Functional Servicing Report

Tulip Estates Subdivision, Prince Edward County

ARCADIS | IBI GROUP

Prepared for Hilden Homes
by ARCADIS/IBI Group
January 11, 2023

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1 Introduction

1.1 Background

IBI Group was retained by Hilden Homes to prepare a Functional Servicing Report for the proposed subdivision development located at the north-eastern limit of the Picton-Hallowell area in Prince Edward County, ON. The subject lands are currently undeveloped, with proposed access connections from Bridge Street and Owen Street. The legal description of the site is:

PART OF LOTS 1080 AND 1081, REGISTERED PLAN 24, TOWNSHIP OF PICTON, PART OF LOTS 19 AND 20 CONCESSION SOUTH EAST OF CARRYING PLACE, TOWNSHIP OF HALLOWELL NOW IN THE MUNICUIPALITY OF THE COUNTY OF PRINCE EDWARD

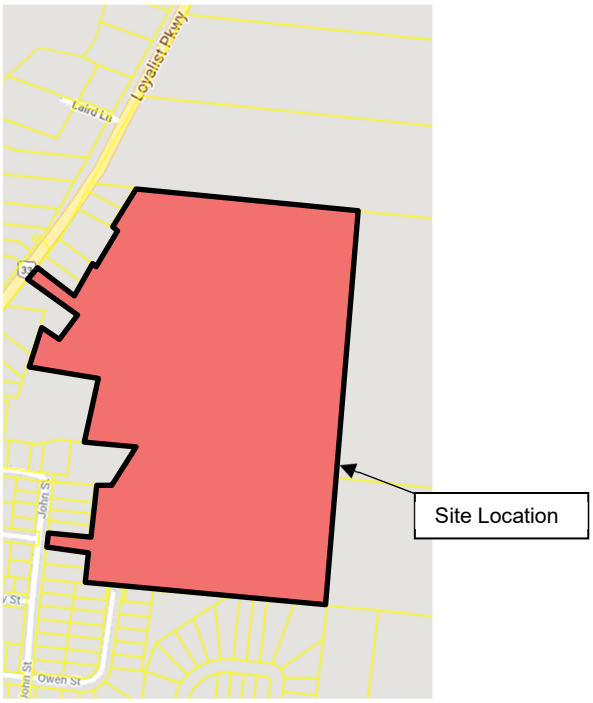


Figure 1 - Site Location (VUMAP, 2020)

The development site has an area of approximately 22.15 ha, bounded by existing residential and commercial uses along Bridge Street (Highway 33 – Loyalist Parkway) to the west, an existing residential subdivision to the south, and vacant lands to the north and east.

1.2 Purpose and Objectives

The purpose of this report is to illustrate the functional servicing requirements for a proposed subdivision development in Prince Edward County, Ontario. This report will outline the preliminary municipal servicing design including water distribution, wastewater collection, and municipal right of ways. Stormwater management has been addressed in a separate design brief, titled Draft Plan of Subdivision Tulip Estates, Prince Edward County Stormwater Management Report, prepared by IBI Group, and dated January 2023. This report will demonstrate how the subdivision will be serviced to support the proposed uses, and future development connections to the north and east.

1.3 Existing Conditions

1.3.1 Topography

The existing site is largely covered by pasture and forested areas, with a large change in elevation from west to east. The existing topography rises approximately 28 m in elevation from the western property limit along Bridge Street to the eastern property boundary.

1.3.2 Municipal Water Distribution

Prince Edward County owns and operates a municipal water distribution system in the area of the proposed subdivision development. Existing municipal watermains currently exist at three potential tie-in locations for the development site. These locations include Bridge Street, John Street and Owen Street.

A 150 mm diameter ductile iron watermain exists along Bridge Street, a 150 mm diameter ductile iron watermain exists along John Street, and a 200 mm diameter PVC water main exists along Owen Street.

1.3.3 Municipal Wastewater Collection

Prince Edward County owns and operates a municipal wastewater collection system in the area of the proposed subdivision development. Existing municipal sanitary sewer mains currently exist at Bridge Street for the development site.

A 200 mm diameter PVC sanitary sewer main exists along Bridge Street, a 200 mm diameter PVC sanitary sewer main exists along John Street, and a 200 mm diameter PVC sanitary sewer main exists along Owen Street.

2 Water Distribution System

2.1 Design Criteria

The proposed development consists of residential, with no commercial zoning proposed. The water system demand is based on:

- Daily demand: 350 L/d/person;
- Average 2.8 Persons per dwelling unit;
- Maximum Day Demand: 2.4 x Average Day;
- Peak Hour Demand: 4.25 x Average Day;
- 40 PSI residual pressure with Peak Hour Demand; and
- 20 PSI residual pressure with Maximum Day Demand plus Fire Flow.

To estimate the number of dwelling units, the area was determined, and the proposed maximum density of the development areas was used. This is anticipated to be the upper limit of demand for the development.

2.2 Existing Water System

The subject site is located within the Picton water distribution, which is supplied Picton Water Treatment Plant. The existing High-Level Reservoir provides water storage and maintains system pressure for the Picton water system. The High-Level Reservoir with a storage volume of

4,546m^3 and the operational water levels range between 139.1m (Low Water Level, LWL or water depth 2.7m) and 140m (High Water Level, HWL, or water depth 3.6m).

There are three potential connection points for the subject sites: Loyalist Parkway, Owen Street and Low Street/John Street.

2.3 Field Testing

For the purpose of confirming general supply and water pressures in the vicinity of the site, three hydrant flow tests by the County were performed on October 27, 2022. The test results will be used to for the model calibration. The field test locations are shown in Figure2 and **Appendix B** and ad follows:

- Test 1 - along Owen Street: The detected static system pressures was 50.4 psi (348kPa) and the High-Level Reservoir level was approximately 3.27 m, corresponding to system head 139.7as shown in **Appendix B**. The pressure / system head dropped by approximately 11 m (16 psi), when the hydrant was flowing at 85 L/s (1346usgpm).
- Test 2 - along Loyalist Parkway: Little flow was detected.
- Test 3 -along Bridge Street: The detected static system pressures was 57.9 psi (400kPa) and the High-Level Reservoir level was approximately 3.16 m, corresponding to system head 139.6 as shown in **Appendix B**. The pressure / system head dropped by approximately 12 m (17 psi), when the hydrant was flowing at 95 L/s (15066usgpm).

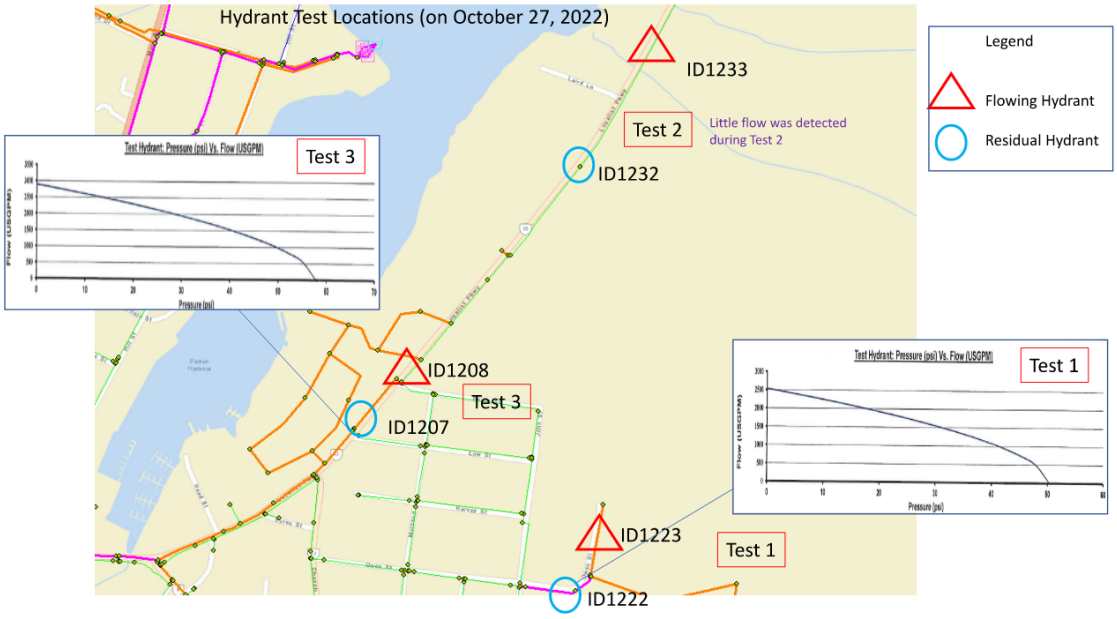


Figure 2 - Field test locations

2.4 Model Calibration

The Infowater hydraulic model (as provided by the County) was used to estimate the available system pressures along the existing watermains near subject site.

The watermain information and water consumptions under average day demand for the existing area in the vicinity of site have been provided by the City – See **Appendix B** for details. This

information for the PD3 system was used as the base for the model development. **Appendix B** shows the model layout and the information for the supply boundary.

The water distribution network system model was conducted to simulate the hydrant flow test results. C-factors along the existing pipelines in the vicinity of the site were refined. A watermain network analysis via a hydraulic model was performed to assess the available system head and pressure within the subject site under the proposed development.

2.5 Design Flows

Sheet C-100 in **Appendix A** illustrate the anticipated phasing for the subdivision development.

