins & Manholes

MH	Manhole Top Elevation or HWL (m)	Low Invert Elevation (m)	Diameter (m)	Volume (m^3)
MH7	93.45	89.64	1.20	4.31
MH6	93.26	89.12	1.20	4.68
MH5	92.09	88.18	1.20	4.42
MH4	88.62	85.97	1.20	3.00
MH3	87.72	85.47	1.20	2.54
MH2	87.39	85.33	1.50	3.64
CNTRL MH	87.37	85.28	1.50	3.69
DCB4	93.49	92.55	(1.2 x 1.2)	1.35
DCB3	93.49	92.55	(1.2 x 1.2)	1.35
CB4	92.05	90.54	(0.6 x 0.6)	0.54
CB3	92.05	90.54	(0.6 x 0.6)	0.54
CB2	89.18	87.68	(0.6 x 0.6)	0.54
CB1	89.11	87.61	(0.6 x 0.6)	0.54
DCB2	87.32	85.57	(1.2 x 1.2)	2.52
DCB1	87.32	85.57	(1.2 x 1.2)	2.52
Total Storage Underground in CB's & MH's (m^3):				**36.2**

Total Available Underground Storage (m^3): 63.0
(In Sewer, Manholes and Catchbasins)


Area 101 to Pape Ave. Outlet
AREA [ha] - 0.140
101 PKFW [m³/s] - 0.032
Site Total
AREA [ha] - 2.050
5001 PKFW [m³/s] - 0.440
Area 100 to Carlaw Ave. Outlet
AREA [ha] - 1.910
100 PKFW [m³/s] - 0.407

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\6
fbf2f35-9c7a-4547-a8de-8ff318d8d1ed\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\6
fbf2f35-9c7a-4547-a8de-8ff318d8d1ed\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:      Yelena Koshenkov


COMMENTS: The City of Toronto 6-hour Chicago Design Storms, 2 - 100 year


--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 100-year storm                **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1579.412
| Ptotal= 85.43 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.800

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.99	1.50	7.83	3.00	9.27	4.50	4.11
0.17	3.19	1.67	9.98	3.17	8.03	4.67	3.89
0.33	3.42	1.83	14.18	3.33	7.11	4.83	3.70
0.50	3.70	2.00	27.99	3.50	6.40	5.00	3.52
0.67	4.03	2.17	250.32	3.67	5.83	5.17	3.37
0.83	4.43	2.33	32.87	3.83	5.36	5.33	3.22
1.00	4.94	2.50	18.98	4.00	4.97	5.50	3.09
1.17	5.61	2.67	13.83	4.17	4.64	5.67	2.98
1.33	6.51	2.83	11.04	4.33	4.36	5.83	2.87

CALIB
STANDHYD (0100)
ID= 1 DT= 5.0 min

Area (ha)= 1.91
Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37

Pre-Development Conditions

0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.90 (ii)	4.19 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.32	0.24	
			TOTALS
PEAK FLOW (cms)=	1.15	0.12	1.265 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	80.55
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	30.55	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11

Pre-Development Conditions

0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.87 (ii)	2.90 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.28	
			TOTALS
PEAK FLOW (cms)=	0.09	0.01	0.095 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	81.44
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.95

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	1.265	2.33	80.55
+ ID2= 2 (0101):	0.14	0.095	2.33	81.44
ID = 3 (5001):	2.05	1.360	2.33	80.61

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c
d11ab65-b31b-42bd-8d9d-e48c07ba298b\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c
d11ab65-b31b-42bd-8d9d-e48c07ba298b\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:


COMMENTS: ____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 10-year storm               **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1023.840
| Ptotal= 55.38 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.800

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.94	1.50	5.08	3.00	6.01	4.50	2.66
0.17	2.07	1.67	6.47	3.17	5.21	4.67	2.52
0.33	2.22	1.83	9.19	3.33	4.61	4.83	2.40
0.50	2.40	2.00	18.14	3.50	4.15	5.00	2.28
0.67	2.61	2.17	162.27	3.67	3.78	5.17	2.18
0.83	2.87	2.33	21.31	3.83	3.48	5.33	2.09
1.00	3.20	2.50	12.30	4.00	3.22	5.50	2.01
1.17	3.63	2.67	8.97	4.17	3.01	5.67	1.93
1.33	4.22	2.83	7.16	4.33	2.82	5.83	1.86

CALIB STANDHYD (0100) ID= 1 DT= 5.0 min	Area (ha)= 1.91 Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18

Pre-Development Conditions

0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

			TOTALS
Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	5.00	
Storage Coeff. (min)=	2.26 (ii)	4.98 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.30	0.22	
PEAK FLOW (cms)=	0.74	0.06	0.798 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	54.38	28.73	51.04
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.52	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.13	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	30.55	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66

Pre-Development Conditions

0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.03 (ii)	3.45 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.26	
			TOTALS
PEAK FLOW (cms)=	0.06	0.00	0.060 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	54.38	28.73	51.81
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.52	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	0.798	2.33	51.04
+ ID2= 2 (0101):	0.14	0.060	2.33	51.81
ID = 3 (5001):	2.05	0.858	2.33	51.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\8
70370f5-3a70-47d7-9f10-5478dfc3c766\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\8
70370f5-3a70-47d7-9f10-5478dfc3c766\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 25-year storm               **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1195.802
| Ptotal= 64.68 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.800

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.26	1.50	5.93	3.00	7.02	4.50	3.11
0.17	2.41	1.67	7.55	3.17	6.08	4.67	2.94
0.33	2.59	1.83	10.73	3.33	5.38	4.83	2.80
0.50	2.80	2.00	21.19	3.50	4.85	5.00	2.67
0.67	3.05	2.17	189.52	3.67	4.41	5.17	2.55
0.83	3.36	2.33	24.89	3.83	4.06	5.33	2.44
1.00	3.74	2.50	14.37	4.00	3.77	5.50	2.34
1.17	4.24	2.67	10.47	4.17	3.52	5.67	2.25
1.33	4.93	2.83	8.36	4.33	3.30	5.83	2.17

CALIB
STANDHYD (0100)
ID= 1 DT= 5.0 min

Area (ha)= 1.91
Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55

Pre-Development Conditions

0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	111.47	
over (min)	5.00	5.00	
Storage Coeff. (min)=	2.13 (ii)	4.68 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.31	0.22	
			TOTALS
PEAK FLOW (cms)=	0.87	0.07	0.942 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	63.68	36.48	60.14
TOTAL RAINFALL (mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT =	0.98	0.56	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.13	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	30.55	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11

Pre-Development Conditions

0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	111.47	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.97 (ii)	3.24 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.27	
			TOTALS
PEAK FLOW (cms)=	0.07	0.00	0.071 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	63.68	36.48	60.95
TOTAL RAINFALL (mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT =	0.98	0.56	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	0.942	2.33	60.14
+ ID2= 2 (0101):	0.14	0.071	2.33	60.95
ID = 3 (5001):	2.05	1.013	2.33	60.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\a
6cc68e0-c7e6-459f-a84e-7c3852c2e4b2\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\a
6cc68e0-c7e6-459f-a84e-7c3852c2e4b2\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 2-year storm                **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 531.391
| Ptotal= 32.33 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.780

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.24	1.50	3.18	3.00	3.75	4.50	1.69
0.17	1.32	1.67	4.03	3.17	3.26	4.67	1.61
0.33	1.42	1.83	5.67	3.33	2.89	4.83	1.53
0.50	1.53	2.00	10.99	3.50	2.61	5.00	1.46
0.67	1.66	2.17	88.19	3.67	2.38	5.17	1.40
0.83	1.82	2.33	12.86	3.83	2.20	5.33	1.34
1.00	2.03	2.50	7.53	4.00	2.04	5.50	1.29
1.17	2.29	2.67	5.53	4.17	1.91	5.67	1.24
1.33	2.66	2.83	4.44	4.33	1.79	5.83	1.19

CALIB
STANDHYD (0100)
ID= 1 DT= 5.0 min

Area (ha)= 1.91
Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40

Pre-Development Conditions

0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	29.10	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.89 (ii)	6.36 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.28	0.15	
			TOTALS
PEAK FLOW (cms)=	0.40	0.02	0.407 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	31.33	11.44	28.75
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.35	0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.13	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	30.55	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69

Pre-Development Conditions

0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	29.10	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.32 (ii)	4.40 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.23	
			TOTALS
PEAK FLOW (cms)=	0.03	0.00	0.032 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	31.33	11.44	29.34
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.35	0.91

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	0.407	2.33	28.75
+ ID2= 2 (0101):	0.14	0.032	2.33	29.34
ID = 3 (5001):	2.05	0.440	2.33	28.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c
9e6ce73-c53c-40c0-b3c2-e2b1c6a30b23\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c
9e6ce73-c53c-40c0-b3c2-e2b1c6a30b23\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 50-year storm                **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1415.386
| Ptotal= 76.56 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.800

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.68	1.50	7.02	3.00	8.31	4.50	3.68
0.17	2.86	1.67	8.94	3.17	7.20	4.67	3.49
0.33	3.07	1.83	12.71	3.33	6.37	4.83	3.31
0.50	3.31	2.00	25.08	3.50	5.74	5.00	3.16
0.67	3.61	2.17	224.32	3.67	5.23	5.17	3.02
0.83	3.97	2.33	29.45	3.83	4.81	5.33	2.89
1.00	4.43	2.50	17.01	4.00	4.46	5.50	2.77
1.17	5.02	2.67	12.39	4.17	4.16	5.67	2.67
1.33	5.84	2.83	9.90	4.33	3.90	5.83	2.57

CALIB
STANDHYD (0100)
ID= 1 DT= 5.0 min

Area (ha)= 1.91
Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02

Pre-Development Conditions

0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

			TOTALS
Max.Eff.Inten.(mm/hr)=	224.32	144.73	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.99 (ii)	4.38 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.31	0.23	
PEAK FLOW (cms)=	1.03	0.10	1.127 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	75.55	46.76	71.81
TOTAL RAINFALL (mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT =	0.99	0.61	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.13	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	30.55	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68

Pre-Development Conditions

0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	144.73	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.91 (ii)	3.03 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.27	
			TOTALS
PEAK FLOW (cms)=	0.08	0.01	0.085 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	75.56	46.76	72.67
TOTAL RAINFALL (mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT =	0.99	0.61	0.95

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	1.127	2.33	71.81
+ ID2= 2 (0101):	0.14	0.085	2.33	72.67
ID = 3 (5001):	2.05	1.211	2.33	71.87

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Pre-Development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\e
82b6359-542e-483c-a29f-1ee5f6b0a1f5\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\e
82b6359-542e-483c-a29f-1ee5f6b0a1f5\s


DATE: 07-14-2022                          TIME: 06:13:59

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 5-year storm                **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 812.624
| Ptotal= 46.62 mm |                          B=   0.000
```

Pre-Development Conditions

C= 0.790

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.71	1.50	4.43	3.00	5.23	4.50	2.34
0.17	1.82	1.67	5.63	3.17	4.54	4.67	2.22
0.33	1.96	1.83	7.96	3.33	4.03	4.83	2.11
0.50	2.11	2.00	15.58	3.50	3.63	5.00	2.01
0.67	2.30	2.17	131.79	3.67	3.31	5.17	1.92
0.83	2.53	2.33	18.26	3.83	3.05	5.33	1.84
1.00	2.81	2.50	10.62	4.00	2.83	5.50	1.77
1.17	3.18	2.67	7.77	4.17	2.64	5.67	1.70
1.33	3.69	2.83	6.22	4.33	2.48	5.83	1.64

CALIB
STANDHYD (0100)
ID= 1 DT= 5.0 min

Area (ha)= 1.91
Total Imp(%)= 87.00 Dir. Conn.(%)= 87.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.66	0.25
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	112.84	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92

Pre-Development Conditions

0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=	131.79	61.79	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.46 (ii)	5.41 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.30	0.16	
			TOTALS
PEAK FLOW (cms)=	0.60	0.03	0.627 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	45.62	21.77	42.52
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.47	0.91

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0101)	Area (ha)= 0.14
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 90.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.13	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	30.55	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34

Pre-Development Conditions

0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=	131.79	61.79	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.12 (ii)	3.75 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.25	
			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.049 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	45.62	21.77	43.23
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.47	0.93

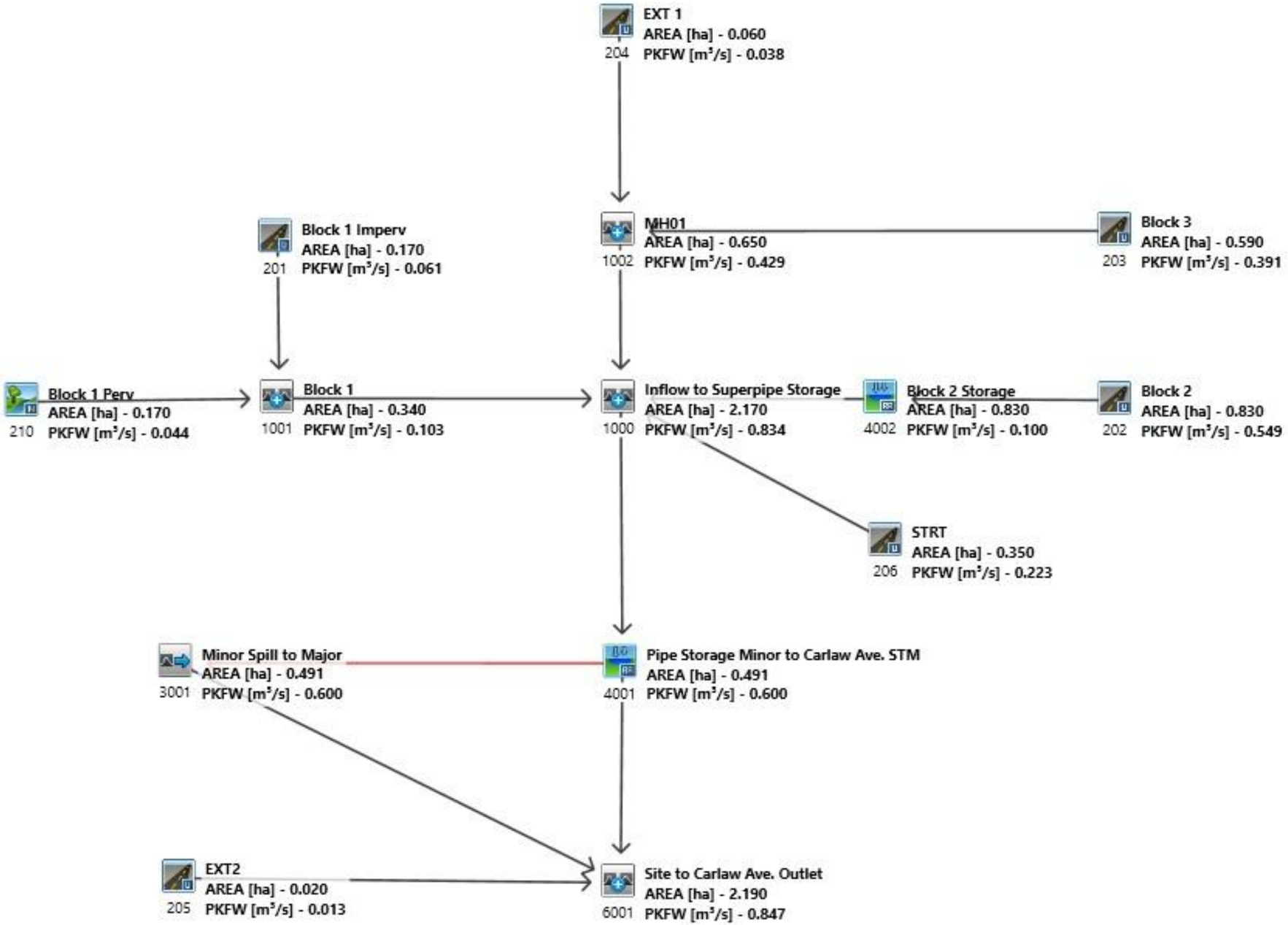
(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0100):	1.91	0.627	2.33	42.52
+ ID2= 2 (0101):	0.14	0.049	2.33	43.23
ID = 3 (5001):	2.05	0.676	2.33	42.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

==========


EXT 1
AREA [ha] - 0.060
204 PKFW [m³/s] - 0.038
Block 1 Imperv
AREA [ha] - 0.170
201 PKFW [m³/s] - 0.061
MH01
AREA [ha] - 0.650
1002 PKFW [m³/s] - 0.429
Block 3
AREA [ha] - 0.590
203 PKFW [m³/s] - 0.391
Block 1 Perv
AREA [ha] - 0.170
210 PKFW [m³/s] - 0.044
Block 1
AREA [ha] - 0.340
1001 PKFW [m³/s] - 0.103
Inflow to Superpipe Storage
AREA [ha] - 2.170
1000 PKFW [m³/s] - 0.834
Block 2 Storage
AREA [ha] - 0.830
4002 PKFW [m³/s] - 0.100
Block 2
AREA [ha] - 0.830
202 PKFW [m³/s] - 0.549
STRT
AREA [ha] - 0.350
206 PKFW [m³/s] - 0.223
Minor Spill to Major
AREA [ha] - 0.491
3001 PKFW [m³/s] - 0.600
Pipe Storage Minor to Carlaw Ave. STM
AREA [ha] - 0.491
4001 PKFW [m³/s] - 0.600
EXT2
AREA [ha] - 0.020
205 PKFW [m³/s] - 0.013
Site to Carlaw Ave. Outlet
AREA [ha] - 2.190
6001 PKFW [m³/s] - 0.847

Post-development Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\0
b808fce-cbe8-49d4-9678-133c960ff529\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\0
b808fce-cbe8-49d4-9678-133c960ff529\s


DATE: 07-15-2022                          TIME: 10:42:49

USER:     Yelena Koshenkov


COMMENTS: The City of Toronto 6-hour Chicago Design Storms, 2 - 100 year


--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 100-year storm                **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1579.412
| Ptotal= 85.43 mm |                          B=   0.000
```

Post-development Conditions

C= 0.800

used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.99	1.50	7.83	3.00	9.27	4.50	4.11
0.17	3.19	1.67	9.98	3.17	8.03	4.67	3.89
0.33	3.42	1.83	14.18	3.33	7.11	4.83	3.70
0.50	3.70	2.00	27.99	3.50	6.40	5.00	3.52
0.67	4.03	2.17	250.32	3.67	5.83	5.17	3.37
0.83	4.43	2.33	32.87	3.83	5.36	5.33	3.22
1.00	4.94	2.50	18.98	4.00	4.97	5.50	3.09
1.17	5.61	2.67	13.83	4.17	4.64	5.67	2.98
1.33	6.51	2.83	11.04	4.33	4.36	5.83	2.87

CALIB			
NASHYD (0210)	Area (ha)=	0.17	Curve Number (CN)= 87.0
ID= 1 DT=10.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.044 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 52.122
TOTAL RAINFALL (mm)= 85.427
RUNOFF COEFFICIENT = 0.610

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

CALIB			
STANDHYD (0201)	Area (ha)=	0.17	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

			TOTALS
Max.Eff.Inten.(mm/hr)=	250.32	230.05	
over (min)	5.00	10.00	
Storage Coeff. (min)=	0.92 (ii)	5.98 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.15	
PEAK FLOW (cms)=	0.00	0.06	0.061 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.42
RUNOFF VOLUME (mm)=	84.43	59.11	59.34
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.69	0.69

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (1001)|

Post-development Conditions

1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0201):	0.17	0.061	2.42	59.34
+	ID2= 2 (0210):	0.17	0.044	2.33	52.12
	ID = 3 (1001):	0.34	0.103	2.33	55.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0203)	Area (ha)= 0.59
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.50	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	62.72	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	170.26
over (min)	5.00	5.00
Storage Coeff. (min)=	1.34 (ii)	3.78 (ii)

Post-development Conditions

Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.33	0.25		
				TOTALS
PEAK FLOW (cms)=	0.35	0.04		0.391 (iii)
TIME TO PEAK (hrs)=	2.33	2.33		2.33
RUNOFF VOLUME (mm)=	84.43	54.64		79.96
TOTAL RAINFALL (mm)=	85.43	85.43		85.43
RUNOFF COEFFICIENT =	0.99	0.64		0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0204)	Area (ha)= 0.06
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.05	0.01
Dep. Storage (mm)=	1.00	5.00
Average Slope (%)=	1.00	2.00
Length (m)=	20.00	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98

Post-development Conditions

1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.67 (ii)	3.82 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.25	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	76.96
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1002)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0203):	0.59	0.391	2.33	79.96	
+ ID2= 2 (0204):	0.06	0.038	2.33	76.96	
ID = 3 (1002):	0.65	0.429	2.33	79.68	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0202) | ID= 1 DT= 5.0 min	Area (ha)= 0.83	Total Imp(%)= 85.00	Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.71	0.12
Dep. Storage (mm)=		1.00	5.00
Average Slope (%)=		1.00	2.00
Length (m)=		74.39	40.00
Mannings n =		0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

			TOTALS
Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.48 (ii)	3.93 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.24	
PEAK FLOW (cms)=	0.49	0.06	0.549 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	79.96
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.94

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

RESERVOIR(4002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

Post-development Conditions

0.0000 0.0000 | 0.1020 0.0360

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	0.830	0.549	2.33	79.96
OUTFLOW: ID= 1 (4002)	0.830	0.100	2.42	79.86

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.23
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0353

CALIB
STANDHYD (0206)
ID= 1 DT= 5.0 min

Area (ha)= 0.35
Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.26	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	48.30	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

	Post-development Conditions		
Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.14 (ii)	4.29 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.23	
			TOTALS
PEAK FLOW (cms)=	0.18	0.04	0.223 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	76.97
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):	0.34	0.103	2.33	55.73
+ ID2= 2 (1002):	0.65	0.429	2.33	79.68
ID = 3 (1000):	0.99	0.532	2.33	71.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (1000):	0.99	0.532	2.33	71.45
+ ID2= 2 (0206):	0.35	0.223	2.33	76.97
ID = 1 (1000):	1.34	0.754	2.33	72.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)

```
                              Post-development Conditions
          ID1= 1 (  1000):     1.34   0.754     2.33    72.89
        + ID2= 2 (  4002):     0.83   0.100     2.42    79.86
          ================================================
          ID = 3 (  1000):     2.17   0.835     2.33    75.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  4001)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2340      0.0060

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  1000)      2.170      0.835      2.33      75.56
   OUTFLOW: ID= 1 (  4001)      1.678      0.234      2.25      79.09
   OVERFLOW:ID= 3 (  0003)      0.492      0.601      2.33      79.09

                    TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                    CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                    PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 28.04
                    TIME SHIFT OF PEAK FLOW         (min)= -5.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0060

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD(  3001)|
| IN= 2---> OUT= 1 |
| SHIFT=  1.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (  4001):    0.49      0.60      2.33     79.09
    SHIFT ID= 1 (  3001):    0.49      0.60      2.33     79.09


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0205)|   Area    (ha)=   0.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      11.55        40.00
```

Post-development Conditions

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.99	1.583	7.83	3.083	9.27	4.58	4.11
0.167	2.99	1.667	7.83	3.167	9.27	4.67	4.11
0.250	3.19	1.750	9.98	3.250	8.03	4.75	3.89
0.333	3.19	1.833	9.98	3.333	8.03	4.83	3.89
0.417	3.42	1.917	14.18	3.417	7.11	4.92	3.70
0.500	3.42	2.000	14.18	3.500	7.11	5.00	3.70
0.583	3.70	2.083	27.99	3.583	6.40	5.08	3.52
0.667	3.70	2.167	27.99	3.667	6.40	5.17	3.52
0.750	4.03	2.250	250.32	3.750	5.83	5.25	3.37
0.833	4.03	2.333	250.32	3.833	5.83	5.33	3.37
0.917	4.43	2.417	32.87	3.917	5.36	5.42	3.22
1.000	4.43	2.500	32.87	4.000	5.36	5.50	3.22
1.083	4.94	2.583	18.98	4.083	4.97	5.58	3.09
1.167	4.94	2.667	18.98	4.167	4.97	5.67	3.09
1.250	5.61	2.750	13.83	4.250	4.64	5.75	2.98
1.333	5.61	2.833	13.83	4.333	4.64	5.83	2.98
1.417	6.51	2.917	11.04	4.417	4.36	5.92	2.87
1.500	6.51	3.000	11.04	4.500	4.36	6.00	2.87

			TOTALS
Max.Eff.Inten.(mm/hr)=	250.32	170.26	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.48 (ii)	3.64 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.25	
PEAK FLOW (cms)=	0.01	0.00	0.013 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	84.43	54.64	76.96
TOTAL RAINFALL (mm)=	85.43	85.43	85.43
RUNOFF COEFFICIENT =	0.99	0.64	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

Post-development Conditions

```
| ADD HYD  (  6001)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.02   0.013     2.33    76.96
      + ID2= 2 (  3001):     0.49   0.601     2.33    79.09
        ====================================================
        ID = 3 (  6001):     0.51   0.613     2.33    79.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  6001):     0.51   0.613     2.33    79.01
      + ID2= 2 (  4001):     1.68   0.234     2.25    79.09
        ====================================================
        ID = 1 (  6001):     2.19   0.847     2.33    79.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\a
1222da2-05c1-4f6f-8711-3e959456ed72\s
  Summary filename:
```

Post-development Conditions
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\a1222da2-05c1-4f6f-8711-3e959456ed72\s

DATE: 07-15-2022 TIME: 10:42:49

USER:

COMMENTS: _____

****
** SIMULATION : 10-year storm **
****

| CHICAGO STORM |
| Ptotal= 55.38 mm |

IDF curve parameters: A=1023.840
B= 0.000
C= 0.800
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.94	1.50	5.08	3.00	6.01	4.50	2.66
0.17	2.07	1.67	6.47	3.17	5.21	4.67	2.52
0.33	2.22	1.83	9.19	3.33	4.61	4.83	2.40
0.50	2.40	2.00	18.14	3.50	4.15	5.00	2.28
0.67	2.61	2.17	162.27	3.67	3.78	5.17	2.18
0.83	2.87	2.33	21.31	3.83	3.48	5.33	2.09
1.00	3.20	2.50	12.30	4.00	3.22	5.50	2.01
1.17	3.63	2.67	8.97	4.17	3.01	5.67	1.93
1.33	4.22	2.83	7.16	4.33	2.82	5.83	1.86

| CALIB |
| NASHYD (0210)|
|ID= 1 DT=10.0 min |

Area (ha)= 0.17 Curve Number (CN)= 87.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.17

Post-development Conditions

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.022 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 27.406
TOTAL RAINFALL (mm)= 55.377
RUNOFF COEFFICIENT = 0.495

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

CALIB	
STANDHYD (0201)	Area (ha)= 0.17
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)= 162.27 122.12

```
                              Post-development Conditions
                over (min)        5.00        10.00
      Storage Coeff.  (min)=      1.10 (ii)    7.61 (ii)
      Unit Hyd. Tpeak (min)=      5.00        10.00
      Unit Hyd. peak  (cms)=      0.34         0.13
                                                          *TOTALS*
      PEAK FLOW       (cms)=      0.00         0.03          0.031 (iii)
      TIME TO PEAK    (hrs)=      2.33         2.42           2.42
      RUNOFF VOLUME    (mm)=     54.38        32.14          32.33
      TOTAL RAINFALL   (mm)=     55.38        55.38          55.38
      RUNOFF COEFFICIENT   =      0.98         0.58           0.58


        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  87.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1001)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0201):     0.17   0.031     2.42    32.33
      + ID2= 2 (  0210):     0.17   0.022     2.33    27.41
        ================================================
        ID = 3 (  1001):     0.34   0.050     2.42    29.86

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0203)|   Area    (ha)=   0.59
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.09
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      62.72        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                           ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

Post-development Conditions

0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.59 (ii)	4.50 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.23	
			TOTALS
PEAK FLOW (cms)=	0.23	0.02	0.247 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	54.38	28.73	50.53
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.52	0.91

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0204)	Area (ha)= 0.06
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.05	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	20.00	40.00

Post-development Conditions

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

			TOTALS
Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.80 (ii)	4.55 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.23	
PEAK FLOW (cms)=	0.02	0.00	0.024 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	54.38	28.73	47.95
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.52	0.87

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

Post-development Conditions

ADD HYD (1002)|	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0203):		0.59	0.247	2.33	50.53
+ ID2= 2 (0204):		0.06	0.024	2.33	47.95
ID = 3 (1002):		0.65	0.271	2.33	50.29

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0202)	Area (ha)= 0.83			
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00	Dir. Conn.(%)= 85.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.12
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	74.39	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	5.00	

```
                              Post-development Conditions
      Storage Coeff.  (min)=       1.76 (ii)    4.67 (ii)
      Unit Hyd. Tpeak (min)=       5.00         5.00
      Unit Hyd. peak  (cms)=       0.32         0.22
                                                          *TOTALS*
      PEAK FLOW       (cms)=       0.32         0.03          0.346 (iii)
      TIME TO PEAK    (hrs)=       2.33         2.33           2.33
      RUNOFF VOLUME    (mm)=      54.38        28.73          50.53
      TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
      RUNOFF COEFFICIENT   =       0.98         0.52           0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  87.0    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.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  4002)|     OVERFLOW IS OFF
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.1020      0.0360

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0202)      0.830      0.346      2.33       50.53
   OUTFLOW: ID= 1 (  4002)      0.830      0.063      2.42       50.42

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.16
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0223

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0206)|   Area    (ha)=   0.35
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.26         0.09
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      48.30        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

Post-development Conditions

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

			TOTALS
Max.Eff.Inten.(mm/hr)=	162.27	86.46	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.36 (ii)	5.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.16	
PEAK FLOW (cms)=	0.12	0.02	0.132 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	54.38	28.73	47.96
TOTAL RAINFALL (mm)=	55.38	55.38	55.38
RUNOFF COEFFICIENT =	0.98	0.52	0.87

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1001):	0.34	0.050	2.42	29.86

Post-development Conditions

```
      + ID2= 2 (  1002):     0.65   0.271     2.33    50.29
        ================================================
        ID = 3 (  1000):     0.99   0.320     2.33    43.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.99   0.320     2.33    43.27
      + ID2= 2 (  0206):     0.35   0.132     2.33    47.96
        ================================================
        ID = 1 (  1000):     1.34   0.452     2.33    44.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     1.34   0.452     2.33    44.50
      + ID2= 2 (  4002):     0.83   0.063     2.42    50.42
        ================================================
        ID = 3 (  1000):     2.17   0.502     2.33    46.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  4001)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.2340      0.0060

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  1000)      2.170      0.502      2.33      46.76
   OUTFLOW: ID= 1 (  4001)      1.951      0.234      2.33      47.06
   OVERFLOW:ID= 3 (  0003)      0.219      0.268      2.33      47.06

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 46.62
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
```

Post-development Conditions

MAXIMUM STORAGE USED (ha.m.)= 0.0060

SHIFT HYD(3001)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
IN= 2---> OUT= 1					
SHIFT= 1.0 min	ID= 2 (4001):	0.22	0.27	2.33	47.06
	SHIFT ID= 1 (3001):	0.22	0.27	2.33	47.06

CALIB STANDHYD (0205) ID= 1 DT= 5.0 min	Area (ha)= 0.02	Total Imp(%)= 75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.01	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	11.55	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.94	1.583	5.08	3.083	6.01	4.58	2.66
0.167	1.94	1.667	5.08	3.167	6.01	4.67	2.66
0.250	2.07	1.750	6.47	3.250	5.21	4.75	2.52
0.333	2.07	1.833	6.47	3.333	5.21	4.83	2.52
0.417	2.22	1.917	9.19	3.417	4.61	4.92	2.40
0.500	2.22	2.000	9.19	3.500	4.61	5.00	2.40
0.583	2.40	2.083	18.14	3.583	4.15	5.08	2.28
0.667	2.40	2.167	18.14	3.667	4.15	5.17	2.28
0.750	2.61	2.250	162.27	3.750	3.78	5.25	2.18
0.833	2.61	2.333	162.27	3.833	3.78	5.33	2.18
0.917	2.87	2.417	21.31	3.917	3.48	5.42	2.09
1.000	2.87	2.500	21.31	4.000	3.48	5.50	2.09
1.083	3.20	2.583	12.30	4.083	3.22	5.58	2.01
1.167	3.20	2.667	12.30	4.167	3.22	5.67	2.01
1.250	3.63	2.750	8.97	4.250	3.01	5.75	1.93
1.333	3.63	2.833	8.97	4.333	3.01	5.83	1.93
1.417	4.22	2.917	7.16	4.417	2.82	5.92	1.86
1.500	4.22	3.000	7.16	4.500	2.82	6.00	1.86

Post-development Conditions

```
      Max.Eff.Inten.(mm/hr)=     162.27        86.46
                 over (min)        5.00         5.00
      Storage Coeff.  (min)=       0.58 (ii)    4.32 (ii)
      Unit Hyd. Tpeak (min)=       5.00         5.00
      Unit Hyd. peak  (cms)=       0.34         0.23
                                                          *TOTALS*
      PEAK FLOW       (cms)=       0.01         0.00          0.008 (iii)
      TIME TO PEAK    (hrs)=       2.33         2.33           2.33
      RUNOFF VOLUME    (mm)=      54.38        28.73          47.66
      TOTAL RAINFALL   (mm)=      55.38        55.38          55.38
      RUNOFF COEFFICIENT   =       0.98         0.52           0.86


        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  87.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.02   0.008     2.33    47.66
      + ID2= 2 (  3001):     0.22   0.268     2.33    47.06
        ================================================
        ID = 3 (  6001):     0.24   0.276     2.33    47.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  6001):     0.24   0.276     2.33    47.11
      + ID2= 2 (  4001):     1.95   0.234     2.33    47.06
        ================================================
        ID = 1 (  6001):     2.19   0.510     2.33    47.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L             (v 6.2.2010)
```