The recommended watermain connections and external system upgrades under each phasing development are summarized as follows:

Phase 1: One watermain connection will be made Owen St. Another connection will be made to 150mm watermain along Loyalist Parkway to allow water turnover for the proposed watermain along Street B within subject site.

Phase 2: same as Phase 1 – additional external watermain upgrades and/or connections may not be needed.

Phase 3: A 300mm watermain will be proposed along Loyalist Parkway from Philip Street to subject site connection at Street B. It will be connected to the proposed 300mm watermain along Street B within subject site.

Phase 4: A booster pumping station will be proposed to service the high elevation areas within Phase 4 development boundary. The location of the booster pumping station is to be determined (e.g., Block 10 within Phase 1 or at a location near Street B within Phase 4).

The Average Day Demand (ADD), Peak Hour Demand (PHD), and Max Day Demand (MDD) have been calculated using the criteria set in **Section 2.3**, and are summarized as follows:

LOCATION	Residential Units	Water Demand (L/s)			
		Average Daily Demand (L/s)	Maximum Daily Demand	Peak Hourly Demand	Fire Flow
		(l/s)	(l/s)	(l/s)	(l/s)
Phase 1	68-104	1.2	2.8	5	83
Phase 2	44-76	0.8	2.0	3.5	83
Phase 3	86-143	1.6	3.7	6.6	83
Phase 4	51-87	1.0	2.4	4.2	83
Total	249-410	5	11	20	-

Based on the recent hydrant test (October 27, 2022) and the Technical Memorandum (TM) for the Tulip Estates Subdivision Water Servicing, prepared by RVA (April 16, 2021), the available fire flow is 91L/s at the boundary supply from Owen Street.

The required fire flow will be determined in accordance with the calculations from the FUS for the future. The fire-resistive construction and a complete automatic sprinkler protection are recommended and will be required to limit the fire flow requirement (e.g., fire flow less than 83/s) for the Phase 1 and Phase 2 development – see **Appendix B** for details.

As per RVA's TM, the available fire flows at the supply boundaries are higher (e.g., 117 L/s) with the proposed watermain upgrade along Loyalist Parkway.

2.6 System Pressure Under Normal Operation

The estimated system heads/pressures for the proposed development under normal operation conditions (i.e., Peak Hour) are summarized below (see also see **Appendix B** for model outputs).

DESIGN CONDITION (Normal Operation Conditions)	SYSTEM HEAD (m)	SYSTEM PRESSURE (kPa)
Phase 1	>137	>411
Phase 2	>137	>365
Phase 3	>136	>302
Phase 4	>136	>299

Based on the hydrant test results and as shown above, there are no significant pressure reductions with the proposed development under the normal operation conditions (e.g., peak hour). The estimated system pressures within the subject site is greater than 342 kPa under proposed development conditions.

2.7 System Pressure Under Fire Flow

As shown below, the system pressure under the MDD + fire flow demand near the subject site is greater than 224 kPa (35 psi), if the fire flow is supplied from the hydrants located along Dufferin Street and Proposed Street A. Below summarizes the residual pressure under fire flow conditions (e.g., 83 L/s) along the watermains near the subject site:

DESIGN CONDITION (Fire Flow Conditions)	SYSTEM HEAD (m)	SYSTEM PRESSURE (kPa)
Phase 1	>118	>397
Phase 2	>117	>177
Phase 3	>126	>210
Phase 4	>126	>203

The available fire flow at the locations within the subject site is approximately 83L/s (at pressure 140kPa) - see **Appendix B** for details). As shown above, the residual pressure at the building face along the existing/proposed watermains is above the minimum acceptable pressure of 20 psi (140 kPa) under fire demand conditions. Please see **Appendix B** for the detailed design calculations.

3 Wastewater Collection System

3.1 Design Criteria

The proposed development consists of residential, with no commercial zoning proposed. The design of the sanitary sewer system is based on the following:

- Average per capita flow rate: 350 L/d/person;

- Average population per dwelling unit: 2.8 Persons/unit;
- Infiltration allowance: 0.14 L/sec/Ha;
- Residential peaking factor (PF): $PF = 1 + \frac{14}{4+\sqrt{\frac{P}{1000}}}$

  Where: P = population; and

  2.0 ≤ PF ≤ 4.0.

To estimate the number of dwelling units, the tributary areas were determined, and the proposed maximum density for each area was used. This is anticipated to be the upper limit of demand for the development.

The proposed sanitary sewer collection mains are sized using Manning's Equation:

$$Q = \frac{A\, r^{2/3}\, S^{1/2}}{n}$$

Where: Q = Flow Rate (m^3/s);

A = Flow Area (m^2);

r = Hydraulic Radius (m);

S = Slope (m/m); and

n = Manning's Roughness Coefficient = 0.013.

3.2 Population Projections

The subdivision is proposed to include:

- One (1) townhouse residential block consisting of 30-40 residential units; and
- Nineteen (19) single detached, semi-detached and street townhouse blocks consisting of 169-285 residential units.

The results of the above subdivision layout provide a range of 199-325 residential units. In order to ensure adequate capacity, the wastewater collection system has been sized for the upper limit of residential units.

With an estimated population of 2.8 persons per residential unit, the peak anticipated population of the proposed subdivision is 909.

3.3 Proposed Wastewater Plan

Refer to Sheet C-302 in **Appendix A** for a detailed depiction of the proposed wastewater plan.

The subdivision is proposed to be serviced with 200 mm and 250 mm diameter PVC sanitary gravity mains. The network of gravity mains will flow to a local sanitary lift station located at Block 10 on Street "B".

The sanitary lift station will provide temporary storage of the wastewater prior to pumping flows to the existing 200 mm diameter municipal sanitary sewer along Bridge Street. Pumping will occur at 28 L/s. Capacity of the current system to handle the flows will be determined by others.

4 Municipal Right of Ways

The proposed subdivision will consist of mainly local streets, with one east-west collector street (Street “B”), and one north-south collector street (Owen Street).

4.1 Collector Streets

4.1.1 Street “B”

Street “B” will serve as the east-west collector street for the proposed subdivision, with access to existing Bridge Street at the west end, and potential access connection for future development of the lands to the east.

Street “B” is proposed as a 22 m right of way. A typical 22 m right of way cross section has been provided in **Appendix A** (Figure 1) for reference. The cross section includes 11.5 m of asphalt travel lanes and parking lanes, a 3 m asphalt multi-use pathway, and landscaped boulevards on each side of the roadway, complete with street trees and lamp posts. The type of curb and gutter will vary along the right of way, with standard curb and gutter in all locations except those with residential zoning fronting on Street “B”. These locations will include rolled curb and gutter in place of standard curb and gutter.

4.1.2 Owen Street

Owen Street is proposed to be extended north into the subdivision and will connect to Street “B”. The existing section of Owen Street is within a 20 m right of way. The extension of Owen Street is proposed to remain consistent with a 20 m right of way. A typical 20 m right of way cross section has been provided in **Appendix A** (Figure 1) for reference. The cross section includes 11.5 m of asphalt travel lanes and parking lanes, a 3 m asphalt multi-use path, and landscaped boulevards on either side of the roadway.

4.2 Local Streets

The remaining streets in the subdivision development are proposed to be local streets (Street “A”, Street “C”, and Street “E”).

The local streets are proposed with an 18 m right of way. A typical 18 m right of way cross section has been provided in **Appendix A** (Figure 1) for reference. The cross section includes 10.5 m of asphalt travel lanes and parking lanes, a 1.5 m wide rolled monolithic sidewalk on one side, rolled curb and gutter on the other side, and landscaped boulevards on either side of the roadway.

5 Shallow Utilities

The proposed subdivision will require installation of new utility services. Existing utilities, including gas, hydro, and communication lines, are available at both Bridge Street and Owen Street.

The subdivision will be serviced with new underground utilities, with connections to existing infrastructure at Bridge Street and Owen Street. Design and coordination of the new utility works shall be completed by the relevant utility purveyors.

6 Development Phasing

Sheet C-100 in **Appendix A** illustrates the anticipated phasing for the subdivision development. The current access and utility tie-in locations at Bridge Street and Owen Street dictate Phase 1 of development. Phase 1 will provide connections to existing municipal infrastructure. Market conditions may influence the actual phasing of subsequent development. The services will be extended into each phase as required.

7 Conclusion

7.1 Water Distribution

The water system is proposed to connect to the existing distribution system in two locations and provide a loop through the subdivision. Water main stubs are proposed to the north and east to allow for future connections and growth. A location for a booster pumping station (Block 10 within Phase 1 or at a location near Street B within Phase 4) has been provided in the Draft Plan of Subdivision, if required.

With proposed watermain infrastructure upgrades along Loyalist Parkway, the available fire flow is 91L/s along boundary supply at Owen Street.

With the proposed system upgrades under each development phase, sufficient capacity would be available to support the required fire and domestic water demands for the proposed development.

7.2 Wastewater Collection

Wastewater from the proposed subdivision will be piped via a municipal gravity system to a proposed lift station located at Block 10 on Street “B”. Flows will be temporarily stored at the lift station and pumped at off-peak times to the existing municipal sanitary sewer main along Bridge Street.

7.3 Municipal Right of Ways

The proposed subdivision will incorporate one east-west collector street (Street “B”), one north-south collector street (Owen Street), and four local streets (Street “A”, “C”, and “E”).