Post-development Conditions

```
        V    V   I    SS     U   U   A A   L
         V  V    I     SS    U   U  AAAAA  L
         V  V    I      SS   U   U  A   A  L
          VV     I    SSSSS  UUUUU  A   A  LLLLL

         OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
        O   O    T      T    H   H   Y Y   MM MM  O   O
        O   O    T      T    H   H    Y    M   M  O   O
         OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c9edd5e4-101e-48b8-8ddb-2598919df96d\s
Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\c9edd5e4-101e-48b8-8ddb-2598919df96d\s

DATE: 07-15-2022 TIME: 10:42:50

USER:

COMMENTS: _____

****
** SIMULATION : 25-year storm **
****

| CHICAGO STORM | Ptotal= 64.68 mm |

IDF curve parameters: A=1195.802
B= 0.000
C= 0.800
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs

Post-development Conditions
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.26	1.50	5.93	3.00	7.02	4.50	3.11
0.17	2.41	1.67	7.55	3.17	6.08	4.67	2.94
0.33	2.59	1.83	10.73	3.33	5.38	4.83	2.80
0.50	2.80	2.00	21.19	3.50	4.85	5.00	2.67
0.67	3.05	2.17	189.52	3.67	4.41	5.17	2.55
0.83	3.36	2.33	24.89	3.83	4.06	5.33	2.44
1.00	3.74	2.50	14.37	4.00	3.77	5.50	2.34
1.17	4.24	2.67	10.47	4.17	3.52	5.67	2.25
1.33	4.93	2.83	8.36	4.33	3.30	5.83	2.17

CALIB			
NASHYD (0210)	Area (ha)=	0.17	Curve Number (CN)= 87.0
ID= 1 DT=10.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.029 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 34.797
TOTAL RAINFALL (mm)= 64.678
RUNOFF COEFFICIENT = 0.538

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

CALIB			
STANDHYD (0201)	Area (ha)=	0.17	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Post-development Conditions

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	154.70		
over (min)	5.00	10.00		
Storage Coeff. (min)=	1.03 (ii)	6.96 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.34	0.14		
			TOTALS	
PEAK FLOW (cms)=	0.00	0.04	0.040 (iii)	
TIME TO PEAK (hrs)=	2.33	2.42	2.42	
RUNOFF VOLUME (mm)=	63.68	40.27	40.48	
TOTAL RAINFALL (mm)=	64.68	64.68	64.68	
RUNOFF COEFFICIENT =	0.98	0.62	0.63	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

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

ADD HYD (1001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0201):		0.17	0.040	2.42	40.48
+ ID2= 2 (0210):		0.17	0.029	2.33	34.80

Post-development Conditions

==========

ID = 3 (1001): 0.34 0.065 2.33 37.63

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0203)	Area (ha)= 0.59
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.50	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	62.72	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=		189.52	111.47	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.50 (ii)	4.23 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.33	0.24	
				TOTALS
PEAK FLOW	(cms)=	0.26	0.03	0.291 (iii)

Post-development Conditions

TIME TO PEAK	(hrs)=	2.33	2.33	2.33
RUNOFF VOLUME	(mm)=	63.68	36.48	59.59
TOTAL RAINFALL	(mm)=	64.68	64.68	64.68
RUNOFF COEFFICIENT	=	0.98	0.56	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0204)	Area (ha)= 0.06
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.05	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	20.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Post-development Conditions

Max.Eff.Inten.(mm/hr)=	189.52	111.47		
over (min)	5.00	5.00		
Storage Coeff. (min)=	0.75 (ii)	4.27 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.34	0.23		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.028 (iii)	
TIME TO PEAK (hrs)=	2.33	2.33	2.33	
RUNOFF VOLUME (mm)=	63.68	36.48	56.86	
TOTAL RAINFALL (mm)=	64.68	64.68	64.68	
RUNOFF COEFFICIENT =	0.98	0.56	0.88	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1002)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0203):	0.59	0.291	2.33	59.59	
+ ID2= 2 (0204):	0.06	0.028	2.33	56.86	
ID = 3 (1002):	0.65	0.319	2.33	59.34	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0202)	Area (ha)= 0.83			
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00	Dir. Conn.(%)= 85.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.71	0.12		
Dep. Storage (mm)=	1.00	5.00		
Average Slope (%)=	1.00	2.00		
Length (m)=	74.39	40.00		
Mannings n =	0.013	0.250		

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

Post-development Conditions

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	111.47		
over (min)	5.00	5.00		
Storage Coeff. (min)=	1.66 (ii)	4.39 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.32	0.23		
			TOTALS	
PEAK FLOW (cms)=	0.37	0.04	0.409 (iii)	
TIME TO PEAK (hrs)=	2.33	2.33	2.33	
RUNOFF VOLUME (mm)=	63.68	36.48	59.59	
TOTAL RAINFALL (mm)=	64.68	64.68	64.68	
RUNOFF COEFFICIENT =	0.98	0.56	0.92	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

RESERVOIR(4002) / IN= 2---> OUT= 1 / DT= 5.0 min	OVERFLOW IS OFF			
	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.1020	0.0360

	AREA	QPEAK	TPEAK	R.V.

Post-development Conditions

	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0202)	0.830	0.409	2.33	59.59
OUTFLOW: ID= 1 (4002)	0.830	0.074	2.42	59.49

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.18
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0263

CALIB	
STANDHYD (0206)	Area (ha)= 0.35
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.26	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	48.30	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	111.47
over (min)	5.00	5.00
Storage Coeff. (min)=	1.28 (ii)	4.80 (ii)

Post-development Conditions

Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.33	0.22		
			TOTALS	
PEAK FLOW (cms)=	0.14	0.03	0.164	(iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33	
RUNOFF VOLUME (mm)=	63.68	36.48	56.87	
TOTAL RAINFALL (mm)=	64.68	64.68	64.68	
RUNOFF COEFFICIENT =	0.98	0.56	0.88	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1001):	0.34	0.065	2.33	37.63
+ ID2= 2 (1002):	0.65	0.319	2.33	59.34
ID = 3 (1000):	0.99	0.384	2.33	51.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (1000):	0.99	0.384	2.33	51.89
+ ID2= 2 (0206):	0.35	0.164	2.33	56.87
ID = 1 (1000):	1.34	0.548	2.33	53.19

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1000):	1.34	0.548	2.33	53.19
+ ID2= 2 (4002):	0.83	0.074	2.42	59.49

Post-development Conditions

```
         ID = 3 (  1000):     2.17   0.607     2.33    55.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  4001)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE    |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)    |   (cms)     (ha.m.)
                          0.0000     0.0000    |   0.2340      0.0060

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  1000)      2.170      0.607      2.33      55.60
   OUTFLOW: ID= 1 (  4001)      1.897      0.234      2.33      55.64
   OVERFLOW:ID= 3 (  0003)      0.273      0.373      2.33      55.64

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 38.53
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0060

--------------------------------------------------------------------------------
--------------------
| SHIFT HYD(  3001)|
| IN= 2---> OUT= 1 |
| SHIFT=  1.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (  4001):    0.27     0.37      2.33     55.64
    SHIFT ID= 1 (  3001):    0.27     0.37      2.33     55.64


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0205)|   Area    (ha)=   0.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      11.55        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.26	1.583	5.93	3.083	7.02	4.58	3.11
0.167	2.26	1.667	5.93	3.167	7.02	4.67	3.11
0.250	2.41	1.750	7.55	3.250	6.08	4.75	2.94
0.333	2.41	1.833	7.55	3.333	6.08	4.83	2.94
0.417	2.59	1.917	10.73	3.417	5.38	4.92	2.80
0.500	2.59	2.000	10.73	3.500	5.38	5.00	2.80
0.583	2.80	2.083	21.19	3.583	4.85	5.08	2.67
0.667	2.80	2.167	21.19	3.667	4.85	5.17	2.67
0.750	3.05	2.250	189.52	3.750	4.41	5.25	2.55
0.833	3.05	2.333	189.52	3.833	4.41	5.33	2.55
0.917	3.36	2.417	24.89	3.917	4.06	5.42	2.44
1.000	3.36	2.500	24.89	4.000	4.06	5.50	2.44
1.083	3.74	2.583	14.37	4.083	3.77	5.58	2.34
1.167	3.74	2.667	14.37	4.167	3.77	5.67	2.34
1.250	4.24	2.750	10.47	4.250	3.52	5.75	2.25
1.333	4.24	2.833	10.47	4.333	3.52	5.83	2.25
1.417	4.93	2.917	8.36	4.417	3.30	5.92	2.17
1.500	4.93	3.000	8.36	4.500	3.30	6.00	2.17

Max.Eff.Inten.(mm/hr)=	189.52	111.47		
over (min)	5.00	5.00		
Storage Coeff. (min)=	0.54 (ii)	4.06 (ii)		
Unit Hyd. Tpeak (min)=	5.00	5.00		
Unit Hyd. peak (cms)=	0.34	0.24		
			TOTALS	
PEAK FLOW (cms)=	0.01	0.00	0.009 (iii)	
TIME TO PEAK (hrs)=	2.33	2.33	2.33	
RUNOFF VOLUME (mm)=	63.68	36.48	56.86	
TOTAL RAINFALL (mm)=	64.68	64.68	64.68	
RUNOFF COEFFICIENT =	0.98	0.56	0.88	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6001)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
                              Post-development Conditions
          ID1= 1 (  0205):     0.02   0.009     2.33    56.86
        + ID2= 2 (  3001):     0.27   0.373     2.33    55.64
          ================================================
          ID = 3 (  6001):     0.29   0.383     2.33    55.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 3 (  6001):     0.29   0.383     2.33    55.72
        + ID2= 2 (  4001):     1.90   0.234     2.33    55.64
          ================================================
          ID = 1 (  6001):     2.19   0.617     2.33    55.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

         V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
         V    V   I    SS     U   U   A A   L
          V  V    I     SS    U   U  AAAAA  L
          V  V    I      SS   U   U  A   A  L
           VV     I    SSSSS  UUUUU  A   A  LLLLL

          OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
         O   O    T      T    H   H   Y Y   MM MM  O   O
         O   O    T      T    H   H    Y    M   M  O   O
          OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\8
84d8075-e8dd-4899-806f-d9308a587bab\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\8
84d8075-e8dd-4899-806f-d9308a587bab\s
```

Post-development Conditions

DATE: 07-15-2022 TIME: 10:42:49

USER:

COMMENTS: _____

****
** SIMULATION : 2-year storm **
****

| CHICAGO STORM |
| Ptotal= 32.33 mm |

IDF curve parameters: A= 531.391
B= 0.000
C= 0.780
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.24	1.50	3.18	3.00	3.75	4.50	1.69
0.17	1.32	1.67	4.03	3.17	3.26	4.67	1.61
0.33	1.42	1.83	5.67	3.33	2.89	4.83	1.53
0.50	1.53	2.00	10.99	3.50	2.61	5.00	1.46
0.67	1.66	2.17	88.19	3.67	2.38	5.17	1.40
0.83	1.82	2.33	12.86	3.83	2.20	5.33	1.34
1.00	2.03	2.50	7.53	4.00	2.04	5.50	1.29
1.17	2.29	2.67	5.53	4.17	1.91	5.67	1.24
1.33	2.66	2.83	4.44	4.33	1.79	5.83	1.19

| CALIB |
| NASHYD (0210) |
|ID= 1 DT=10.0 min |

Area (ha)= 0.17 Curve Number (CN)= 87.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.17

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.007 (i)

Post-development Conditions

TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 10.915
TOTAL RAINFALL (mm)= 32.332
RUNOFF COEFFICIENT = 0.338

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

CALIB	
STANDHYD (0201)	Area (ha)= 0.17
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=		88.19	44.81
	over (min)	5.00	15.00
Storage Coeff. (min)=		1.40 (ii)	11.13 (ii)
Unit Hyd. Tpeak (min)=		5.00	15.00

Post-development Conditions

Unit Hyd. peak (cms)=	0.33	0.09		
				TOTALS
PEAK FLOW (cms)=	0.00	0.01		0.009 (iii)
TIME TO PEAK (hrs)=	2.33	2.50		2.50
RUNOFF VOLUME (mm)=	31.33	13.58		13.71
TOTAL RAINFALL (mm)=	32.33	32.33		32.33
RUNOFF COEFFICIENT =	0.97	0.42		0.42

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0201):	0.17	0.009	2.50	13.71
	+ ID2= 2 (0210):	0.17	0.007	2.33	10.91
	ID = 3 (1001):	0.34	0.015	2.50	12.31

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0203)	Area (ha)= 0.59			
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00	Dir. Conn.(%)= 85.00		
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.09	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	62.72	40.00	
Mannings n	=	0.013	0.250	

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61

Post-development Conditions

0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	29.10	
over (min)	5.00	10.00	
Storage Coeff. (min)=	2.03 (ii)	5.74 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.31	0.15	
			TOTALS
PEAK FLOW (cms)=	0.12	0.01	0.126 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	31.33	11.44	28.34
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.35	0.88

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0204)	Area (ha)=	0.06	
ID= 1 DT= 5.0 min	Total Imp(%)=	75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.05	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	20.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

			TOTALS
Max.Eff.Inten.(mm/hr)=	88.19	29.10	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.02 (ii)	5.81 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.34	0.15	
PEAK FLOW (cms)=	0.01	0.00	0.012 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	31.33	11.44	26.34
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.35	0.81

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1002)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

Post-development Conditions

ID1= 1 (0203):	0.59	0.126	2.33	28.34
+ ID2= 2 (0204):	0.06	0.012	2.33	26.34
ID = 3 (1002):	0.65	0.138	2.33	28.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0202)	Area (ha)= 0.83
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.12
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	74.39	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	29.10
over (min)	5.00	10.00
Storage Coeff. (min)=	2.25 (ii)	5.96 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.30	0.15

Post-development Conditions

				TOTALS
PEAK FLOW	(cms)=	0.17	0.01	0.177 (iii)
TIME TO PEAK	(hrs)=	2.33	2.42	2.33
RUNOFF VOLUME	(mm)=	31.33	11.44	28.35
TOTAL RAINFALL	(mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT	=	0.97	0.35	0.88

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

RESERVOIR(4002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.1020	0.0360

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	0.830	0.177	2.33	28.35
OUTFLOW: ID= 1 (4002)	0.830	0.034	2.50	28.25

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.04
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0119

CALIB	
STANDHYD (0206)	Area (ha)= 0.35
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.26	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	48.30	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN

Post-development Conditions

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

			TOTALS
Max.Eff.Inten.(mm/hr)=	88.19	29.10	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.74 (ii)	6.52 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.32	0.14	
PEAK FLOW (cms)=	0.06	0.01	0.068 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	31.33	11.44	26.35
TOTAL RAINFALL (mm)=	32.33	32.33	32.33
RUNOFF COEFFICIENT =	0.97	0.35	0.81

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (1001):		0.34	0.015	2.50	12.31
+ ID2= 2 (1002):		0.65	0.138	2.33	28.16
ID = 3 (1000):		0.99	0.150	2.33	22.72

```
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  1000):     0.99   0.150     2.33    22.72
      + ID2= 2 (  0206):     0.35   0.068     2.33    26.35
        ================================================
        ID = 1 (  1000):     1.34   0.218     2.33    23.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1000)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  1000):     1.34   0.218     2.33    23.66
      + ID2= 2 (  4002):     0.83   0.034     2.50    28.25
        ================================================
        ID = 3 (  1000):     2.17   0.245     2.33    25.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| RESERVOIR(  4001)|     OVERFLOW IS ON
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------       (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           0.0000     0.0000   |   0.2340      0.0060

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  1000)      2.170      0.245      2.33      25.42
   OUTFLOW: ID= 1 (  4001)      2.170      0.192      2.33      25.42
   OVERFLOW:ID= 3 (  0003)      0.000      0.000      0.00       0.00

                  TOTAL NUMBER OF SIMULATION OVERFLOW  =     0
                  CUMULATIVE TIME OF OVERFLOW  (HOURS) =  0.00
                  PERCENTAGE OF TIME OVERFLOWING   (%) =  0.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 78.42
                  TIME SHIFT OF PEAK FLOW         (min)=  0.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0057

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

Post-development Conditions

```
--------------------
| SHIFT HYD(  3001)|
| IN= 2---> OUT= 1 |
| SHIFT=  1.0 min  |      AREA     QPEAK     TPEAK      R.V.
--------------------      (ha)     (cms)     (hrs)      (mm)
          ID= 2 (  4001):    0.00      0.00      0.00      0.00
    SHIFT ID= 1 (  3001):    0.00      0.00      0.00      0.00


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0205)|   Area    (ha)=   0.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  75.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.01         0.00
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      11.55        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.24	1.583	3.18	3.083	3.75	4.58	1.69
0.167	1.24	1.667	3.18	3.167	3.75	4.67	1.69
0.250	1.32	1.750	4.03	3.250	3.26	4.75	1.61
0.333	1.32	1.833	4.03	3.333	3.26	4.83	1.61
0.417	1.42	1.917	5.67	3.417	2.89	4.92	1.53
0.500	1.42	2.000	5.67	3.500	2.89	5.00	1.53
0.583	1.53	2.083	10.99	3.583	2.61	5.08	1.46
0.667	1.53	2.167	10.99	3.667	2.61	5.17	1.46
0.750	1.66	2.250	88.19	3.750	2.38	5.25	1.40
0.833	1.66	2.333	88.19	3.833	2.38	5.33	1.40
0.917	1.82	2.417	12.86	3.917	2.20	5.42	1.34
1.000	1.82	2.500	12.86	4.000	2.20	5.50	1.34
1.083	2.03	2.583	7.54	4.083	2.04	5.58	1.29
1.167	2.03	2.667	7.53	4.167	2.04	5.67	1.29
1.250	2.29	2.750	5.53	4.250	1.91	5.75	1.24
1.333	2.29	2.833	5.53	4.333	1.91	5.83	1.24
1.417	2.66	2.917	4.44	4.417	1.79	5.92	1.19
1.500	2.66	3.000	4.44	4.500	1.79	6.00	1.19

Max.Eff.Inten.(mm/hr)=	88.19	29.10
over (min)	5.00	10.00