Street “B” will consist of a 22 m right of way, and will provide access from Bridge Street, as well as access to potential future development to the east.

Owen Street will consist of a 20 m right of way, and will provide access from the existing portion of Owen Street to Street “B”.

The local streets will consist of 18 m right of ways.

7.4 Utility Infrastructure

Alignments for dry utilities have been provided for in the roadway cross-sections. Communication, hydro, and gas services are proposed to be front serviced to the lots from the proposed municipal right of ways.

The material in this report reflects IBI Group's judgement in light of the information available to it at the time of preparation and completion of this report. Should the above information not be accurate or current or change, it will be necessary to reconfirm the findings of this report. Any use which a Third Party makes of this report, or any reliance or decisions to be made based on it for other than its intended purpose, are the responsibility of such Third Party. IBI Group accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

IBI Group

Report prepared by:	Report reviewed by:
Maryam Haj Mir Fattah	Bill Thomas, M.Eng., P.Eng.
Engineering Intern	Associate – Manager Civil Engineering

8 References

Ontario. 2012. *"Ontario Building Code 2012"*. Ontario Ministry of Municipal Affairs and Housing. Toronto Ontario.

VUMAP, 2020. Digital image, Vumap – First Base Solutions, accessed June 18, 2020, < http://vumap.firstbasesolutions.com/vumap.php >

Appendix A – Drawings & Figures

C100 Phasing Plan
C200 Subdivision Grading Plan
C300 General Servicing Plan
C301 Water Servicing Plan
C302 Sanitary Servicing Plan
C303 Storm Sewer Servicing Plan
C400 Pre-Development Storm Catchment Plan
C401 Post-Development Storm Catchment Plan
FIG 01 Typical Road Cross Section

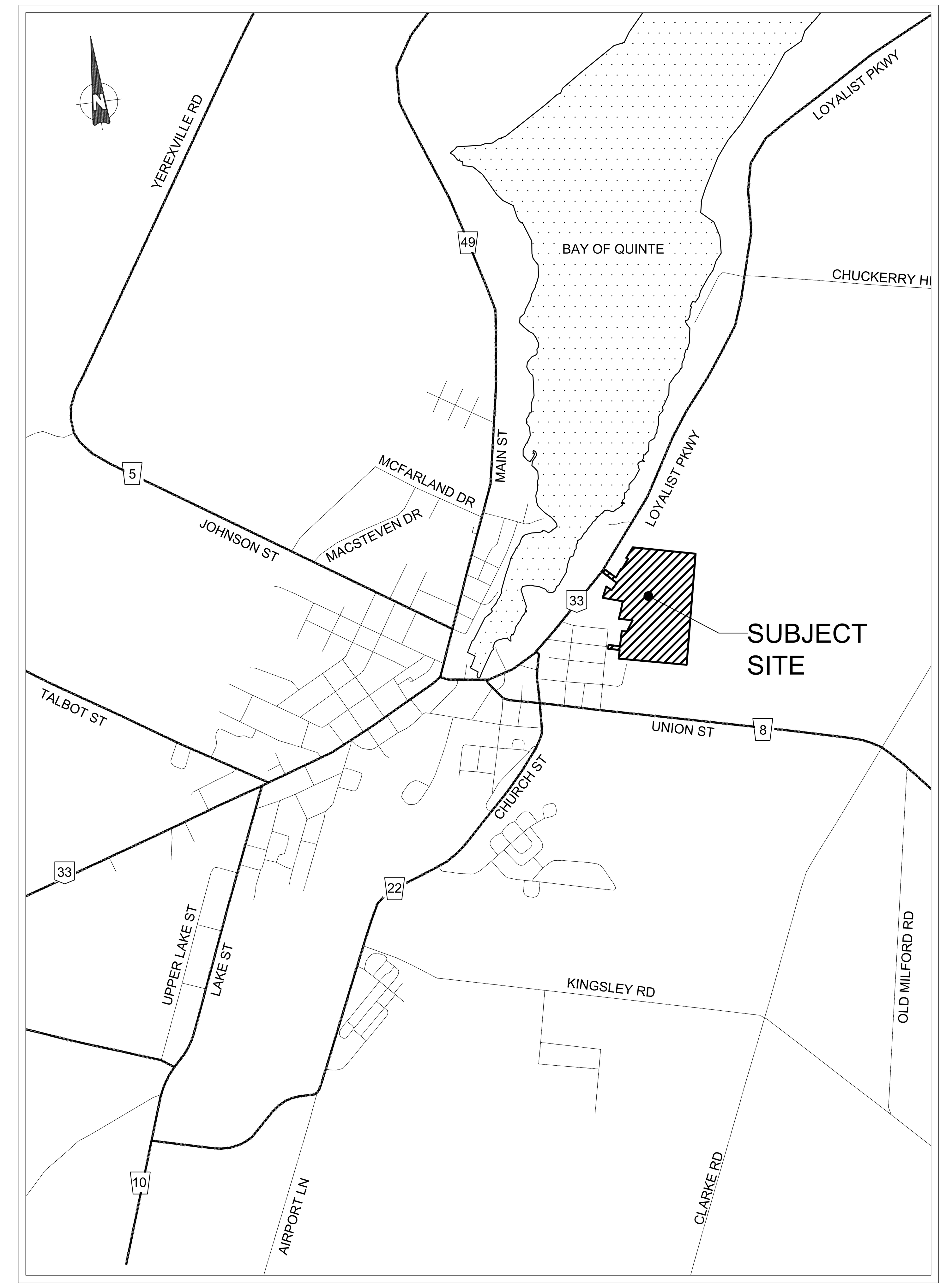
HILDEN HOMES

TULIP ESTATES SUBDIVISION

PRINCE EDWARD COUNTY

DRAWING INDEX PLAN

N.T.S.



KEY PLAN

N.T.S.

LIST OF CIVIL DRAWINGS

C100	PHASING PLAN
C200	SUBDIVISION GRADING PLAN
C300	GENERAL SERVICING PLAN
C301	WATER SERVICING PLAN
C302	SANITARY SERVICING PLAN
C303	STORM SEWER SERVICING PLAN
C400	PRE-DEVELOPMENT STORM CATCHMENT PLAN
C401	POST-DEVELOPMENT STORM CATCHMENT PLAN
SWM FIGURE #01	EXISTING STORM WATER CATCHMENT AREAS
SWM FIGURE #02	PROPOSED STORMWATER CATCHMENT AREAS

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Kingston ON K7K 7K7 Canada
tel 613 531 4440
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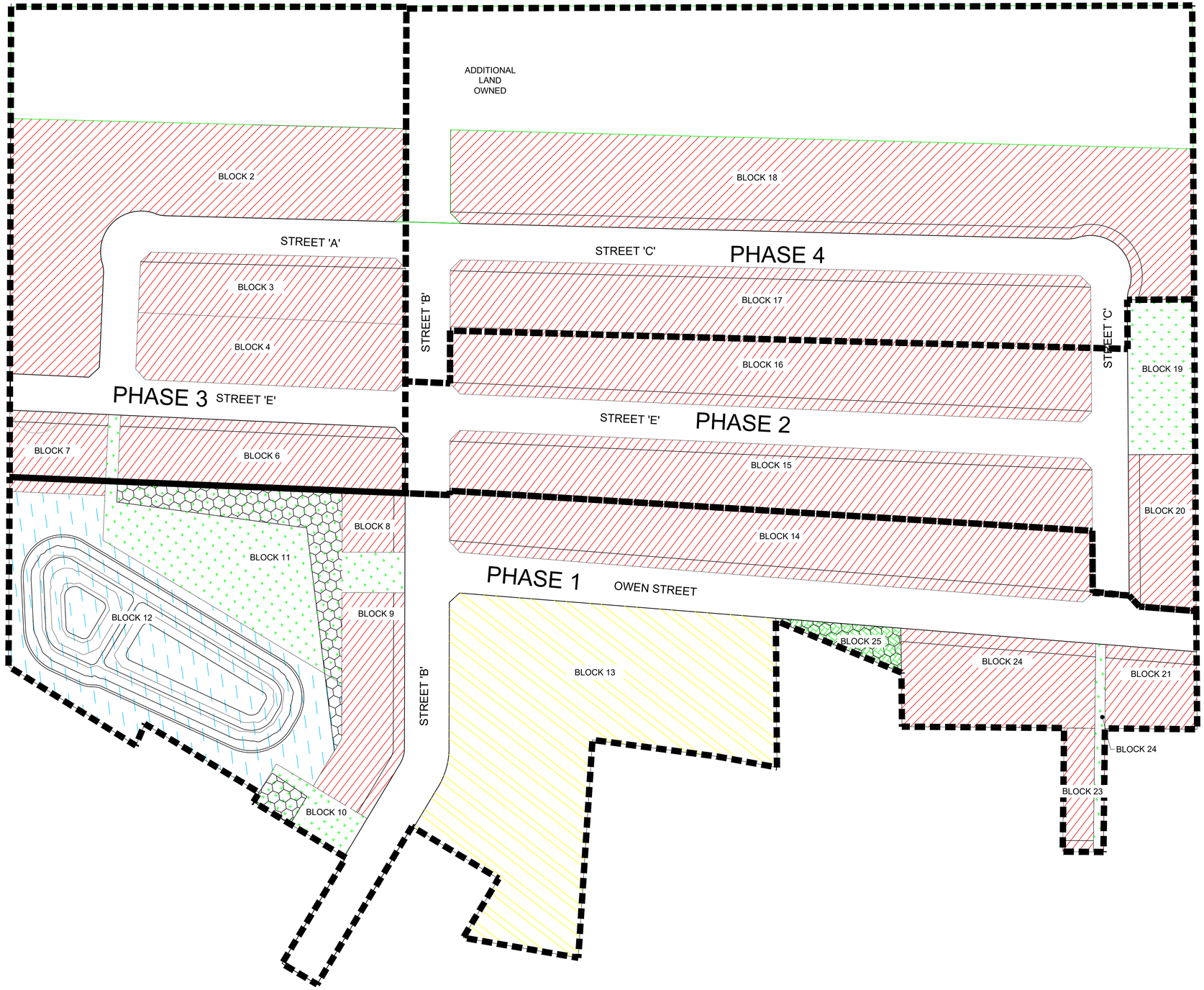

CLIENT

HILDEN HOMES

393 SIDNEY STREET BELLEVILLE, ON K8P 3Z9

ISSUES

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2	ISSUED FOR SECOND SUBMISSION	2023-01-XX

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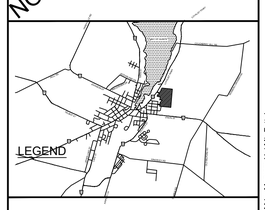

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No.	SCALE:
115791	
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

SHEET TITLE

PHASING PLAN

SHEET NUMBER	ISSUE
C-100	2

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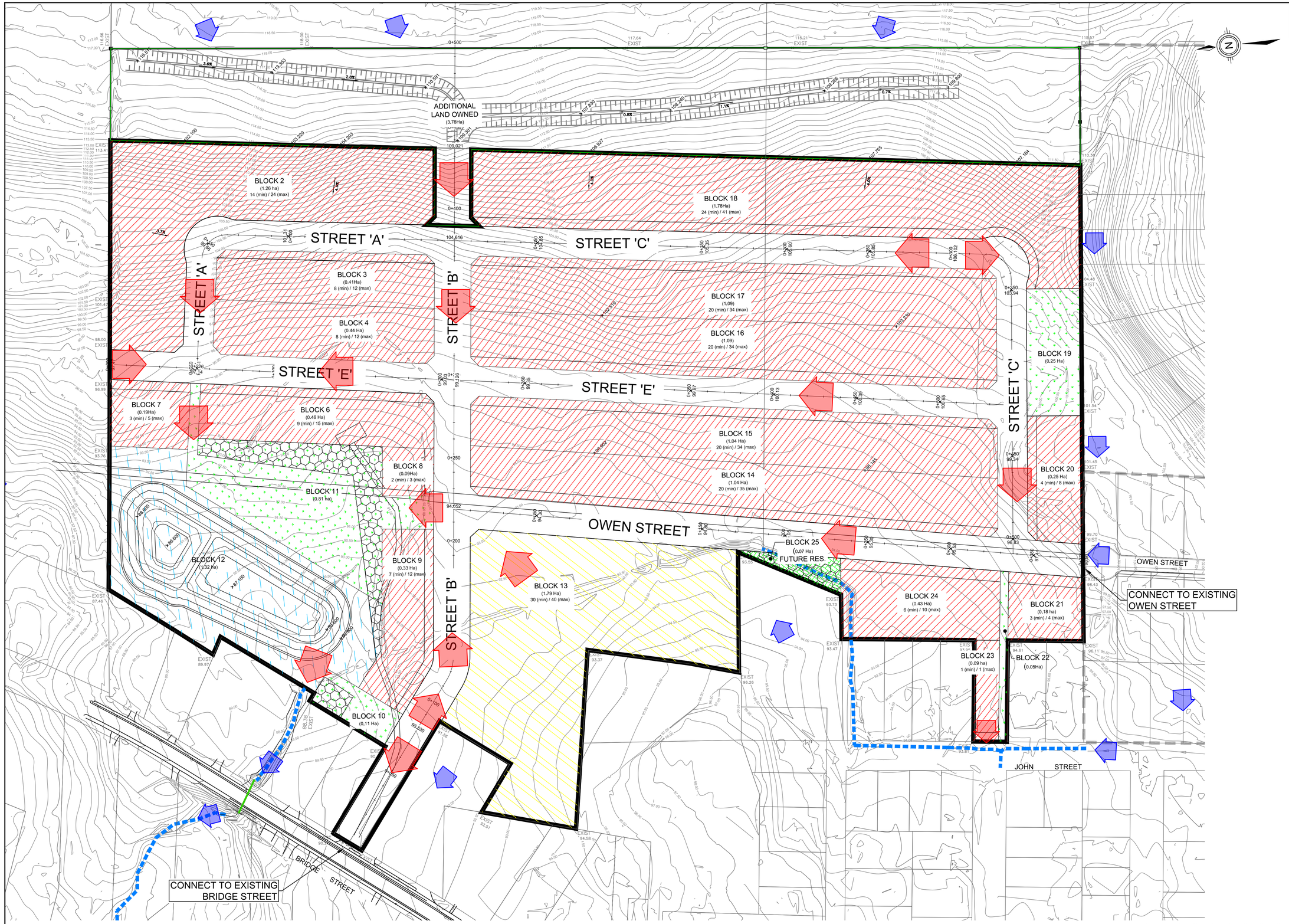

CLIENT

HILDEN HOMES

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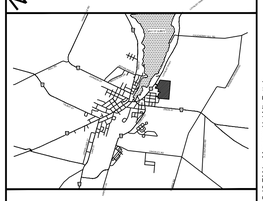

LEGEND

- EXISTING GROUND CONTOUR
- EXISTING ELEVATION
- PROPOSED ELEVATION
- PROPOSED SLOPE
- PROPOSED DEVELOPMENT BOUNDARIES
- PROPOSED MAJOR OVERLAND FLOW ROUTE
- EXISTING MAJOR OVERLAND FLOW ROUTE

IBI GROUP
Unit 6 - 81 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No. 115791	SCALE: 1:1000
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

SHEET TITLE

GRADING PLAN

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PLUG AND BLOW OFF FOR FUTURE DEVELOPMENT

PROPOSED HEADWALL TO RECEIVE FLOWS FROM EXTERNAL CATCHMENT AREAS AT INTERIM CONDITION.

ADDITIONAL LAND OWNED (3.78 ha)

BLOCK 2 (1.26 ha) 14 (min) / 24 (max)

BLOCK 18 (1,78Ha) 24 (min) / 41 (max)

STREET 'A'

STREET 'B'

STREET 'C'

BLOCK 3 (0,41Ha) 8 (min) / 12 (max)

BLOCK 4 (0,44 Ha) 8 (min) / 12 (max)

BLOCK 17 (1.09) 20 (min) / 34 (max)

BLOCK 16 (1.09) 20 (min) / 34 (max)

BLOCK 19 (0.25 Ha)

STREET 'E'

BLOCK 7 (0,19Ha) 3 (min) / 5 (max)

BLOCK 6 (0.46 Ha) 9 (min) / 15 (max)

BLOCK 8 (0,09Ha) 2 (min) / 3 (max)

BLOCK 11 (0.11 Ha)

BLOCK 15 (1.04 Ha) 20 (min) / 34 (max)

BLOCK 14 (1.04 Ha) 20 (min) / 35 (max)

BLOCK 20 (0.25 Ha) 4 (min) / 8 (max)

OWEN STREET

BLOCK 12 (1.32 Ha)

BLOCK 9 (0.33 Ha) 7 (min) / 12 (max)

PROPSED CULVERT

BLOCK 25 (0.07 Ha) FUTURE RES.

BLOCK 13 (1.79 Ha) 30 (min) / 40 (max)

BLOCK 24 (0,43 Ha) 6 (min) / 10 (max)

BLOCK 21 (0,18 ha) 3 (min) / 4 (max)

EXISTING STORM SEWERS ALONG OWEN STREET TO BE CONNECTED TO THE PROPOSED STORM SEWERS.