```
                              Post-development Conditions
      Storage Coeff.  (min)=       0.74 (ii)    5.52 (ii)
      Unit Hyd. Tpeak (min)=       5.00        10.00
      Unit Hyd. peak  (cms)=       0.34         0.16
                                                          *TOTALS*
      PEAK FLOW       (cms)=       0.00         0.00          0.004 (iii)
      TIME TO PEAK    (hrs)=       2.33         2.42           2.33
      RUNOFF VOLUME    (mm)=      31.33        11.44          23.83
      TOTAL RAINFALL   (mm)=      32.33        32.33          32.33
      RUNOFF COEFFICIENT   =       0.97         0.35           0.74


        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  87.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
*** W A R N I N G :  HYDROGRAPH   3001 <ID= 2> IS DRY.
*** W A R N I N G :  HYDROGRAPH   0003 = HYDROGRAPH 0001
        ID1= 1 (  0205):     0.02   0.004     2.33    23.83
      + ID2= 2 (  3001):     0.00   0.000     0.00     0.00
        ================================================
        ID = 3 (  6001):     0.02   0.004     2.33    23.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  6001):     0.02   0.004     2.33    23.83
      + ID2= 2 (  4001):     2.17   0.192     2.33    25.42
        ================================================
        ID = 1 (  6001):     2.19   0.196     2.33    25.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
```

Post-development Conditions

```
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Smart City Water Inc

Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

Output filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\aafc5f81-764b-4e61-9957-6b648dba5cb4\s
Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\aafc5f81-764b-4e61-9957-6b648dba5cb4\s

DATE: 07-15-2022 TIME: 10:42:50

USER:

COMMENTS: _____

****
** SIMULATION : 50-year storm **
****

| CHICAGO STORM |
| Ptotal= 76.56 mm |

IDF curve parameters: A=1415.386
B= 0.000
C= 0.800
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min

Post-development Conditions
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.68	1.50	7.02	3.00	8.31	4.50	3.68
0.17	2.86	1.67	8.94	3.17	7.20	4.67	3.49
0.33	3.07	1.83	12.71	3.33	6.37	4.83	3.31
0.50	3.31	2.00	25.08	3.50	5.74	5.00	3.16
0.67	3.61	2.17	224.32	3.67	5.23	5.17	3.02
0.83	3.97	2.33	29.45	3.83	4.81	5.33	2.89
1.00	4.43	2.50	17.01	4.00	4.46	5.50	2.77
1.17	5.02	2.67	12.39	4.17	4.16	5.67	2.67
1.33	5.84	2.83	9.90	4.33	3.90	5.83	2.57

CALIB			
NASHYD (0210)	Area (ha)=	0.17	Curve Number (CN)= 87.0
ID= 1 DT=10.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.17	

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.037 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 44.599
TOTAL RAINFALL (mm)= 76.555
RUNOFF COEFFICIENT = 0.583

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

CALIB			
STANDHYD (0201)	Area (ha)=	0.17	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

Post-development Conditions

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	197.50		
over (min)	5.00	10.00		
Storage Coeff. (min)=	0.96 (ii)	6.34 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.34	0.15		
			TOTALS	
PEAK FLOW (cms)=	0.00	0.05	0.052 (iii)	
TIME TO PEAK (hrs)=	2.33	2.42	2.42	
RUNOFF VOLUME (mm)=	75.56	50.96	51.18	
TOTAL RAINFALL (mm)=	76.56	76.56	76.56	
RUNOFF COEFFICIENT =	0.99	0.67	0.67	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0201):	0.17	0.052	2.42	51.18
	+ ID2= 2 (0210):	0.17	0.037	2.33	44.60
		==========	==========	==========	==========

Post-development Conditions

ID = 3 (1001): 0.34 0.086 2.33 47.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0203)	Area (ha)= 0.59
ID= 1 DT= 5.0 min	Total Imp(%)= 85.00 Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.50	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	62.72	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

Max.Eff.Inten.(mm/hr)=		224.32	144.73	
	over (min)	5.00	5.00	
Storage Coeff.	(min)=	1.40 (ii)	3.95 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.33	0.24	
				TOTALS
PEAK FLOW	(cms)=	0.31	0.04	0.348 (iii)
TIME TO PEAK	(hrs)=	2.33	2.33	2.33

Post-development Conditions

RUNOFF VOLUME	(mm)=	75.56	46.76	71.23
TOTAL RAINFALL	(mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT	=	0.99	0.61	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0204) | Area (ha)= 0.06
ID= 1 DT= 5.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.05	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	20.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

```
                              Post-development Conditions
      Max.Eff.Inten.(mm/hr)=     224.32       144.73
                  over (min)       5.00         5.00
      Storage Coeff.  (min)=       0.70 (ii)    4.00 (ii)
      Unit Hyd. Tpeak (min)=       5.00         5.00
      Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
      PEAK FLOW       (cms)=       0.03         0.01         0.034 (iii)
      TIME TO PEAK    (hrs)=       2.33         2.33          2.33
      RUNOFF VOLUME    (mm)=      75.56        46.76         68.34
      TOTAL RAINFALL   (mm)=      76.56        76.56         76.56
      RUNOFF COEFFICIENT   =       0.99         0.61          0.89


        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  87.0    Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  1002)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0203):     0.59   0.348     2.33    71.23
      + ID2= 2 (  0204):     0.06   0.034     2.33    68.34
        ================================================
        ID = 3 (  1002):     0.65   0.382     2.33    70.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.12
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      74.39        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                             ---- TRANSFORMED HYETOGRAPH ----
               TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
```

Post-development Conditions

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	144.73	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.55 (ii)	4.10 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.33	0.24	
			TOTALS
PEAK FLOW (cms)=	0.44	0.05	0.489 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	75.56	46.76	71.23
TOTAL RAINFALL (mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT =	0.99	0.61	0.93

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

RESERVOIR(4002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.1020	0.0360

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

Post-development Conditions

INFLOW : ID= 2 (0202)	0.830	0.489	2.33	71.23
OUTFLOW: ID= 1 (4002)	0.830	0.089	2.42	71.13

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.21
TIME SHIFT OF PEAK FLOW (min)= 5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0315

CALIB
STANDHYD (0206)
ID= 1 DT= 5.0 min

Area (ha)= 0.35
Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.26	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	48.30	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

Max.Eff.Inten.(mm/hr)=	224.32	144.73
over (min)	5.00	5.00
Storage Coeff. (min)=	1.19 (ii)	4.49 (ii)
Unit Hyd. Tpeak (min)=	5.00	5.00

Post-development Conditions

Unit Hyd. peak (cms)=	0.33	0.23		
				TOTALS
PEAK FLOW (cms)=	0.16	0.03		0.198 (iii)
TIME TO PEAK (hrs)=	2.33	2.33		2.33
RUNOFF VOLUME (mm)=	75.56	46.76		68.35
TOTAL RAINFALL (mm)=	76.56	76.56		76.56
RUNOFF COEFFICIENT =	0.99	0.61		0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1001):	0.34	0.086	2.33	47.89
+ ID2= 2 (1002):	0.65	0.382	2.33	70.96
ID = 3 (1000):	0.99	0.468	2.33	63.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (1000):	0.99	0.468	2.33	63.04
+ ID2= 2 (0206):	0.35	0.198	2.33	68.35
ID = 1 (1000):	1.34	0.666	2.33	64.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1000):	1.34	0.666	2.33	64.43
+ ID2= 2 (4002):	0.83	0.089	2.42	71.13
ID = 3 (1000):	2.17	0.737	2.33	66.99

Post-development Conditions

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(4001) / IN= 2---> OUT= 1 / DT= 5.0 min	OVERFLOW IS ON	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
		0.0000	0.0000	0.2340	0.0060

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (1000)	2.170	0.737	2.33	66.99
OUTFLOW: ID= 1 (4001)	1.725	0.234	2.25	70.31
OVERFLOW:ID= 3 (0003)	0.445	0.503	2.33	70.31

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 31.76
TIME SHIFT OF PEAK FLOW (min)= -5.00
MAXIMUM STORAGE USED (ha.m.)= 0.0060

SHIFT HYD(3001) / IN= 2---> OUT= 1 / SHIFT= 1.0 min	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID= 2 (4001):	0.45	0.50	2.33	70.31
SHIFT ID= 1 (3001):	0.45	0.50	2.33	70.31

CALIB / STANDHYD (0205) / ID= 1 DT= 5.0 min	Area (ha)= 0.02	Total Imp(%)= 75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.01	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	11.55	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Post-development Conditions

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.68	1.583	7.02	3.083	8.31	4.58	3.68
0.167	2.68	1.667	7.02	3.167	8.31	4.67	3.68
0.250	2.86	1.750	8.94	3.250	7.20	4.75	3.49
0.333	2.86	1.833	8.94	3.333	7.20	4.83	3.49
0.417	3.07	1.917	12.71	3.417	6.37	4.92	3.31
0.500	3.07	2.000	12.71	3.500	6.37	5.00	3.31
0.583	3.31	2.083	25.08	3.583	5.74	5.08	3.16
0.667	3.31	2.167	25.08	3.667	5.74	5.17	3.16
0.750	3.61	2.250	224.32	3.750	5.23	5.25	3.02
0.833	3.61	2.333	224.32	3.833	5.23	5.33	3.02
0.917	3.97	2.417	29.46	3.917	4.81	5.42	2.89
1.000	3.97	2.500	29.45	4.000	4.81	5.50	2.89
1.083	4.43	2.583	17.01	4.083	4.46	5.58	2.77
1.167	4.43	2.667	17.01	4.167	4.46	5.67	2.77
1.250	5.02	2.750	12.39	4.250	4.16	5.75	2.67
1.333	5.02	2.833	12.39	4.333	4.16	5.83	2.67
1.417	5.84	2.917	9.90	4.417	3.91	5.92	2.57
1.500	5.84	3.000	9.90	4.500	3.90	6.00	2.57

			TOTALS
Max.Eff.Inten.(mm/hr)=	224.32	144.73	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.51 (ii)	3.80 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.25	
PEAK FLOW (cms)=	0.01	0.00	0.011 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	75.56	46.76	68.34
TOTAL RAINFALL (mm)=	76.56	76.56	76.56
RUNOFF COEFFICIENT =	0.99	0.61	0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6001)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0205):	0.02	0.011	2.33	68.34

```
                              Post-development Conditions
       + ID2= 2 (  3001):     0.45   0.503     2.33    70.31
         ================================================
         ID = 3 (  6001):     0.47   0.514     2.33    70.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 3 (  6001):     0.47   0.514     2.33    70.23
       + ID2= 2 (  4001):     1.72   0.234     2.25    70.31
         ================================================
         ID = 1 (  6001):     2.19   0.748     2.33    70.29

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2010)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Smart City Water Inc
Copyright 2007 - 2021 Smart City Water Inc
All rights reserved.


                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.2\VO2\voin.dat

  Output  filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\f
e1c3bf4-e648-4a57-b17e-f6d437765c39\s
  Summary filename:
C:\Users\ykoshenkov\AppData\Local\Civica\VH5\95aa6302-d561-466b-a85b-2e34c191f114\f
e1c3bf4-e648-4a57-b17e-f6d437765c39\s
```

Post-development Conditions

DATE: 07-15-2022 TIME: 10:42:50

USER:

COMMENTS: _____

****
** SIMULATION : 5-year storm **
****

| CHICAGO STORM |
| Ptotal= 46.62 mm |

IDF curve parameters: A= 812.624
B= 0.000
C= 0.790
used in: INTENSITY = A / (t + B)^C

Duration of storm = 6.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.38

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.71	1.50	4.43	3.00	5.23	4.50	2.34
0.17	1.82	1.67	5.63	3.17	4.54	4.67	2.22
0.33	1.96	1.83	7.96	3.33	4.03	4.83	2.11
0.50	2.11	2.00	15.58	3.50	3.63	5.00	2.01
0.67	2.30	2.17	131.79	3.67	3.31	5.17	1.92
0.83	2.53	2.33	18.26	3.83	3.05	5.33	1.84
1.00	2.81	2.50	10.62	4.00	2.83	5.50	1.77
1.17	3.18	2.67	7.77	4.17	2.64	5.67	1.70
1.33	3.69	2.83	6.22	4.33	2.48	5.83	1.64

| CALIB |
| NASHYD (0210)|
|ID= 1 DT=10.0 min |

Area (ha)= 0.17 Curve Number (CN)= 87.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.17

Unit Hyd Qpeak (cms)= 0.038

PEAK FLOW (cms)= 0.016 (i)
TIME TO PEAK (hrs)= 2.333

Post-development Conditions

RUNOFF VOLUME (mm)= 20.763
TOTAL RAINFALL (mm)= 46.618
RUNOFF COEFFICIENT = 0.445

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

CALIB	
STANDHYD (0201)	Area (ha)= 0.17
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.03	0.14
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	33.67	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=		131.79	89.30
over (min)		5.00	10.00
Storage Coeff. (min)=		1.19 (ii)	8.58 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.33	0.12

Post-development Conditions

			TOTALS
PEAK FLOW (cms)=	0.00	0.02	0.022 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.42
RUNOFF VOLUME (mm)=	45.62	24.75	24.92
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.53	0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1001)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0201):	0.17	0.022	2.42	24.92
	+ ID2= 2 (0210):	0.17	0.016	2.33	20.76
	ID = 3 (1001):	0.34	0.035	2.42	22.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0203)	Area (ha)=	0.59	
ID= 1 DT= 5.0 min	Total Imp(%)=	85.00	Dir. Conn.(%)= 85.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.50	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	62.72	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22

Post-development Conditions

0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=	131.79	61.79	
over (min)	5.00	5.00	
Storage Coeff. (min)=	1.73 (ii)	4.89 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.32	0.22	
			TOTALS
PEAK FLOW (cms)=	0.18	0.01	0.198 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	45.62	21.77	42.04
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.47	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0204)	Area (ha)=	0.06	
ID= 1 DT= 5.0 min	Total Imp(%)=	75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.05	0.01
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	20.00	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

Post-development Conditions

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

			TOTALS
Max.Eff.Inten.(mm/hr)=	131.79	61.79	
over (min)	5.00	5.00	
Storage Coeff. (min)=	0.87 (ii)	4.94 (ii)	
Unit Hyd. Tpeak (min)=	5.00	5.00	
Unit Hyd. peak (cms)=	0.34	0.22	
PEAK FLOW (cms)=	0.02	0.00	0.019 (iii)
TIME TO PEAK (hrs)=	2.33	2.33	2.33
RUNOFF VOLUME (mm)=	45.62	21.77	39.64
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.47	0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1002)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0203):	0.59	0.198	2.33	42.04

Post-development Conditions

```
       + ID2= 2 (  0204):     0.06   0.019     2.33    39.64
         ================================================
         ID = 3 (  1002):     0.65   0.217     2.33    41.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0202)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  85.00   Dir. Conn.(%)=  85.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.12
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      74.39        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

```
     Max.Eff.Inten.(mm/hr)=     131.79        61.79
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.92 (ii)    5.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.16
                                                    *TOTALS*
```

Post-development Conditions

PEAK FLOW	(cms)=	0.26	0.02	0.271 (iii)
TIME TO PEAK	(hrs)=	2.33	2.42	2.33
RUNOFF VOLUME	(mm)=	45.62	21.77	42.04
TOTAL RAINFALL	(mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT	=	0.98	0.47	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 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.

RESERVOIR(4002)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.1020	0.0360

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0202)	0.830	0.271	2.33	42.04
OUTFLOW: ID= 1 (4002)	0.830	0.051	2.50	41.94

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.74
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.0180

CALIB		
STANDHYD (0206)	Area (ha)= 0.35	
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.26	0.09
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	48.30	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr

Post-development Conditions

0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

			TOTALS
Max.Eff.Inten.(mm/hr)=	131.79	61.79	
over (min)	5.00	10.00	
Storage Coeff. (min)=	1.48 (ii)	5.55 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.33	0.16	
PEAK FLOW (cms)=	0.10	0.01	0.106 (iii)
TIME TO PEAK (hrs)=	2.33	2.42	2.33
RUNOFF VOLUME (mm)=	45.62	21.77	39.64
TOTAL RAINFALL (mm)=	46.62	46.62	46.62
RUNOFF COEFFICIENT =	0.98	0.47	0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 87.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (1000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (1001):	0.34	0.035	2.42	22.84
+ ID2= 2 (1002):	0.65	0.217	2.33	41.82
ID = 3 (1000):	0.99	0.251	2.33	35.30

Post-development Conditions

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (1000):	0.99	0.251	2.33	35.30
	+ ID2= 2 (0206):	0.35	0.106	2.33	39.64
	ID = 1 (1000):	1.34	0.357	2.33	36.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (1000)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (1000):	1.34	0.357	2.33	36.43
	+ ID2= 2 (4002):	0.83	0.051	2.50	41.94
	ID = 3 (1000):	2.17	0.396	2.33	38.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(4001)	OVERFLOW IS ON			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	0.0000	0.0000	0.2340	0.0060

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (1000)	2.170	0.396	2.33	38.54
OUTFLOW: ID= 1 (4001)	2.030	0.234	2.33	38.97
OVERFLOW:ID= 3 (0003)	0.140	0.162	2.33	38.97

TOTAL NUMBER OF SIMULATION OVERFLOW = 0
CUMULATIVE TIME OF OVERFLOW (HOURS) = 0.00
PERCENTAGE OF TIME OVERFLOWING (%) = 0.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 59.05
TIME SHIFT OF PEAK FLOW (min)= 0.00
MAXIMUM STORAGE USED (ha.m.)= 0.0060

Post-development Conditions

| SHIFT HYD(3001)|
| IN= 2---> OUT= 1 |
| SHIFT= 1.0 min |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID= 2 (4001):	0.14	0.16	2.33	38.97
SHIFT ID= 1 (3001):	0.14	0.16	2.33	38.97

CALIB	
STANDHYD (0205)	Area (ha)= 0.02
ID= 1 DT= 5.0 min	Total Imp(%)= 75.00 Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.01	0.00
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	2.00
Length	(m)=	11.55	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.71	1.583	4.43	3.083	5.23	4.58	2.34
0.167	1.71	1.667	4.43	3.167	5.23	4.67	2.34
0.250	1.82	1.750	5.63	3.250	4.54	4.75	2.22
0.333	1.82	1.833	5.63	3.333	4.54	4.83	2.22
0.417	1.96	1.917	7.96	3.417	4.03	4.92	2.11
0.500	1.96	2.000	7.96	3.500	4.03	5.00	2.11
0.583	2.11	2.083	15.58	3.583	3.63	5.08	2.01
0.667	2.11	2.167	15.58	3.667	3.63	5.17	2.01
0.750	2.30	2.250	131.79	3.750	3.31	5.25	1.92
0.833	2.30	2.333	131.79	3.833	3.31	5.33	1.92
0.917	2.53	2.417	18.26	3.917	3.05	5.42	1.84
1.000	2.53	2.500	18.26	4.000	3.05	5.50	1.84
1.083	2.81	2.583	10.62	4.083	2.83	5.58	1.77
1.167	2.81	2.667	10.62	4.167	2.83	5.67	1.77
1.250	3.18	2.750	7.77	4.250	2.64	5.75	1.70
1.333	3.18	2.833	7.77	4.333	2.64	5.83	1.70
1.417	3.69	2.917	6.22	4.417	2.48	5.92	1.64
1.500	3.69	3.000	6.22	4.500	2.48	6.00	1.64

Max.Eff.Inten.(mm/hr)=		131.79	61.79
over (min)		5.00	5.00
Storage Coeff. (min)=		0.63 (ii)	4.70 (ii)