EX WATER PLUG & BLOW-OFF

OWEN STREET

EX SAN PLUG

EX STM PLUG

EXISTING SWM FACILITY TO BE DECOMMISSIONED

BLOCK 23 (0,09 ha) 1 (min) / 1 (max)

BLOCK 22 (0,05Ha)

OUTLET TO THE EXISTING DITCH

PROPOSED SANITARY LIFT STATION LOCATION

BLOCK 10 (0.11 Ha)

EXISTING CULVERT

POSSIBLE BOOSTER STATION LOCATION

PROPOSED CONNECTION TO THE EXISTING WATERMAIN

PROPOSED SANITARY FORCEMAIN TO BE CONNECTED TO MH569 ON BRIDGE STREET 425 m FROM STREET B

BRIDGE STREET

JOHN STREET

1:1000

10 0 10 20 30 40 50 60 70 m

CLIENT

HILDEN HOMES

393 SIDNEY STREET BELLEVILLE, ON K8P 3Z9

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SUBMISSION	2020-12-03
2	ISSUED FOR SECOND SUBMISSION	2023-01-XX

NOT FOR CONSTRUCTION

LEGEND

- PROPOSED WATER MAIN
- PROPOSED FIRE HYDRANT
- EXISTING WATER MAIN
- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- STORM DRAIN
- CULVERT
- SANITARY FORCEMAIN

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
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PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No. 115791	SCALE:
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

SHEET TITLE

GENERAL SERVICING PLAN

SHEET NUMBER	ISSUE
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PLUG AND BLOW OFF FOR FUTURE DEVELOPMENT

ADDITIONAL LAND OWNED (3.78Ha)

BLOCK 2 (1.26 ha) 14 (min) / 24 (max)

BLOCK 18 (1,78Ha) 24 (min) / 41 (max)

STREET 'A'

STREET 'C'

BLOCK 3 (0,41Ha) 8 (min) / 12 (max)

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BLOCK 8 (0,09Ha) 2 (min) / 3 (max)

BLOCK 11 (0.81 ha)

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BLOCK 14 (1.04 Ha) 20 (min) / 35 (max)

BLOCK 20 (0.25 Ha) 4 (min) / 8 (max)

BLOCK 12 (1.32 Ha)

BLOCK 9 (0,33 Ha) 7 (min) / 12 (max)

OWEN STREET

BLOCK 25 (0.07 Ha) FUTURE RES.

EX WATER PLUG & BLOW-OFF

OWEN STREET

BLOCK 13 (1.79 Ha) 30 (min) / 40 (max)

BLOCK 24 (0,43 Ha) 6 (min) / 10 (max)

BLOCK 21 (0,18 ha) 3 (min) / 4 (max)

BLOCK 23 (0.10 ha) 1 (min) / 1 (max)

BLOCK 22 (0.05Ha)

BLOCK 10 (0.11 Ha)

POSSIBLE BOOSTER STATION LOCATION

PROPOSED CONNECTION TO THE EXISTING WATERMAIN

BRIDGE STREET

JOHN STREET

1:1000

10 0 10 20 30 40 50 60 70 m

CLIENT

HILDEN HOMES

393 SIDNEY STREET BELLEVILLE, ON K8P 3Z9

ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SUBMISSION	2020-12-03
2	ISSUED FOR SECOND SUBMISSION	2023-01-XX

NOT FOR CONSTRUCTION

LEGEND

- PROPOSED WATER MAIN
- PROPOSED FIRE HYDRANT
- DEVELOPMENT BOUNDARY

IBI GROUP
Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No. 115791	SCALE:
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

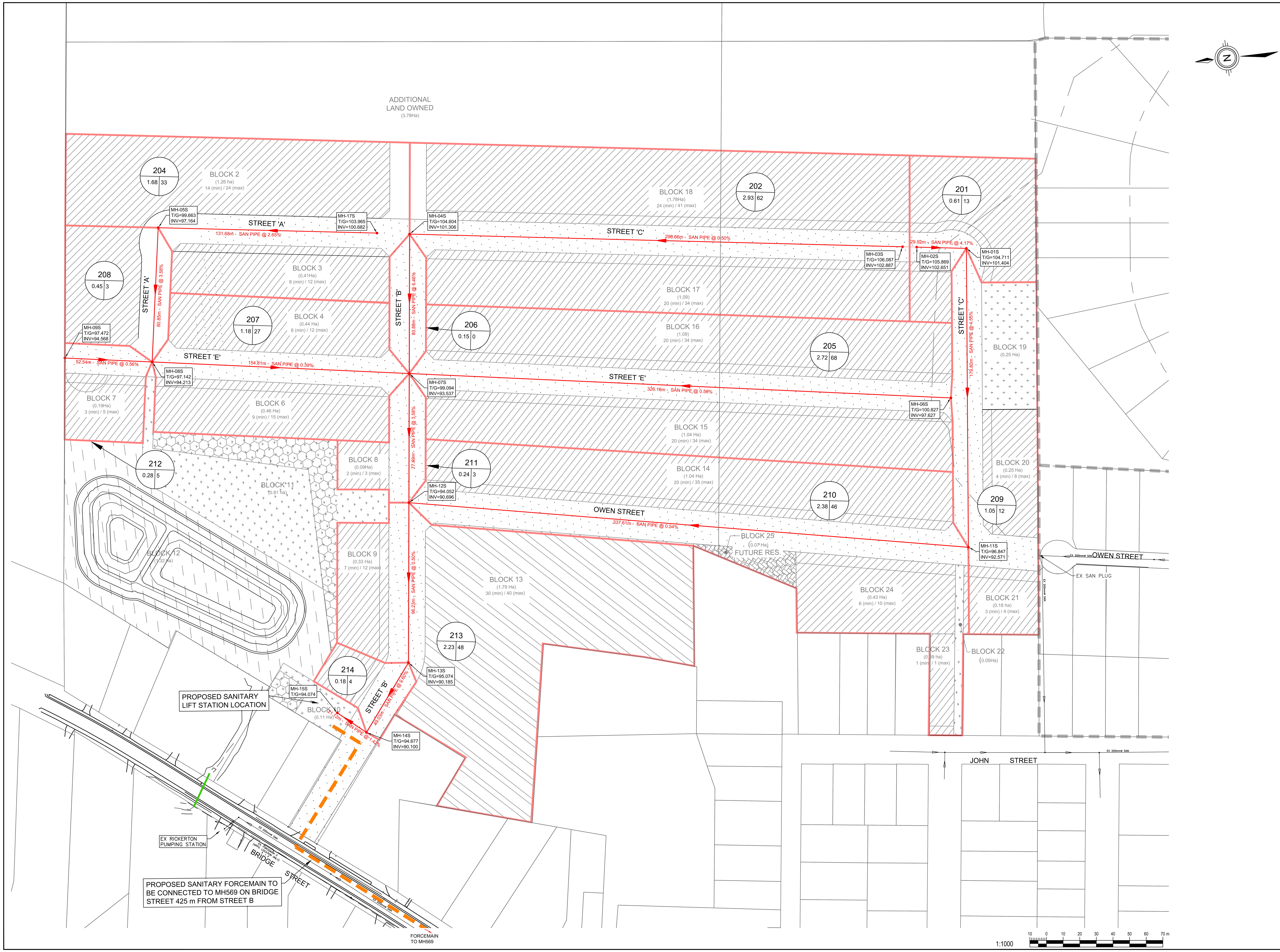
SHEET TITLE

WATER SERVICING PLAN

SHEET NUMBER	ISSUE
C-301	2

SCALE CHECK 50mm 1 in

File Location: \\cnaeast.ibigroup.com\JTO\115791_H&den\Picton\5.9 Drawings\05civil\layouts\115791_C301_Water Servicing Plan.dwg Last Saved: December 22, 2022. by manyam.haj.mir.fatah Plotted: Tuesday, January 10, 2023 3:49:50 PM by Manyam Haj Mir Fatah


ADDITIONAL LAND OWNED
(3.78Ha)
BLOCK 2
(1.26 ha)
14 (min) / 24 (max)
BLOCK 3
(0.41Ha)
8 (min) / 12 (max)
BLOCK 4
(0.44 Ha)
8 (min) / 12 (max)
BLOCK 6
(0.46 Ha)
9 (min) / 15 (max)
BLOCK 7
(0.19Ha)
3 (min) / 5 (max)
BLOCK 8
(0.09Ha)
2 (min) / 3 (max)
BLOCK 9
(0.33 Ha)
7 (min) / 12 (max)
BLOCK 10
(0.11 Ha)
BLOCK 11
(0.81 ha)
BLOCK 12
BLOCK 13
(1.79 Ha)
30 (min) / 40 (max)
BLOCK 14
(1.04 Ha)
20 (min) / 35 (max)
BLOCK 15
(1.04 Ha)
20 (min) / 34 (max)
BLOCK 16
(1.09)
20 (min) / 34 (max)
BLOCK 17
(1.09)
20 (min) / 34 (max)
BLOCK 18
(1.78Ha)
24 (min) / 41 (max)
BLOCK 19
(0.25 Ha)
BLOCK 20
(0.25 Ha)
4 (min) / 8 (max)
BLOCK 21
(0.18 ha)
3 (min) / 4 (max)
BLOCK 22
(0.05Ha)
BLOCK 23
1 (min) / 1 (max)
BLOCK 24
(0.43 Ha)
6 (min) / 10 (max)
BLOCK 25
(0.07Ha)
FUTURE RES.
204 1.68 33
208 0.45 3
207 1.18 27
206 0.15 0
202 2.93 62
201 0.61 13
205 2.72 68
212 0.28 5
211 0.24 3
210 2.38 46
209 1.05 12
213 2.23 48
214 0.18 4
STREET 'A'
STREET 'B'
STREET 'C'
STREET 'E'
OWEN STREET
JOHN STREET
BRIDGE STREET
MH-05S
T/G=99.663
INV=97.164
MH-17S
T/G=103.965
INV=100.682
MH-04S
T/G=104.604
INV=101.306
MH-03S
T/G=106.087
INV=102.887
MH-02S
T/G=105.869
INV=102.651
MH-01S
T/G=104.711
INV=101.404
MH-09S
T/G=97.472
INV=94.568
MH-08S
T/G=97.142
INV=94.213
MH-07S
T/G=99.094
INV=93.537
MH-06S
T/G=100.827
INV=97.627
MH-12S
T/G=94.052
INV=90.696
MH-11S
T/G=96.847
INV=92.571
MH-13S
T/G=95.074
INV=90.185
MH-14S
T/G=94.677
INV=90.100
MH-15S
T/G=94.074
131.68m - SAN PIPE @ 2.65%
298.66m - SAN PIPE @ 0.50%
29.92m - SAN PIPE @ 4.17%
80.85m - SAN PIPE @ 3.58%
83.88m - SAN PIPE @ 6.46%
179.80m - SAN PIPE @ 4.55%
52.54m - SAN PIPE @ 0.56%
154.81m - SAN PIPE @ 0.39%
326.16m - SAN PIPE @ 0.58%
77.69m - SAN PIPE @ 3.58%
337.61m - SAN PIPE @ 0.54%
96.23m - SAN PIPE @ 0.50%
EX SAN PLUG
PROPOSED SANITARY LIFT STATION LOCATION
EX RICKERTON PUMPING STATION
PROPOSED SANITARY FORCEMAIN TO BE CONNECTED TO MH569 ON BRIDGE STREET 425 m FROM STREET B
FORCEMAIN TO MH569
1:1000
10 0 10 20 30 40 50 60 70 m