```
                              Post-development Conditions
      Unit Hyd. Tpeak (min)=       5.00         5.00
      Unit Hyd. peak  (cms)=       0.34         0.22
                                                          *TOTALS*
      PEAK FLOW       (cms)=       0.01         0.00          0.006 (iii)
      TIME TO PEAK    (hrs)=       2.33         2.33           2.33
      RUNOFF VOLUME    (mm)=      45.62        21.77          38.55
      TOTAL RAINFALL   (mm)=      46.62        46.62          46.62
      RUNOFF COEFFICIENT   =       0.98         0.47           0.83


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  87.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0205):     0.02   0.006     2.33    38.55
      + ID2= 2 (  3001):     0.14   0.162     2.33    38.97
        ================================================
        ID = 3 (  6001):     0.16   0.169     2.33    38.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  6001)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  6001):     0.16   0.169     2.33    38.92
      + ID2= 2 (  4001):     2.03   0.234     2.33    38.97
        ================================================
        ID = 1 (  6001):     2.19   0.403     2.33    38.97

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================================================
========================
```

SWM DESIGN CALCULATIONS
Table 8: Water Quantity Calculation Results Summary (SWM Matrix)

Project Name: Carlaw and Gerrard
Municipality: City of Toronto
Project No.: 20026
Date: 7-Jul-22

Prepared by: Y.K.
Checked by: R.K.
Last Revised: 18-Jul-22

Block	Drainage Area [ha]	Total Roof Area (ha)	Imp. Side Walk Drain to Grass (ha)	Roof / Imp. Drain to Grass (%)	Green Roof (ha)	Green Roof (% of Roof)	Paved Surface Impervious Area (ha)	Landscape Assumed (ha)	Imperviousness (%)	X-Imperviousness (%)	Water Balance Target Including Ia (mm)	Water Balance/Cistern Storage Required (m^3)	Quantity Control Storage Utilized (m^3)	Blocks Target Release Rate (L/s)	VO6 Model 100-year Blocks Release Rate (L/s)	Quantity Storage Provided (m^3)
Block 1 (Stratified Parkland)	0.3400	0.0000	0.034	-	0.000	0%	0.034	0.306	10	10	-	-	-	42	103	-
Block 2	0.8300	0.4150	-	-	0.083	20%	0.374	0.041	85	85	6	35	353	102	100	360
Block 3	0.5900	0.2950	-	-	0.059	20%	0.266	0.030	85	85	5	20	-	-	391	-
Right Of Way (New Street incl. portion of Ext. Area)	0.3500	0.0000	-	-	0.000	0%	0.263	0.088	75	75	N/A	N/A		-	-	63
The Site SubTotal	2.11	0.71			0.14		0.94	0.46				55	353			423

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100 Vaughan, Ontario L4K 5Y2
TEL: (905) 326-1404 FAX: (905) 326-1405
www.counterpointeng.com

APPENDIX C

Counterpoint Engineering Inc.

Existing Site Conditions

Project: 449 Carlaw Avenue
Project No: 20026
Location: Toronto
Site Area: 2.27 ha

City of Toronto Sanitary Guidelines

Average Flow		
Residential	240	litres/person/day
Office	180,000	litres/ha/day
Commercial	180,000	litres/ha/day
Infiltration	0.26	litres/second/ha

Retail/Residential Population Criteria		
1B/Studio	1.4	ppu
2B	2.1	ppu
3B	3.1	ppu
Townhouse	2.7	ppu
Single Detached	3.5	ppu
Parkland	10	p/ha
Commercial	1.1	pp/100m^2
Office	3.3	pp/100m^2

	Residential Units					Commercial	Office	Park
Drainage Area ID	**1 Bedroom**	**2 Bedroom**	**3 Bedroom**	**Townhouse**	**Total Units**	**Area (m^2)**	**Area (m^2)**	**Area (m^2)**
Ex. Retail	0	0	0	0	0	7,861	0	0
Ex. Automotive Shop	0	0	0	0	0	517	0	0
Ex. Gas Station	0	0	0	0	0	30	0	0
TOTAL	**0**	**0**	**0**	**0**	**0**	**8,408**	**0**	**0**

	Population 1B/ Studio	Population 2B/2B+D	Population 3B/3B+D	Population Townhouse	Other	TOTAL RES. POPULATION	Average Flow (l/day)	Average Flow (l/s)
Residential	0	0	0	0	0	**0**	0	**0.00**

	Total Non-Res Area	Average Flow (l/day)	Average Flow (l/s)
Retail/Office	8,408	23,122	0.27

Harmon Peaking Factor

Total Res. Population + Park	Harmon Peak Factor
0	**4.50**

Non-Residential Peak Sanitary Flow	0.27	**l/s**
Residential Peak Sanitary Flow	0.00	**l/s**
Total Sanitary Flow	0.27	**l/s**
Infiltration	0.59	**l/s**
Groundwater Rate	0.00	**l/s**
Total Peak Flow	**0.86**	**l/s**

Counterpoint Engineering Inc.

Proposed Conditions

Project: 449 Carlaw Avenue
Project No: 20026
Location: Toronto
Site Area: 2.06 ha

City of Toronto Sanitary Guidelines

Average Flow		
Residential	240	litres/person/day
ICI	250	litres/person/day
Office - not used	180,000	litres/ha/day
Commercial - not used	180,000	litres/ha/day
Infiltration	0.26	litres/second/ha

Population Criteria		
1B/Studio	1.4	ppu
2B	2.1	ppu
3B	3.1	ppu
Single Detached	3.5	ppu
Towns/Semi-Detached	2.7	ppu
Commercial	1.1	pp/100m^2
Office	3.3	pp/100m^2
Parkland	4.0	pp/Ha

	Residential Units					Parkland	Retail	Office
	1 Bedroom	2 Bedroom	3 Bedroom	Townhomes	Total Units	Area (Ha)	Area (m^2)	Area (m^2)
BLOCK 1 - Parkland	0	0	0	0	0	0.34	0.00	0.00
BLOCK 2 - TOC Developmen	704	257	119	0	1080	0.00	7586.00	0.00
BLOCK 3 - POPS	0	0	0	0	0	0.00	0.00	0.00
TOTAL	**704**	**257**	**119**	**0**	**1080**	**0.34**	**7586.00**	**0.00**

	Population Density 1B/ Studio	Population Density 2B/2B+D	Population Density 3B/3B+D	Population Density Towns/Semis	Population Density Parkland	TOTAL RES. POPULATION	Average Flow (l/day)	l/s
Residential	986	540	369	0	1	1896	455040	5.27

	Total Non-Res Population	Average Flow (l/day)	l/s
Retail/Office	83.45	20862	0.24

Harmon Peaking Factor

Total Res. Population	Harmon Peak Factor
1896	**3.60**

Non-Residential Peak Sanitary Flow	0.24	**l/s**
Residential Peak Sanitary Flow	18.98	**l/s**
Total Sanitary Flow	19.22	**l/s**
Infiltration	0.54	**l/s**
Total Peak Flow	**19.76**	**l/s**
Increase in Sanitary Fow from Existing	**18.90**	**l/s**

counterpoint engineering
Project No.: 20026
Project: 449 Carlaw Avenue

OFFSITE COMBINED SEWER OFFSET FLOW CALCULATION
Bain Avenue - Sewer Improvments

Offset Area A = 0.0433 ha

Surface Type	Area	R	R (comp.)
Pervious	0.000	0.25	0.90
Roof	0.000	0.90	
Impervious	0.043	0.90	

2 Year Flow

I_2 = A / (T)^c where I = Rainfall Rate (mm/hr)

A = 21.8
C = 0.78

T = 10 minutes
i = 88.19 mm/hr
RC (C) = 0.90 (composite)

Q = CiA/360 2 year Q = **9.55** L/s

counterpoint engineering
Project No.: 20026
Project: 449 Carlaw Avenue

OFFSITE COMBINED SEWER OFFSET FLOW CALCULATION
Victor Lane - Sewer Improvments

Offset Area A = 0.1360 ha

Surface Type	Area	R	R (comp.)
Pervious	0.000	0.25	0.90
Roof	0.000	0.90	
Impervious	0.136	0.90	

2 Year Flow

I_2 = A / (T)^c where I = Rainfall Rate (mm/hr)

A = 21.8
C = 0.78

T = 10 minutes
i = 88.19 mm/hr
RC (C) = 0.90 (composite)

Q = CiA/360 2 year Q = **29.98** L/s

Counterpoint Engineering

Infrastructure Intelligence Services Inc.

INTEGRITY | COLLABORATION | PERFORMANCE

Dye Testing Results
Carlaw Ave and Gerrard St Combined Sewer

Study Area



I2S Ref #: 2020-411I
February 4, 2022

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca

February 4, 2022

Counterpoint Engineering
8395 Jane Street, Suite 100
Vaughan, ON
L4K 5Y2

Att: Dave Di Iorio

RE: Dye Testing Results
Carlaw Ave and Gerrard St Combined Sewer

Infrastructure Intelligence Services Inc. (I2S Inc.) is pleased to submit the attached results of dye testing with the combined sewer catchment area upstream of Carlaw Ave and Gerrard St East intersection. These inspections were completed to document catch basins in the public right of way that could be feasible disconnected from the combined sewer and redirected to a suitable stormwater outlet. The fieldwork was undertaken between November 2021 and January 2022. The keys findings are as follows:

- Three (3) locations were identified as having significant stormwater flows entering the combined sewer. These locations are 1) an extensive laneway system north of Victor Ave and east of Carlaw Ave, 2) a portion of Gerrard St East, west of CarlawAve , and 3) the west portion of Bains Ave close to Carlaw Ave. These locations have been verified as connected to the combined sewer via dye testing and it appears feasible to reconnect them to an adjacent stormwater sewer.
- Extensive dye testing was complete at a number of other locations along Carlaw Ave between Gerrard Ave East and Danforth Ave, but no other locations of interest were identified.
- I2S previous completed an investigation of the sewer catchment along Gerrard St East, east of Carlaw Ave, and identified some catch basins connected to the combined sewer. This area was excluded for this investigation.

A series of investigation maps are presented in Appendix A. The videos and photographs from the investigation have been provided via download link.

Please feel free to contact the undersigned if you have questions/comments.

Niall Quinlan
Manager, I&I Services
Tel.: 647-229-9175
Email: niall.quinlan@i2sinc.ca

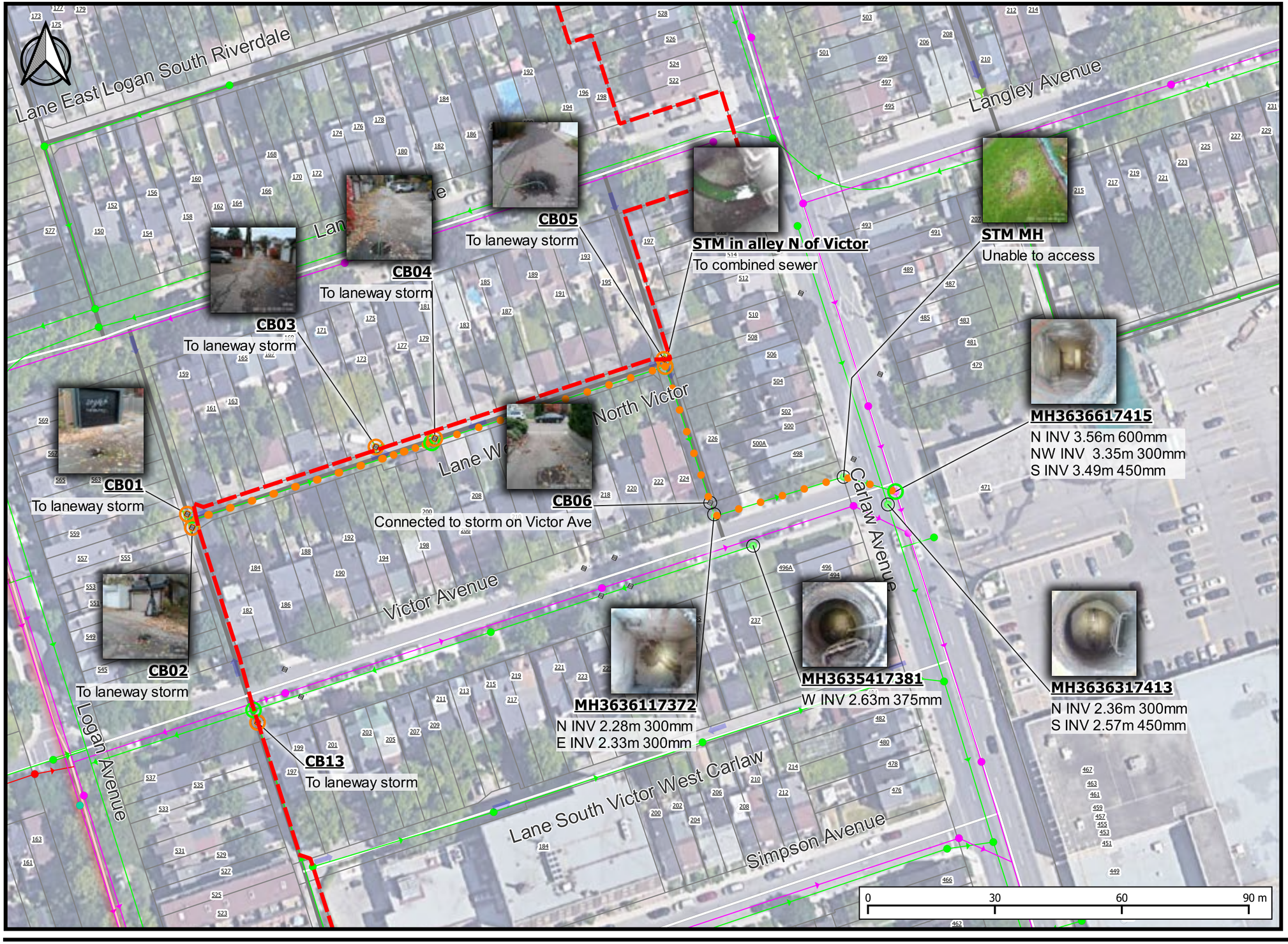
CC'd:
Attached: Dye Testing Results

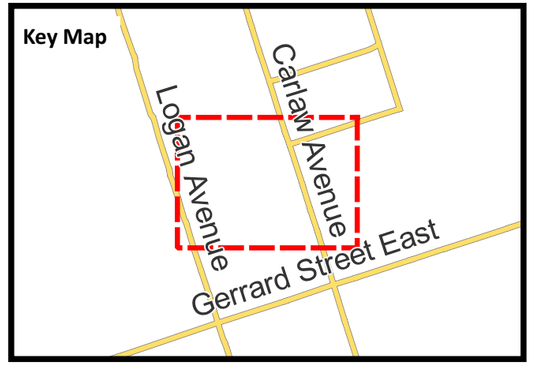
Appendix A

Investigation Map

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca





General Notes

Sewer inspections completed January 25, 2022.

Map Legend

- Extent

Dye Testing

- Dye Injection Point
- Likely Dye Path
- Dye Observation Point

Drainage Area-Outlet

- Combined Sewer
- Surface Overland
- Storm Sewer
- Unknown

Sewerlines

- Combined
- CSO
- DUAL
- Foundation Drain
- Sanitary
- Storm CSO
- SSO
- Storm

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: N.Quinlan Feb 4, 2022

Checked:

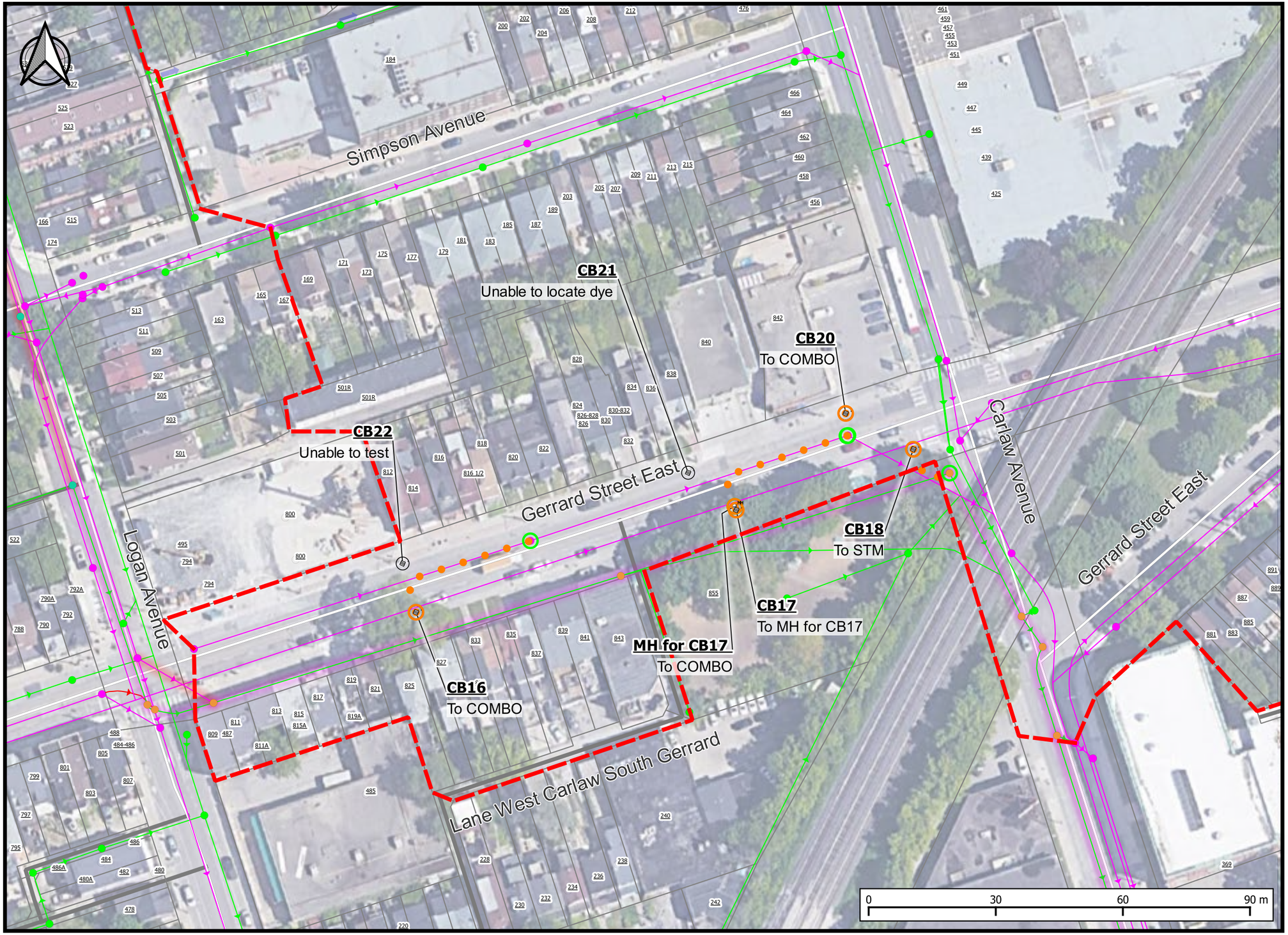
Approved:

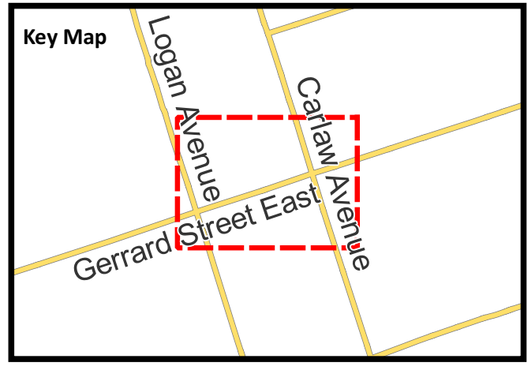
Revision History

Project: Carlaw Ave and Gerrard St Combined Sewer Assessment

Drawing: Dye Testing Results

I2S Ref #: 2020-411I





General Notes

Sewer inspections completed January 25, 2022.

Map Legend

- Extent

Dye Testing

- Dye Injection Point
- Likely Dye Path
- Dye Observation Point

Drainage Area-Outlet

- Combined Sewer
- Surface Overland
- Storm Sewer
- Unknown

Sewerlines

- Combined
- CSO
- DUAL
- Foundation Drain