CLIENT

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393 SIDNEY STREET BELLEVILLE, ON K8P 3Z9

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ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SUBMISSION	2020-12-03
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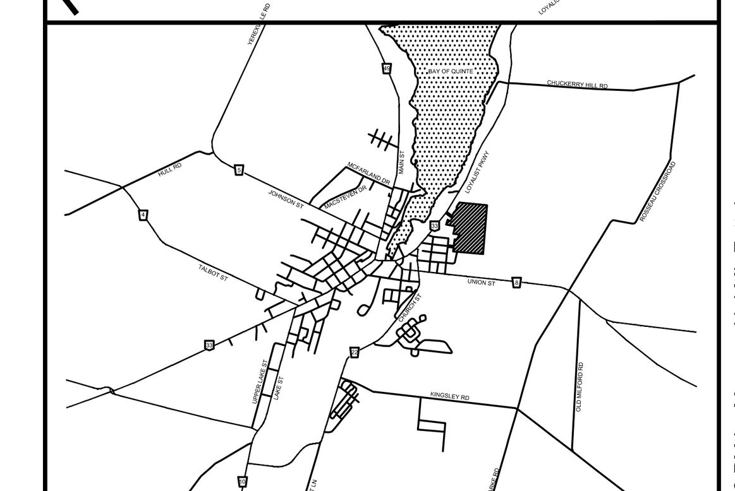

LEGEND

- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- EXISTING SANITARY SEWER
- EXISTING SANITARY MANHOLE
- TRIBUTARY AREA
- SANITARY FORCEMAIN

EXT-04 — AREA NUMBER
8.24 — AREA (HA)
125 — UNITS / ZONING

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No. 115791	SCALE:
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

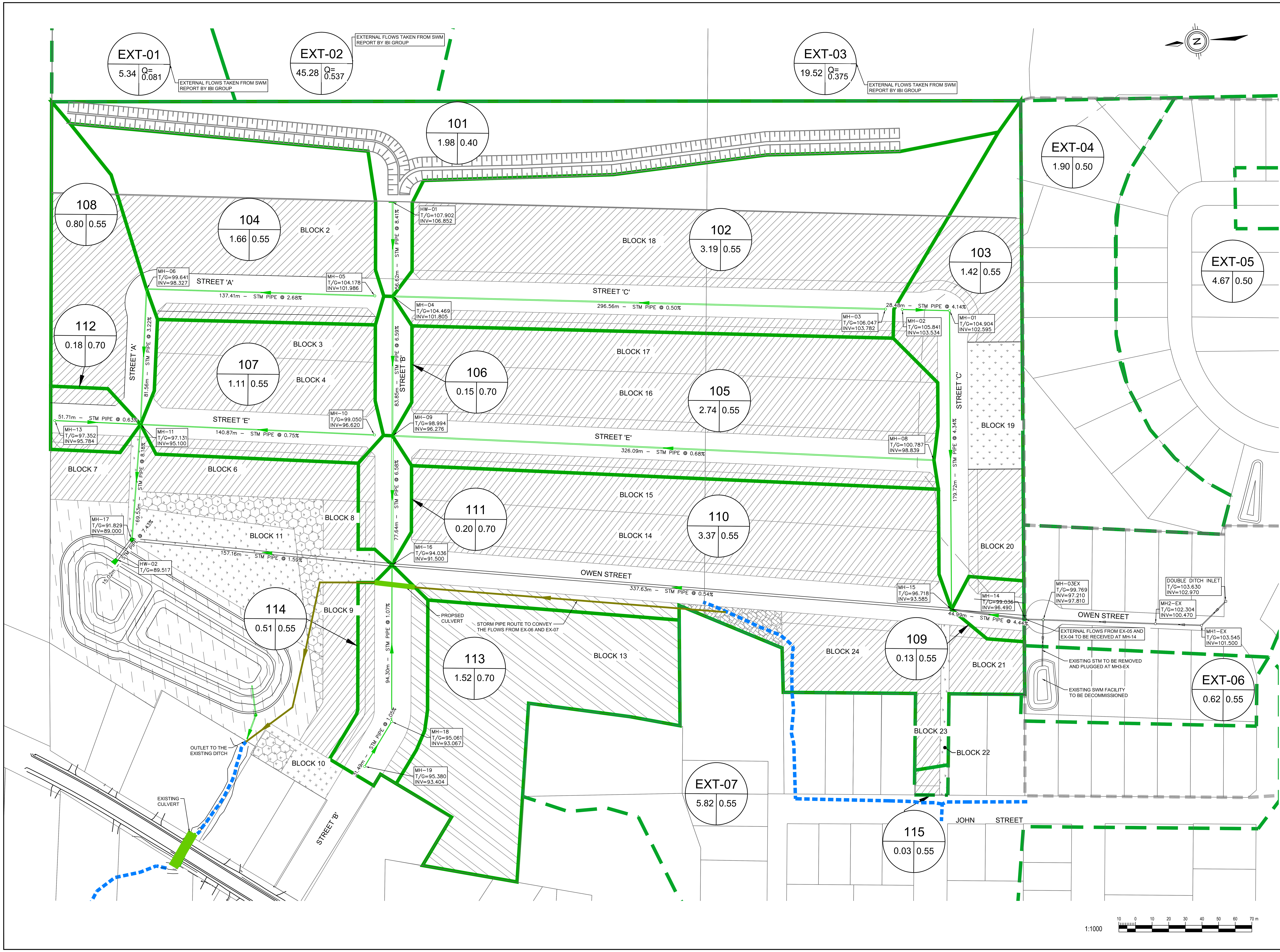
SHEET TITLE

SANITARY SERVICING PLAN

SHEET NUMBER C-302

ISSUE 2

Last Saved: December 22, 2022, by maryam.haj.mir.fatta Plotted: Tuesday, January 10, 2023 3:51:16 PM by Maryam Haj Mir Fattah



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ISSUES

No.	DESCRIPTION	DATE
1	ISSUED FOR SUBMISSION	2020-12-03
2	ISSUED FOR SECOND SUBMISSION	2023-01-XX

NOT FOR CONSTRUCTION

LEGEND

- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE
- EXISTING STORM SEWER
- EXISTING STORM MANHOLE
- INTERNAL CATCHMENT AREA
- EXTERNAL CATCHMENT AREA
- CULVERT CROSSING
- EXISTING DRAINAGE PATH
- STORM DRAIN

101 / 1.98 | 0.50 — CATCHMENT AREA NUMBER; RUN-OFF COEFFICIENT; AREA (HA)

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
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PROJECT

TULIP ESTATES SUBDIVISION

12697 Loyalist Parkway
PICTON, ON

PROJECT No. 115791	SCALE:
DRAWN BY: MH	CHECKED BY: MM
PROJECT MGR: MM	APPROVED BY: BT

SHEET TITLE

STORM SEWER SERVICING PLAN

SHEET NUMBER	ISSUE
C-303	2

File Location: \\caneast.ibigroup.com\J\TO\115791_HildenPicton\5.9 Drawings\59civil\layouts\115791_C303_Storm Servicing Plan.dwg Last Saved: December 23, 2022, by maryam.hajmir.fattah Plotted: Tuesday, January 10, 2023 3:54:19 PM by Maryam Haj Mir Fattah

EXT-01
5.34 | 0.25

EXT-02
45.28 | 0.25

EXISTING
UNDEVELOPED AREA

EXT-03
19.52 | 0.25

SITE BOUNDARY

DEVELOPMENT BOUNDARY

EXISTING DRAIN

EXT-04
1.90 | 0.25

PINERIDGE DR.