- Sanitary
- Storm CSO
- SSO
- Storm

Prepared By:

Associated With:

counterpoint ENGINEERING

Drawn: N.Quinlan Feb 4, 2022

Checked:

Approved:

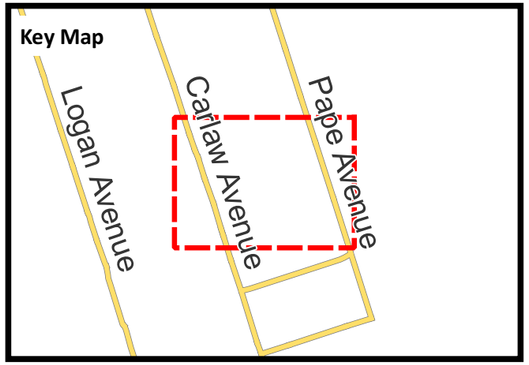
Revision History

Project: Carlaw Ave and Gerrard St Combined Sewer Assessment

Drawing: Dye Testing Results

I2S Ref #: 2020-411I





General Notes

Sewer inspections completed January 25, 2022.

Map Legend

- Extent

Dye Testing

- Dye Injection Point
- Likely Dye Path
- Dye Observation Point

Drainage Area-Outlet

- Combined Sewer
- Surface Overland
- Storm Sewer
- Unknown

Sewerlines

- Combined
- CSO
- DUAL
- Foundation Drain
- Sanitary
- Storm CSO
- SSO
- Storm

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: N.Quinlan Feb 4, 2022

Checked:

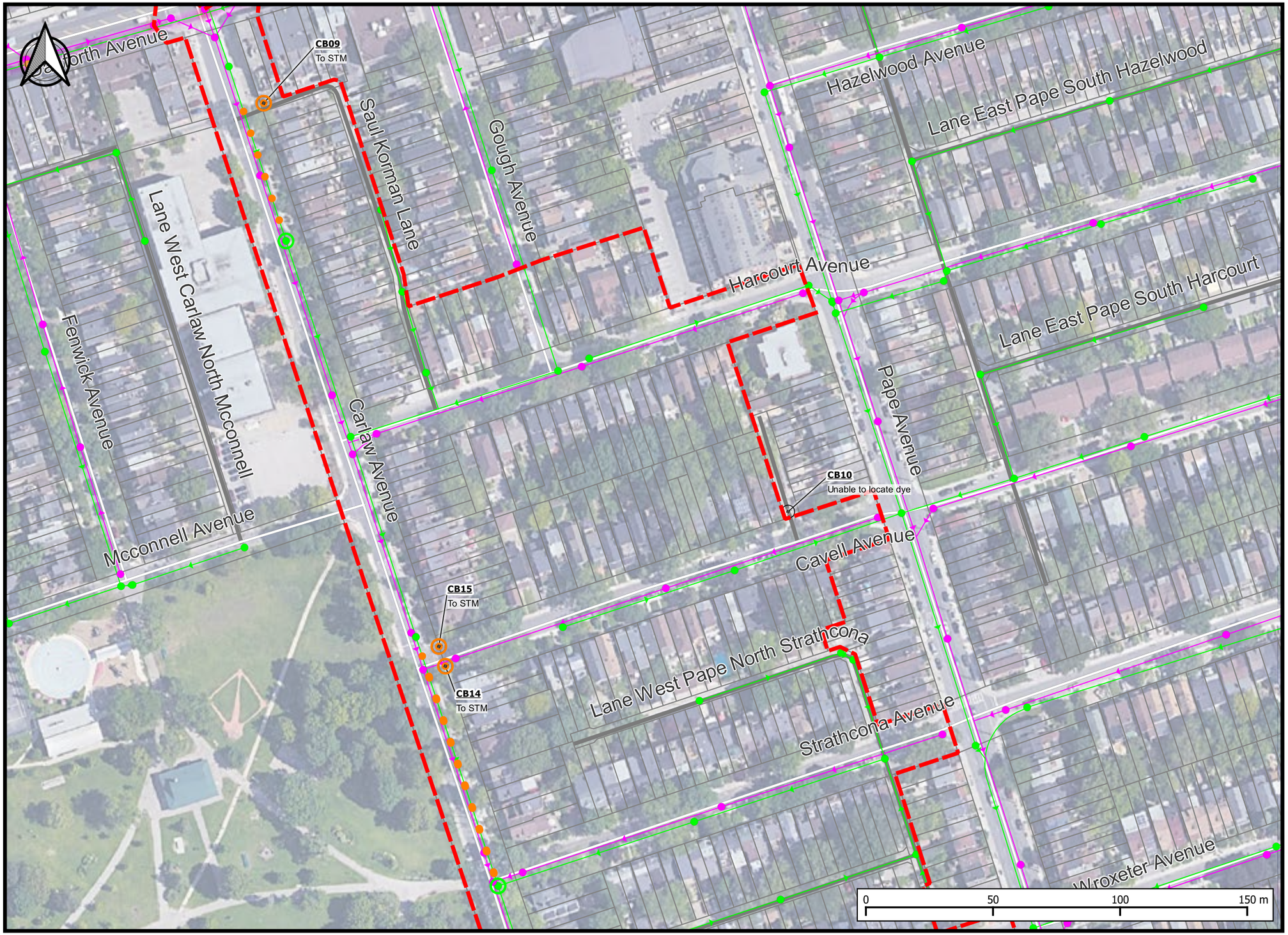
Approved:

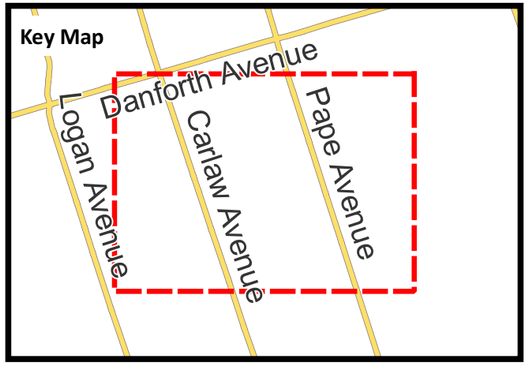
Revision History

Project: Carlaw Ave and Gerrard St Combined Sewer Assessment

Drawing: Dye Testing Results

I2S Ref #: 2020-411I





General Notes

Sewer inspections completed January 25, 2022.

Map Legend

- Extent

Dye Testing

- Dye Injection Point
- Likely Dye Path
- Dye Observation Point

Drainage Area-Outlet

- Combined Sewer
- Surface Overland
- Storm Sewer
- Unknown

Sewerlines

- Combined
- CSO
- DUAL
- Foundation Drain
- Sanitary
- Storm CSO
- SSO
- Storm

Prepared By:

Associated With:

counterpoint ENGINEERING

Drawn: N.Quinlan Feb 4, 2022

Checked:

Approved:

Revision History

Project: Carlaw Ave and Gerrard St Combined Sewer Assessment

Drawing: Dye Testing Results

I2S Ref #: 2020-411I

Appendix B

Digital Package of Files

Inspection Videos & Photos

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca

Counterpoint Engineering Inc.

Infrastructure Intelligence Services Inc.

INTEGRITY | COLLABORATION | PERFORMANCE

Servicing Confirmation
Carlaw Avenue and Gerrard Street East

Study Areas



Project # 2020-411I
October 27, 2020

615 Main St. E.
Milton, Ontario
L9T 3J2

905-699-1065
info@i2sinc.ca
I2Sinc.ca

October 27, 2020

Counterpoint Engineering Inc.
8395 Jane Street, Suite 100
Vaughan, ON
L4K 5Y2

I2S Infrastructure Intelligence Services Inc.
INTEGRITY | COLLABORATION | PERFORMANCE

Att: David Di Iorio, P.Eng.

RE: Servicing Confirmation
Carlaw Avenue and Gerrard Street East
Toronto, Ontario

Infrastructure Intelligence Services Inc. (I2S Inc.) is pleased to submit the attached results of the servicing confirmation investigation completed at properties located near the intersection of Carlaw Avenue and Gerrard Street East. Dye testing was undertaken at the commercial plaza (onsite) located at the northeast corner of Carlaw Avenue and Gerrard Street East (north of the railway tracks) to confirm stormwater connections (roof and surface drains). In addition, catch basin connectivity was documented through dye testing at various offsite catch basins located in the road allowance within the limits of Gerrard Street East between Carlaw Avenue and Pape Avenue, and Gerrard Street East between Carlaw Avenue and Boston Avenue. The fieldwork was undertaken on August 12, 19 and 21, 2020, and the findings are as follows:

Onsite

Commercial Plaza:

- Nine catch basins and two manholes were identified on the property. In addition, four roof drains were identified.
- Through dye testing, six catch basins were documented to be connected to the storm sewer (catch basins CB1, CB2, CB3, CB5, CB6 and CB7). The dye was observed in either manhole MH1 located behind the strip mall building on the property, or MH3 located on Carlaw Avenue.
- One catch basin (CB4) was documented to be connected to the storm sewer through line of sight due to a vehicle being parked over the catch basin.
- Through dye testing, catch basin CB9 was documented to be connected to CB8.
- Catch basin CB8 was inspected using a push camera in an effort to document the discharge location due to the dye testing being inconclusive. The push camera documented connection to a sewer line of brick construction. Evidence of sanitary flow was not observed; however, based on the City of Toronto sewer data, the combined sewer to the east of the property is brick construction.
- Several scuppers, discharging to surface, were identified just below the roof of the strip mall building in the loading dock area.

Off-Site

Gerrard Street East between Carlaw Avenue and Pape Avenue:

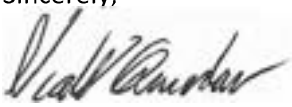
- Eight catch basins, two of which were double catch basins (DCB14 and DCB16) were identified on Gerrard Street East between Carlaw Avenue and Pape Avenue.
- Through dye testing, all eight catch basins were documented to be connected to the combined sewer (CB9, CB10, CB11, CB13, DCB14, CB15 and DCB16). Dye was observed in either manhole MH07, in the intersection of Carlaw Avenue and Gerrard Street East or MH08, located on the south side of Gerrard Street East, west of Pape Avenue. Based on City of Toronto data, MH07 is within the 300 mm dia circular combined sewer flowing west along Gerrard St East, and MH08 is within the 300 mm dia circular combined sewer flowing southwest along the Gerrard St East side road.

Gerrard Street East between Carlaw Avenue and Boston Avenue:

- Eight catch basins were identified in the area of the side street of Gerrard Street East between Carlaw Avenue and Boston Avenue.
- Through dye testing, seven catch basins were documented to be connected to the combined sewer (CB1, CB2, CB3, CB4, CB5, CB7 and CB8). Dye was observed in manholes MH01, MH03 and MH05. Based on City of Toronto data, MH01 and MH03 are within the 300 mm dia circular combined sewer running southwest along the Gerrard St East side road, and MH05 is within the 900x600 mm dia egg shaped combined sewer on Carlaw Avenue.
- One catch basin (CB6) was documented to be connected to the storm sewer through dye testing. Dye was observed in STM MH located on Boston Avenue which, based on the City of Toronto data, STM MH is within the 300 mm dia circular storm sewer.

Please feel free to contact the undersigned if you have questions/comments.

Sincerely,



Niall Quinlan
Manager, I&I Services
Tel.: 647-229-9175
Email: niall.quinlan@i2sinc.ca

CC'd:
Attached: Servicing Confirmation

Appendix A

Investigation Maps

Auto Service Centre - No internal roof access

CB4 - CB4 to MH3

CB8 - Push camera

CB9 - CB9 to CB8

CB5 - CB5 to MH3

MH3 - End of investigation limits

MH2 - MH2 to MH3

D1 - D1 to MH2

CB6 - CB6 to MH3

CB7 - CB7 to MH3

D2 - D2 to MH2

CB1 - CB1 to MH1

MH1 - MH1 to STMMH

CB2 - CB2 to MH1

CB3 - CB3 to MH1

D4 - D4 to MH2

D3 - D3 to MH2

STMMH - Storm Sewer observed on far west side of Carlaw St. Alignment does not match available record drawings.

Onsite

Offsite

Langley Avenue

Lane East Carlaw South Langley

Lane West Carlaw North Victor

Victor Avenue

Carlaw Avenue

Lane South Victor West Carlaw

Simpson Avenue

Gerrard Street East

Lane South Gerrard West Pape

Pape Avenue

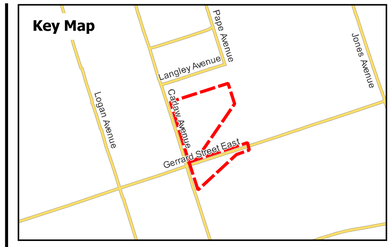
Lane South Riverdale East Pape

Logan Avenue

Jones Avenue

0 10 20 30 m

Key Map



General Notes

The estimated drainage areas are based on dye testing results and observed site features such as interpreted overland flow direction. A detailed topographic survey may be required to confirm drainage areas.

Dye Testing Results - Drainage Area Estimates

Given_ID	Outlet	Area (m2)	Comment
Offsite	COMB	7240.5	
Onsite	STM	20919.8	
Onsite	COMB	1405.4	

Map Legend

- Extent

Drainage Features
- CB
- Manhole
- Drain

Sewer Lines
- Combined
- Sanitary
- Storm
- CSO
- DUAL
- Storm CSO
- SSO

Drainage Area - Outlet
- Combined Sewer
- Surface Overland
- Storm Sewer

Sources:
Projection System: NAD 83 UTM ZONE 17N

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: A.Ambrose Oct 27, 2020

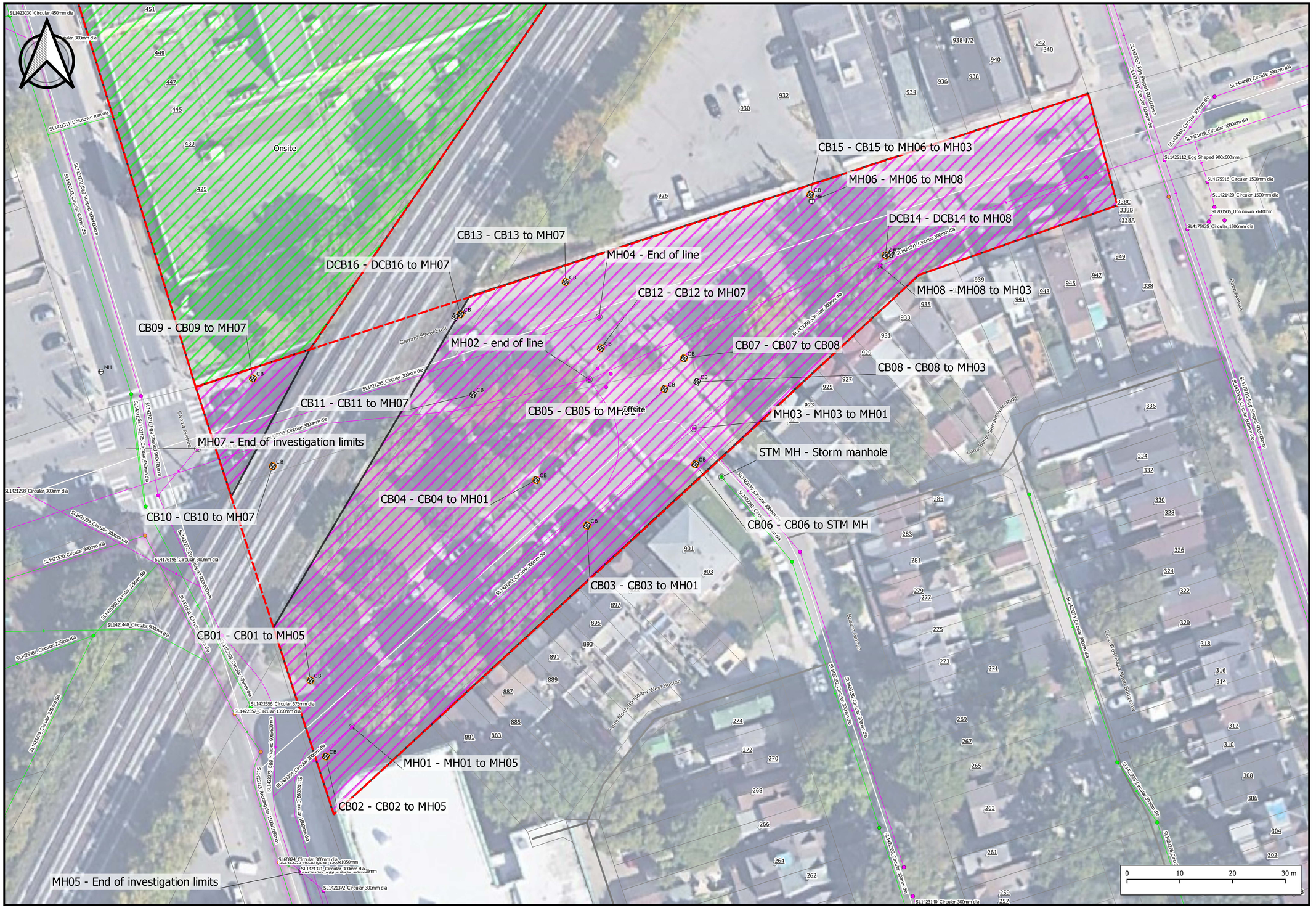
Checked: Niall Quinlan

Approved:

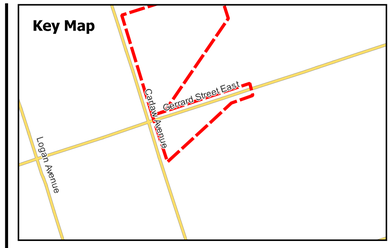
Revision History

Project: Site Servicing - Carlaw and Gerrard - Onsite

Project #: 2020-411I



Key Map



General Notes

The estimated drainage areas are based on dye testing results and observed site features such as interpreted overland flow direction. A detailed topographic survey may be required to confirm drainage areas.

Dye Testing Results - Drainage Area Estimates

Given_ID	Outlet	Area (m2)	Comment
Offsite	COMB	7240.5	
Onsite	STM	20919.8	

Map Legend

- Extent
- Drainage Features
  - CB
  - Manhole
  - Drain
- Sewer Lines
  - Combined
  - Sanitary
  - Storm
  - CSO
  - DUAL
  - Storm CSO
  - SSO
- Drainage Area - Outlet
  - Combined Sewer
  - Surface Overland
  - Storm Sewer

Sources:

Projection System: NAD 83 UTM ZONE 17N

Prepared By: I2S

Associated With: counterpoint ENGINEERING

Drawn: A.Ambrose Oct 27, 2020

Checked: Niall Quinlan

Approved:

Revision History

Project: Site Servicing - Carlaw and Gerrard - Offsite

Project #: 2020-411I

Appendix B

Digital Package of Files

Inspection Videos & Photos

APPENDIX D

Counterpoint Engineering Inc.

WATER DEMANDS BY BLOCK AND BUILDING

Project: 449 Carlaw Avenue
Project No: 20026
Location: Toronto

Per Capita Demand

Single Family	320	litres/person/day
Multi-Unit	190	litres/person/day

Retail/Residential Population Criteria

1 Bedroom	1.4	ppu
2 Bedroom	2.1	ppu
3 Bedroom	3.1	ppu
Townhome	2.7	ppu
Commercial/Retail	1.1	persons/100m^2
Office	3.3	persons/100m^2
Parkland	4.0	persons/10,000m^2

Units per Bldg.		Unit Type Count			
Bldg.	Units	1 Bdrm.	2 Bdrm.	3 Bdrm.	Townhomes
Tower A/B/C	1080	704	257	119	0
Total	**1080**	**704**	**257**	**119**	**0**

Unit and Floor Area Breakdown

POPULATION AND AVERAGE DAY DEMANDS SUMMARY											
Location	1 Bedroom Units	2 Bedroom Units	3 Bedroom Units	Total Residential Units*	Total Residential Population	Residential Average Demand	Office (m^2)	Total Office Population	Office Average Demand	Retail/ Commercial (m^2)	Retail/ Commercial Average Demand (28m^3/ha/day)