EXT-05
5.29 | 0.50

101
20.77 | 0.50

EXISTING
WOODED AREA

PINERIDGE SUBDIVISION
(STORM DRAINAGE AREA PLAN NO. 15815-STM)

EXISTING
UNDEVELOPED
AREA

EXISTING
BUILDING

EXISTING HYDRO EASEMENT
AS PER PLAN OF SURVEY

HP

UNION STREET

102
1.23 | 0.25

EXISTING SWM FACILITY

OWEN STREET

EXISTING SWM
FACILITY OUTLET

EXISTING SWM FACILITY

EXISTING
DRIVEWAY

EXISTING
LOTS

EXISTING
CULVERT

RED GATE SUBDIVISION
(STORM DRAINAGE AREA PLAN NO. 1680-2)

BRIDGE STREET

103
0.12 | 0.25

EXT-06
5.82 | 0.50

EXISTING SWM
FACILITY OUTLET

JOHN STREET

EXISTING
PARK
AREA

EXISTING DITCH
AND CULVERTS

EXT-07
0.15 | 0.50

104
0.03 | 0.25

EX. RICKERTON
PUMPING STATION

PHILIP STREET

EXISTING
LOTS

LOW STREET

HARVEY STREET

OWEN STREET

ROBINSON STREET

NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

1:1250

25 0 25 50 75 m

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

LEGEND

- DEVELOPMENT BOUNDARY
- EXISTING DRAINAGE PATH
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR
- EXISTING CULVERT

EXT-04 (8.24 | 0.50)
- CATCHMENT AREA NUMBER
- RUN-OFF COEFFICIENT
- AREA (HA)

- EXISTING DRAINAGE DIRECTION
- HP - EXISTING HYDROPOLE
- WOODED AREA

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

Drawing Title:
PRE-DEVELOPMENT STORM CATCHMENT PLAN

Designed: M.M	Scale: 1:1250
Drawn By: M.H.	Drawing File: 115791_C400_Pre-Dev Storm Catchment Plan.dwg
Checked: M.M.	Project No.: 115791
Date: DEC. 2022	Drawing No.: C400

\\connect.bigroup.com\LV10\115791_HildenPotton\3.0 Drawings\30sout\Layouts\SWM Exhibits\115791_C400_Pre-Dev Storm Catchment Plan.dwg 2023-01-10 3:56 PM Maryam Haj Mir Fatton

EXT-01
5.34 | 0.25

EXT-02
45.28 | 0.25

EXT-03
19.52 | 0.25

EXISTING WOODED AREA

104
3.78 | 0.25

SITE BOUNDARY

DEVELOPMENT BOUNDARY

EXT-04
1.90 | 0.25

PINERIDGE DR.

EXT-05a
4.67 | 0.50

PINERIDGE SUBDIVISION
(STORM DRAINAGE AREA PLAN NO. 15815-STM)

EXISTING UNDEVELOPED AREA

101
18.16 | 0.25

EXISTING SWM FACILITY

PROPOSED UNDERGROUND ROUTE FOR EXISTING HYDRO LINE

CULVERT ROAD CROSSING

EXISTING SWM FACILITY OUTLET

OWEN STREET

UNION STREET

PROPOSED CONVEYANCE FOR RE-ROUTING THE EXISTING DITCH

EXISTING SWM FACILITY (TO BE DECOMMISSIONED)

EXT-05b
0.62 | 0.50

EXISTING DRAINAGE

EXISTING CULVERT

BRIDGE STREET

RED GATE SUBDIVISION
(STORM DRAINAGE AREA PLAN NO. 1680-2)

EXT-06
5.82 | 0.50

EXISTING SWM FACILITY OUTLET

JOHN STREET

EXISTING DITCH AND CULVERTS

103
0.18 | 0.50

EXT-07
0.15 | 0.50

EXISTING PARK AREA

102
0.03 | 0.50

EXISTING LOTS

PHILIP STREET

LOW STREET

HARVEY STREET

OWEN STREET

ROBINSON STREET

EX RICKERTON PUMPING STATION

NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

1:1250

25 0 25 50 75 m

LEGEND

- DEVELOPMENT BOUNDARY
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR
- EXISTING CULVERT
- UNDERGROUND HYDRO LINE
- EXT-04 (8.24 | 0.50): CATCHMENT AREA NUMBER; RUN-OFF COEFFICIENT; AREA (HA)
- EXISTING DRAINAGE DIRECTION
- PROPOSED DRAINAGE DIRECTION
- EXISTING DRAINAGE PATH
- WOODED AREA

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

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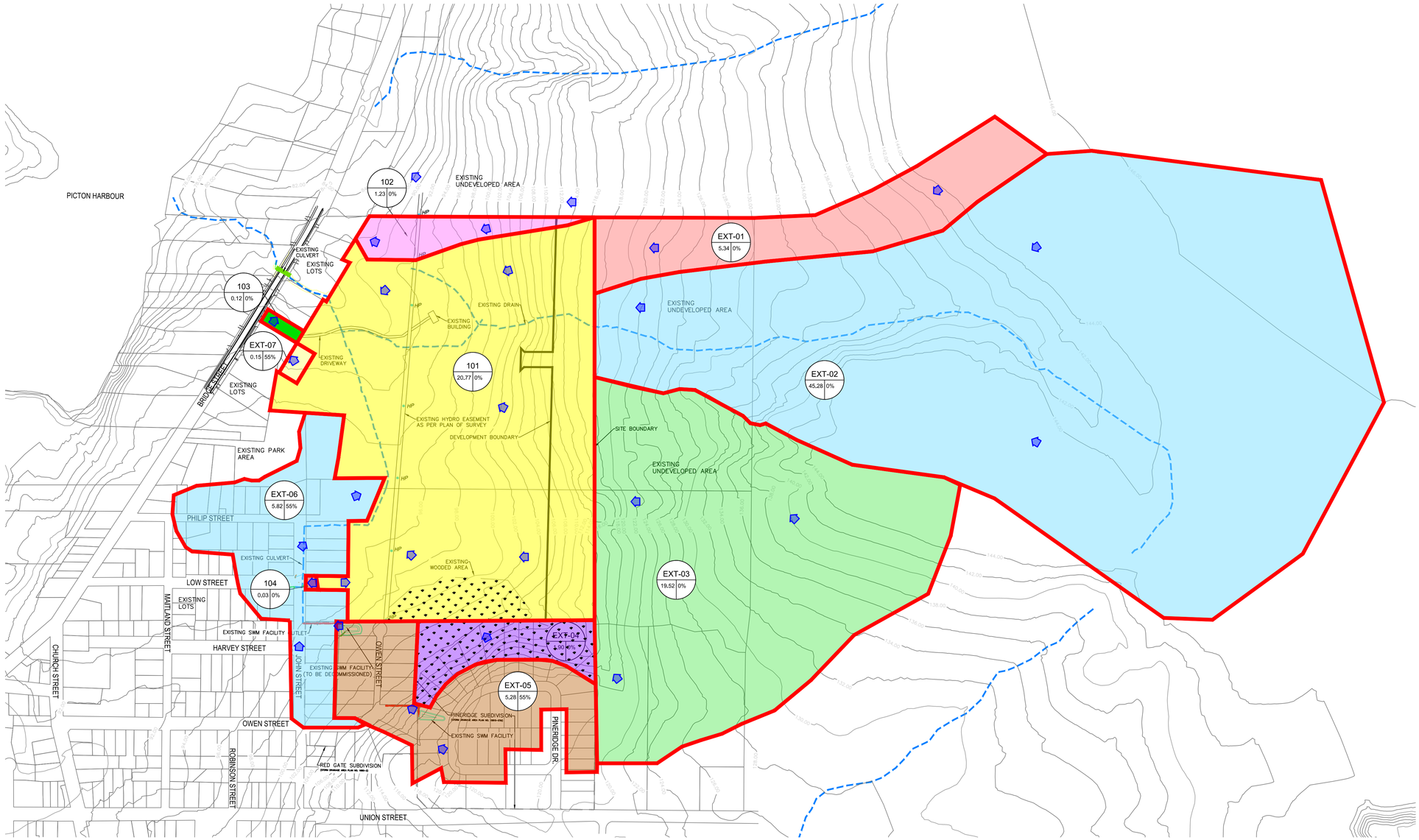
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

Drawing Title:
POST-DEVELOPMENT STORM CATCHMENT PLAN

Designed: M.M	Scale: 1:1250
Drawn By: M.H.	Drawing File: 115791_C401_Post-Dev Storm Catchment Plan.dwg
Checked: M.M.	Project No.: 115791
Date: DEC. 2022	Drawing No.: C401

\\Connect.ibigroup.com\V1\TO\115791_HildenPicton\5.0 Drawings\5Civil\Layouts\SWM Exhibits\115791_C401_Post-Dev Storm Catchment Plan.dwg 2023-01-10 3:57 PM Maryam Haj Mir Fattah



NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

1:3000

50 0 50 100 150 m

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

LEGEND

- DEVELOPMENT BOUNDARY
- EXISTING DRAINAGE PATH
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR
- EXISTING CULVERT
- HP - EXISTING HYDROPOLE
- EXT-04 / 8.24 55% — CATCHMENT AREA NUMBER; % IMPERVIOUSNESS; AREA (ha)
- EXISTING DRAINAGE DIRECTION
- WOODED AREA