	1.4 persons/unit	2.1 persons/unit	3.1 persons/unit	Units	Equivalent Population	L/s	Area	Equivalent Population	L/s	Area	L/s
Tower A/B/C	704	257	119	1080	1894	4.17	-	0.0	0.00	7,586.0	0.25
Totals:	**704**	**257**	**119**	**1,080**	**1,894**	**4.17**	**0**	**0**	**0.00**	**7,586**	**0.25**

**Note: total units rounded up due to rounding when applying unit mix ratio percentages.*

Peaking Factors

Land Use	Minimum Hour	Maximum Hour	Maximum Day
Apartment	0.84	2.50	1.30
Commercial	0.84	1.20	1.10
Industrial	0.84	1.90	1.10
Institutional	0.84	1.90	1.10

Summary of Demands

Block	Building	Daily Water Demand (L/sec)	Max Day Water Demand (L/sec)	Peak Hour Water Demand (L/sec)	Fire Demand Required (L/sec)	Max Day plus Fire Demand (L/sec)
2	A/B/C	4.41	5.69	10.71	233.33	239.02

Counterpoint Engineering Inc.

REQUIRED FIRE FLOW WORKSHEET - PROPOSED DEVELOPMENT

Project: 449 Carlaw Avenue **Tower A/B/C**
Project No: 20026
Location: Toronto

Guide for Determination of Required Flow Copyright I.S.O

$$F = 220C\sqrt{A}$$

where

F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

Type of Construction		Class Factor
WF	Wood Frame	1.5
OC	Ordinary Construction	1.0
NC	Non-Combustible	0.8
FC	Fire-Resistive	0.6

Contents		% Reduction
NC	Non-Combustible	25
LC	Limited Combustible	15
C	Combustible	0
FB	Free Burning	15
RB	Rapid Burning	25

Area Notes for Fire Resistive Buildings (from FUS manual, 1999):

If Vertical Openings are inadequately protected (less than 1-hour fire rating): Area is the total of the two largest adjoining floors (above ground level) plus 50% of the area of each of the next 8 adjoining floors above that.

If Vertical Openings are adequately protected (at least 1-hour fire rating): Area is the total of the largest floor (above ground level) plus 25% of the area of each of the next 2 immediately adjoining floors above that.

1) Fire Flow

Type of Construction:	FC
C=	0.6
A=	9,515.25 m^2
F=	**12,876 L/min**

Assumes Fire Resistive type of construction with vertical openings adequately protected. Largest floor = level 1.

2) Occupancy Reduction/Surcharge

Contents Factor:		C			
Reduction/Surcharge of		0%	=	0	L/min
F=	12876L/min +	0	L/min =	12,876	**L/min**

3) System Type Reduction

NFPA 13 Sprinkler:		YES	30%		
Standard Water Supply:		YES	10%		
Fully Supervised:		YES	10%		
Total			50%		
Reduction of		50%	L/min =	6,438	L/min
F=	12876L/min -	6,438	L/min =	6,438	**L/min**

4) Separation Charge

Building Face	Dist(m)	Charge
North	66	0%
East	0	25%
South	0	25%
West	25	10%
Total		60% **of** 12876.1 **L/min =** 7,726 **L/min**

(max exposure charge can be 75%)

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

F = 6438L/min + 7726L/min = 14,164 **L/min** (2,000L/min<F<45,000L/min)

F =	**14,000**	**L/min**
F =	**233**	**L/s**
F =	**3,698**	**gpm**

(round to the nearest 1,000L/min)

Counterpoint Engineering Inc.

NFPA Theoretical Flow Calculations

Project: 499 Carlaw Avenue
Project No: 20026
Flow Hydrant: 502 Carlaw Avenue
Residual Hydrant: Simpson and Carlaw Avenue

Based on National Fire Protection Association Guidelines, the available flow at the minimum residual pressure of 20psi can be calculated based on the observed flow at the observed pressure readings, as follows:

$$\mathbf{Q_F = 29.83 \times c \times d^2 \times p^{0.5}}$$, where

Q_F = observed flow (US GPM)
c = hydrant nozzle coefficient (0.90 - 0.95)
d = nozzle diameter (in)
p = observed pitot pressure

$$\mathbf{Q_R = Q_F \times h_F^{0.54} / h_R^{0.54}}$$, where

Q_R = available flow
Q_F = observed flow (US GPM)
h_F = drop from measured static to desired baseline pressure
h_R = drop from measured static to measured residual pressure

Based on flow test results obtained by *Lozzi Aqua Check, May 20, 2022.*

c =	0.9	
d =	2.5	in
number of ports =	2	
p =	45	

Q_F = 2251 US GPM

Measured Static Pressure =	92	psi	
Measured Residual Pressure =	70	psi	
Desired Residual Pressure =	20	psi	, minimum per City of Toronto design criteria

Q_R = 4270 US GPM per fire conneciton
16,165 L/min
269.42 L/s

Counterpoint Engineering Inc.

NFPA Theoretical Flow Calculations

Project: 499 Carlaw Avenue
Project No: 22027
Flow Hydrant: 388 Pape Avenue
Residual Hydrant: First Hydrant North of Langley Avenue on Pape Avenue.

Based on National Fire Protection Association Guidelines, the available flow at the minimum residual pressure of 20psi can be calculated based on the observed flow at the observed pressure readings, as follows:

$$\mathbf{Q_F = 29.83 \times c \times d^2 \times p^{0.5}}$$, where

Q_F = observed flow (US GPM)
c = hydrant nozzle coefficient (0.90 - 0.95)
d = nozzle diameter (in)
p = observed pitot pressure

$$\mathbf{Q_R = Q_F \times h_F^{0.54} / h_R^{0.54}}$$, where

Q_R = available flow
Q_F = observed flow (US GPM)
h_F = drop from measured static to desired baseline pressure
h_R = drop from measured static to measured residual pressure

Based on flow test results obtained by *Lozzi Aqua Check, May 20, 2022.*

c =	0.9	
d =	2.5	in
number of ports =	2	
p =	15	

Q_F = 1300 US GPM

Measured Static Pressure =	80	psi	
Measured Residual Pressure =	64	psi	
Desired Residual Pressure =	20	psi	, minimum per City of Toronto design criteria

Q_R = 2654 US GPM
10,045 L/min
167.41 L/s
per fire conneciton

Lozzi Aqua Check Massimo Lozzi

12307 Woodbine Ave, P.O. Box 519 Cell: 416 990-2131

Gormley, ON L0H 1G0 E-mail: lozziaquacheck@gmail.com

Hydrant Flow Test Form

Job Location: Carlaw Ave north of Gerrard. Date: June 8,2022

Time of Test: 9:00 am

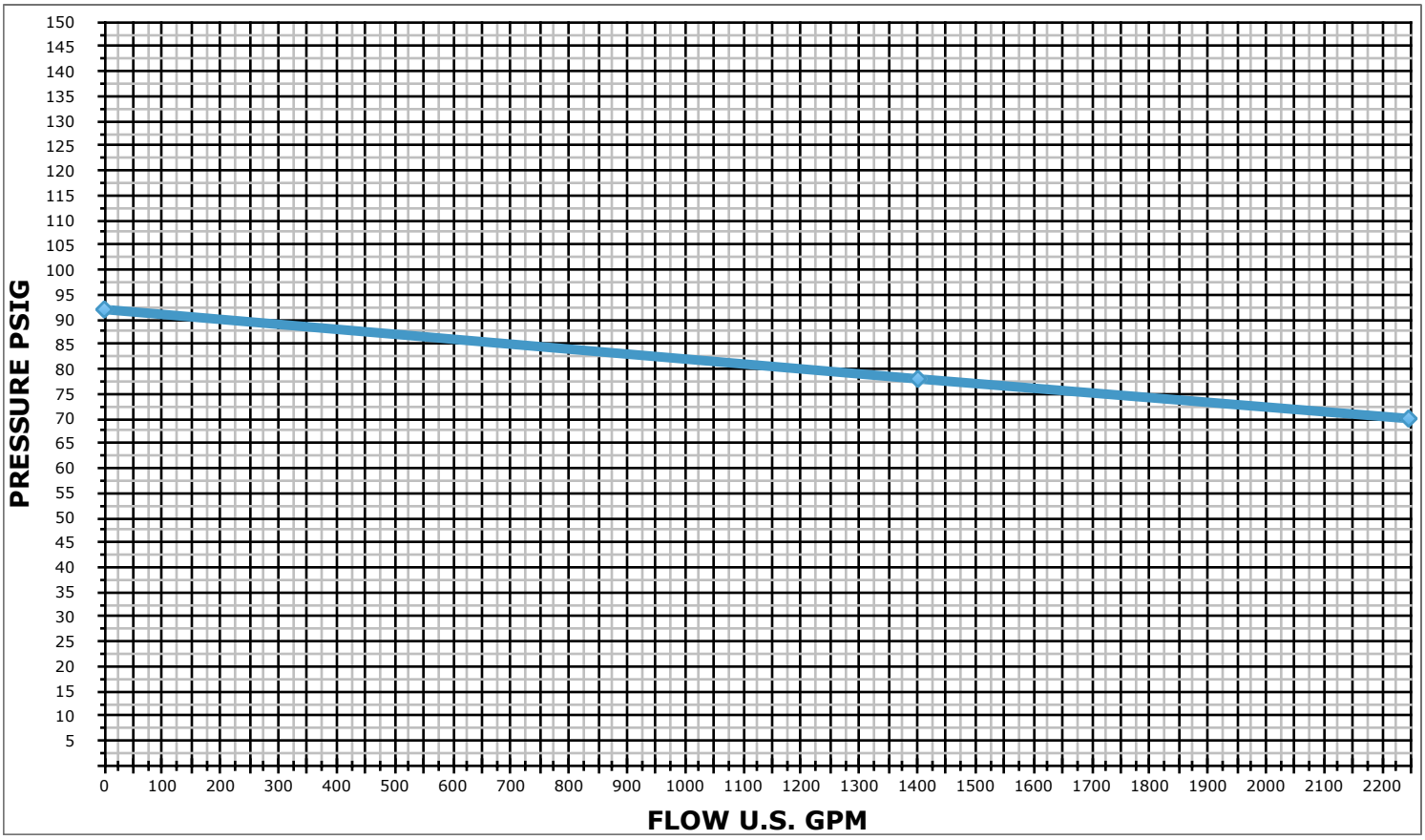
Location of Flow Hydrant: at corner of Simpson Ave and Carlaw Ave.

Residual: in front of 502 Carlaw Ave.

Main Size: Static Pressure: 92 psi

	Number of Outlets & Orifice Size	Pitot Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1.	Static	0	0	92
2.	1 x 2 ½	70	1401	78
3.	2 x 2 ½	45	2246	70

Note: Flow test conducted in accordance with NFPA 291



Lozzi Aqua Check

12307 Woodbine Ave, P.O. Box 519

Gormley, ON L0H 1G0

Massimo Lozzi

Cell: 416 990-2131

E-mail: lozziaquacheck@gmail.com

Site Map:



Lozzi Aqua Check Massimo Lozzi

12307 Woodbine Ave, P.O. Box 519 Cell: 416 990-2131

Gormley, ON L0H 1G0 E-mail: lozziaquacheck@gmail.com

Hydrant Flow Test Form

Job Location: Pape Ave,Toronto Date: June 8,2022

Time of Test: 10:00 am

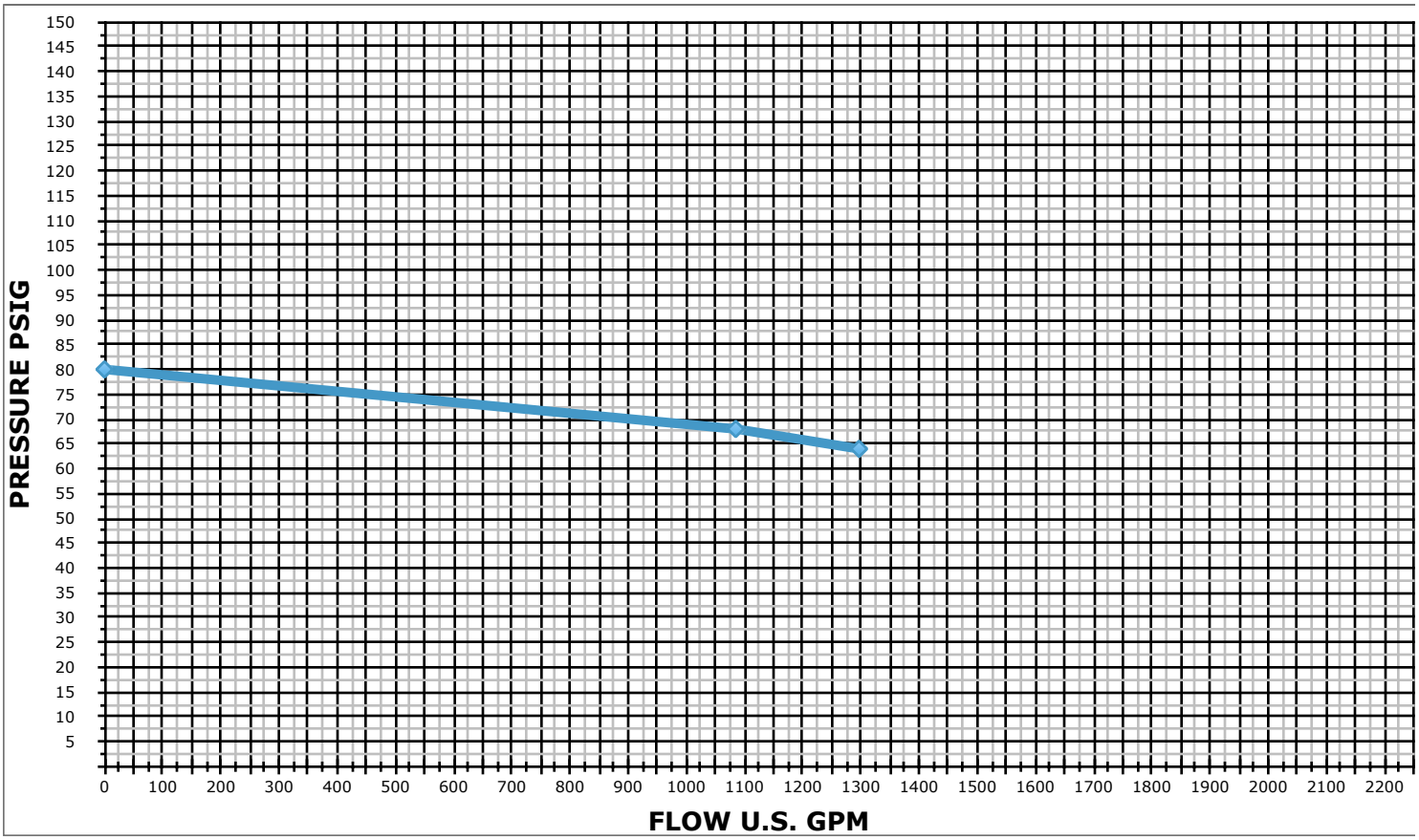
Location of Flow Hydrant:in front of 388 Pape Ave,Toronto

Residual: first hydrant north of Langley Ave on Pape Ave.

Main Size: Static Pressure: 80 psi

	Number of Outlets & Orifice Size	Pitot Pressure (psi)	Flow (U.S. G.P.M.)	Residual Pressure (psi)
1.	Static	0	0	80
2.	1 x 2 ½	42	1085	68
3.	2 x 2 ½	15	1297	64

Note: Flow test conducted in accordance with NFPA 291



Lozzi Aqua Check

12307 Woodbine Ave, P.O. Box 519

Gormley, ON L0H 1G0

Massimo Lozzi

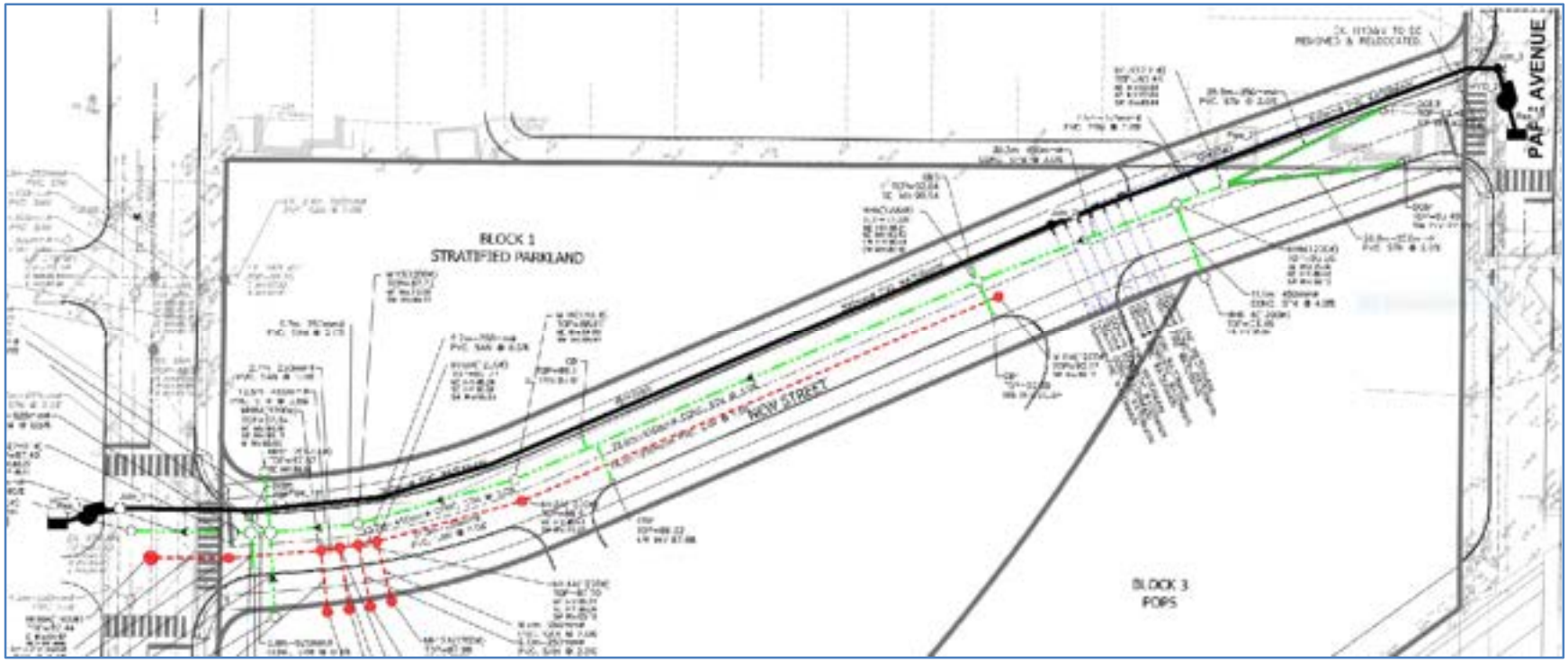
Cell: 416 990-2131

E-mail: lozziaquacheck@gmail.com

Site Map:



EPANET Schematic



Counterpoint Engineering Inc.

Junction Table

Junction	Approx. Ground Elev. (m)	Node Elev. (m)	Contributing Building	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow Demand (L/s)	Max. Day + Fire Flow Demand (L/s)
Jctn_1	87.33	85.53	-					
Jctn_2	93.00	91.20	A/B/C	4.41	5.69	10.71	233.33	239.02
Jctn_3	93.90	92.10	-					
Total	**-**	**-**		**4.41**	**5.69**	**10.71**	**-**	**-**

Notes: *1. Ground Elevation approximated based on Concept Grading Plan 1 (drawing CGP1)*
2. Node elevation = Ground Elevation - 1.8m (required cover)

Counterpoint Engineering Inc.

Pipe Table

Pipe	Length (m)	Diameter (mm)	Hazen-Williams C	Appurtenances	Minor Loss
Pipe_1	140.9	300	120	1x valve, 3x long-radius elbow, 1x tee	2.60
Pipe_2	67.7	300	120	4x valve, 1x long-radius elbow, 1x tee	2.00

Counterpoint Engineering Inc.

Hydrant Fire Flow Testing Results

Location of Test: **502 Carlaw Ave. (300mm watermain)**

Ground Elevation (m)	Node Elevation (m)	Flow		Residual Pressure			HGL
		(GPM)	(L/s)	(psi)	(kPa)	(m)	(m)
89.37	89.97	0	0	92	634	64.70	154.67
		1401	88	78	538	54.85	144.82
		2246	142	70	483	49.23	139.20
		4261	269	20	138	14.06	104.03

Notes:
1. Hydrant fire flow testing conducted by Lozzi Aqua Check on June 8, 2022
2. Node Elevation estimated based on ground elevation plus 0.6m
3. Flow at 20 psi estimated based NFPA 291
4. Ground Elevation approximated based on Concept Grading Plan 1 (drawing CGP1)

Location of Test: **388 Pape Ave. (150mm watermain)**

Ground Elevation (m)	Node Elevation (m)	Flow		Residual Pressure			HGL
		(GPM)	(L/s)	(psi)	(kPa)	(m)	(m)
95.00	95.60	0	0	80	552	56.26	151.86
		1085	68	68	469	47.82	143.42
		1297	82	64	441	45.01	140.61
		2648	167	20	138	14.06	109.66

Notes:
1. Hydrant fire flow testing conducted by Lozzi Aqua Check on June 8, 2022
2. Node Elevation estimated based on ground elevation plus 0.6m
3. Flow at 20 psi estimated based NFPA 291
4. Ground Elevation approximated based on Concept Grading Plan 1 (drawing CGP1)

Counterpoint Engineering Inc.

Residual Pressure based on Maximum Day Demand + Fire Flow

Fire Flow at Building	Max. Velocity (m/s)	Lowest Pressure			Satisfies Fire Flow Requirements?
		Pressure (m H_2O)	Pressure (psi)	**Pressure (kPa)**	
A/B/C	2.07	44.50	63	436	Yes

Notes: *1. Fire flow requirements satisfied if lowest pressure in system > 140 kPa (20 psi)*
2. Maximum allowable flow velocity during fire flow conditions equals 3 m/s

Residual Pressure during Other Scenarios

Scenario	Lowest Pressure		
	Pressure (m H_2O)	Pressure (psi)	**Pressure (kPa)**
Max. Day	62.83	89	616
Peak Hour	62.25	89	610

Scenario	Highest Pressure		
	Pressure (m H_2O)	Pressure (psi)	**Pressure (kPa)**
Max. Day	62.83	89	616
Peak Hour	62.25	89	610

Notes: *1. Prefered design pressure during average day and maximum day is 350 kPa to 550 kPA*
2. Prefered design pressure during minimum hour and peak hour is 275 kPa to 700 kPA
3. The minimum pressure under any non-fire demand scenario should not be less than 275 kPa

Page 1 2022-08-13 13:10:35

```
*************************************************************************
*                            E P A N E T                                *
*                     Hydraulic and Water Quality                       *
*                     Analysis for Pipe Networks                        *
*                           Version 2.2                                 *
*************************************************************************

Input File: CarlawGerrard_max day.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm	
Pipe_1	Jctn_1	Jctn_2	140.9	300	
Pipe_2	Jctn_2	Jctn_3	67.7	300	
HYD_1	Res_1	Jctn_1	#N/A	#N/A	Pump
HYD_2	Res_2	Jctn_3	#N/A	#N/A	Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
HYD_1	100.00	75.00	0.56	11.46	11.46	0.00
HYD_2	0.00	0.00	0.00	0.00	0.00	0.00
				Demand Charge:		0.00
				Total Cost:		0.00

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
Jctn_1	0.00	154.03	68.50	0.00	
Jctn_2	5.69	154.03	62.83	0.00	
Jctn_3	0.00	154.03	61.93	0.00	
Res_1	-5.69	0.00	0.00	0.00	Reservoir
Res_2	0.00	0.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status	
Pipe_1	5.69	0.08	0.04	Open	
Pipe_2	0.00	0.00	0.00	Open	
HYD_1	5.69	0.00	-154.03	Open	Pump
HYD_2	0.00	0.00	0.00	Closed	Pump

Page 1 2022-08-13 13:24:43

```
*************************************************************************
*                            E P A N E T                                *
*                     Hydraulic and Water Quality                       *
*                     Analysis for Pipe Networks                        *
*                           Version 2.2                                 *
*************************************************************************

Input File: CarlawGerrard_peak hr.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm	
Pipe_1	Jctn_1	Jctn_2	140.9	300	
Pipe_2	Jctn_2	Jctn_3	67.7	300	
HYD_1	Res_1	Jctn_1	#N/A	#N/A	Pump
HYD_2	Res_2	Jctn_3	#N/A	#N/A	Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
HYD_1	100.00	75.00	0.56	21.48	21.48	0.00
HYD_2	0.00	0.00	0.00	0.00	0.00	0.00
				Demand Charge:		0.00
				Total Cost:		0.00

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
Jctn_1	0.00	153.47	67.94	0.00	
Jctn_2	10.71	153.45	62.25	0.00	
Jctn_3	0.00	153.45	61.35	0.00	
Res_1	-10.71	0.00	0.00	0.00	Reservoir
Res_2	0.00	0.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status	
Pipe_1	10.71	0.15	0.12	Open	
Pipe_2	0.00	0.00	0.00	Open	
HYD_1	10.71	0.00	-153.47	Open	Pump
HYD_2	0.00	0.00	0.00	Closed	Pump

Page 1 2022-08-13 13:24:30

```
*************************************************************************
*                            E P A N E T                                *
*                     Hydraulic and Water Quality                       *
*                     Analysis for Pipe Networks                        *
*                           Version 2.2                                 *
*************************************************************************

Input File: CarlawGerrard_max day_FF.net
```

Link - Node Table:

Link ID	Start Node	End Node	Length m	Diameter mm	
Pipe_1	Jctn_1	Jctn_2	140.9	300	
Pipe_2	Jctn_2	Jctn_3	67.7	300	
HYD_1	Res_1	Jctn_1	#N/A	#N/A	Pump
HYD_2	Res_2	Jctn_3	#N/A	#N/A	Pump

Energy Usage:

Pump	Usage Factor	Avg. Effic.	Kw-hr /m3	Avg. Kw	Peak Kw	Cost /day
HYD_1	100.00	75.00	0.50	263.50	263.50	0.00
HYD_2	100.00	75.00	0.50	166.08	166.08	0.00
				Demand Charge:		0.00
				Total Cost:		0.00

Node Results:

Node ID	Demand LPS	Head m	Pressure m	Quality	
Jctn_1	0.00	138.09	52.56	0.00	
Jctn_2	239.02	135.98	44.78	0.00	
Jctn_3	0.00	136.60	44.50	0.00	
Res_1	-145.99	0.00	0.00	0.00	Reservoir
Res_2	-93.03	0.00	0.00	0.00	Reservoir

Link Results:

Link ID	Flow LPS	Velocity m/s	Unit Headloss m/km	Status	
Pipe_1	145.99	2.07	15.02	Open	
Pipe_2	-93.03	1.32	9.13	Open	
HYD_1	145.99	0.00	-138.09	Open	Pump
HYD_2	93.03	0.00	-136.60	Open	Pump