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Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
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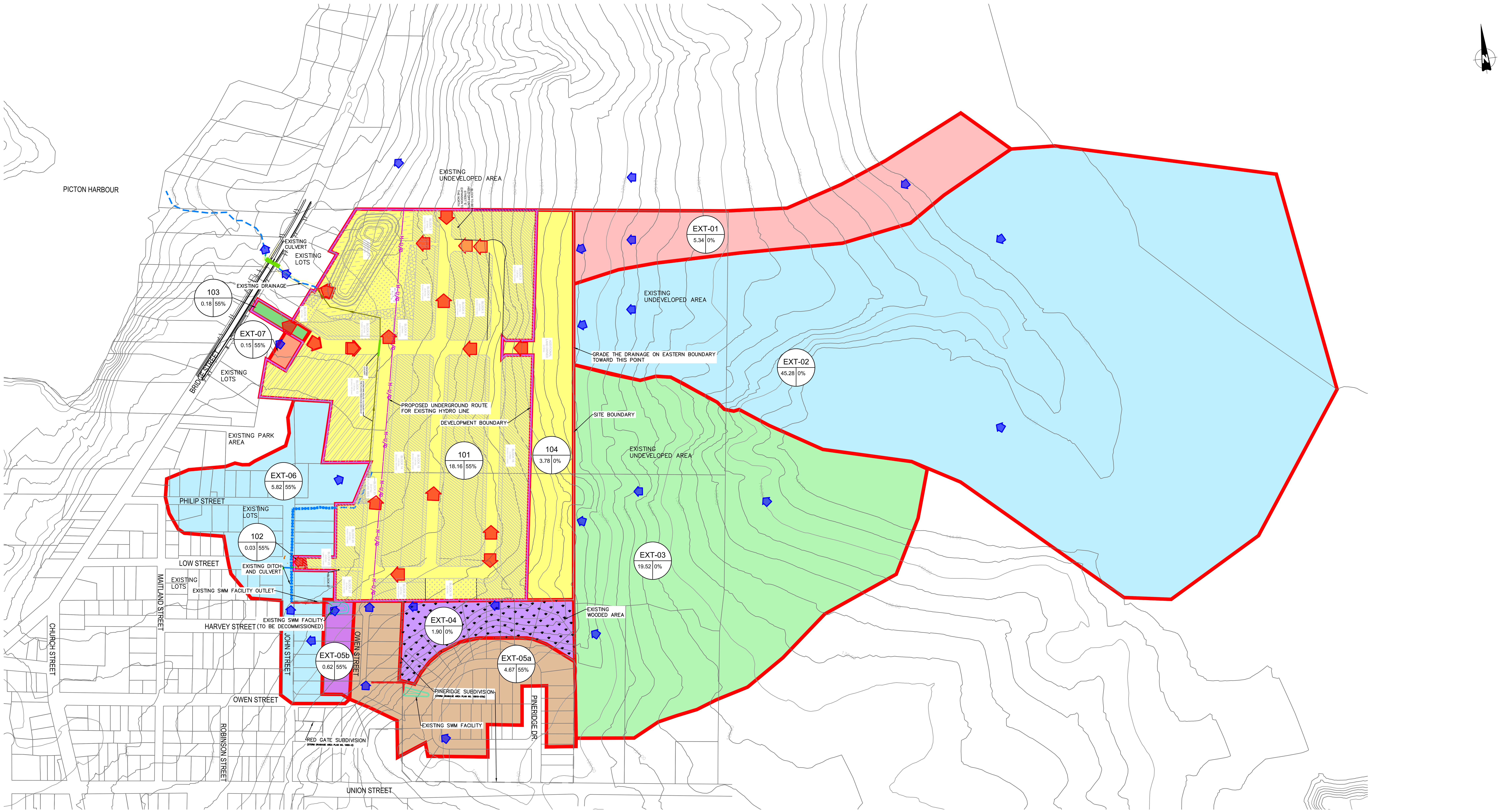
Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

Drawing Title:
SWM FIGURE #01 - EXISTING STORMWATER CATCHMENT AREAS

Designed: M.M	Scale: 1:3000
Drawn By: M.H.	Drawing File: 115791_SWM Fig #01 - Ex SWM Catchment Areas.dwg
Checked: M.M.	Project No.: 115791
Date: DEC. 2022	Drawing No.: C402

\\Comcast.ibigroup.com\V\TO\115791_HildenPicton\5.0 Drawings\5Civil\Layouts\[SWM Exhibits\115791_SWM Fig#01 - Ex SWM Catchment Areas.dwg 2023-01-10 3:59 PM Maryam Haj Mir Fotoh



1:3000

50 0 50 100 150 m

NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

LEGEND

- DEVELOPMENT BOUNDARY
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR (81.5)
- EXISTING CULVERT
- UNDERGROUND HYDRO LINE
- EXT-04 — CATCHMENT AREA NUMBER; 8.24 — AREA (ha); 55% — % IMPERVIOUSNESS
- EXISTING DRAINAGE DIRECTION
- PROPOSED DRAINAGE DIRECTION
- EXISTING DRAINAGE PATH
- WOODED AREA

IBI GROUP
Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
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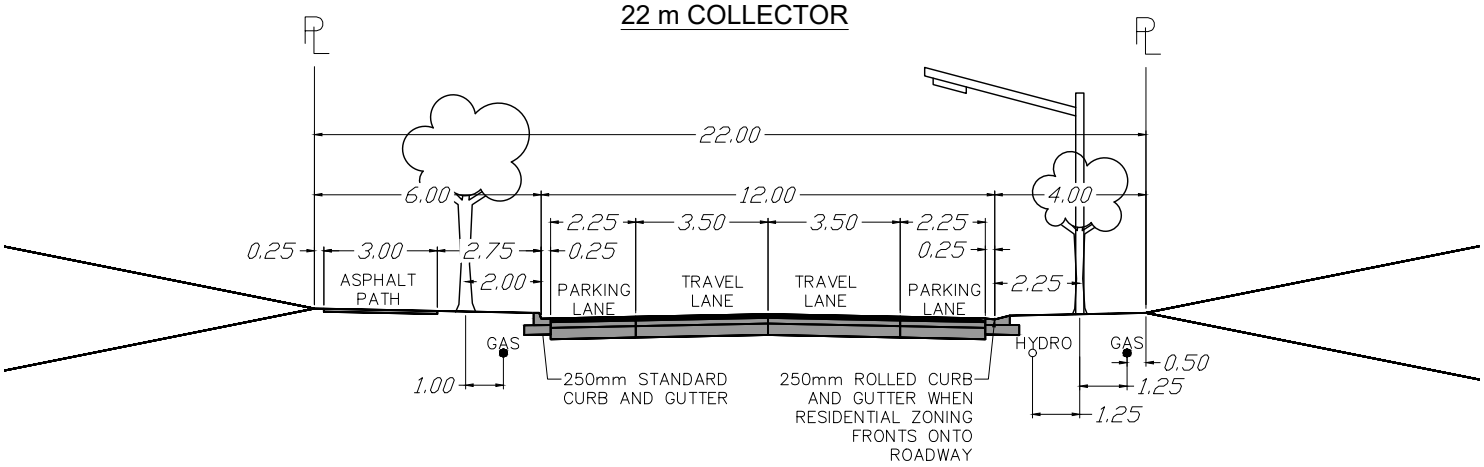
Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

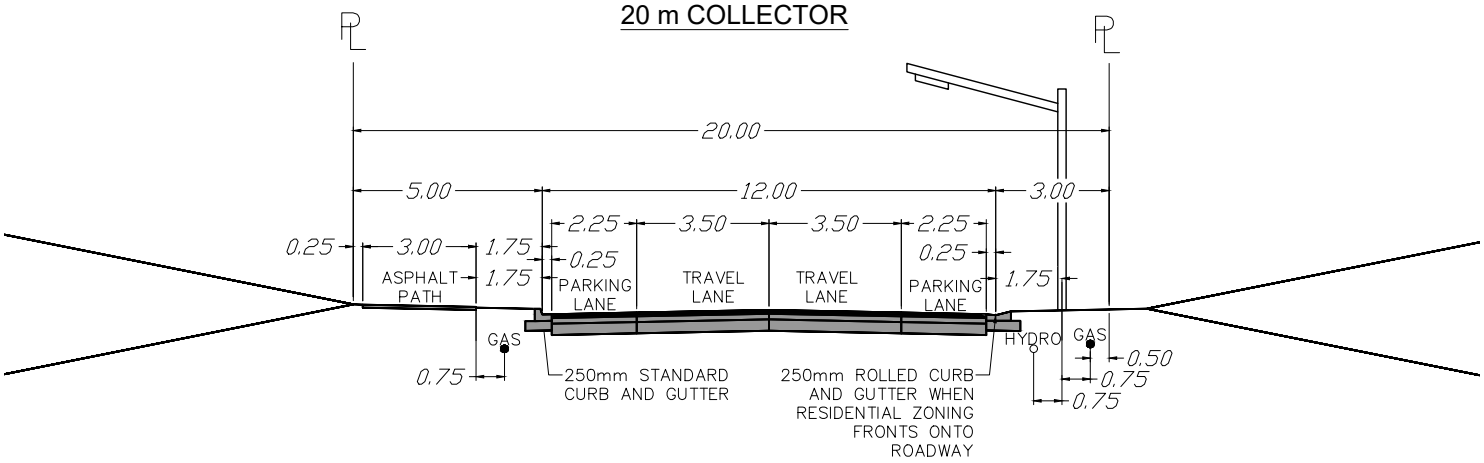
Drawing Title:
SWM FIGURE #02 - PROPOSED STORMWATER CATCHMENT AREAS

Designed: M.M	Scale: 1:3000
Drawn By: M.H.	Drawing File: 115791_SWM Fig#02 - Post-Dev Condition SWM Figure.dwg
Checked: M.M.	Project No.: 115791
Date: DEC. 2022	Drawing No.: C403

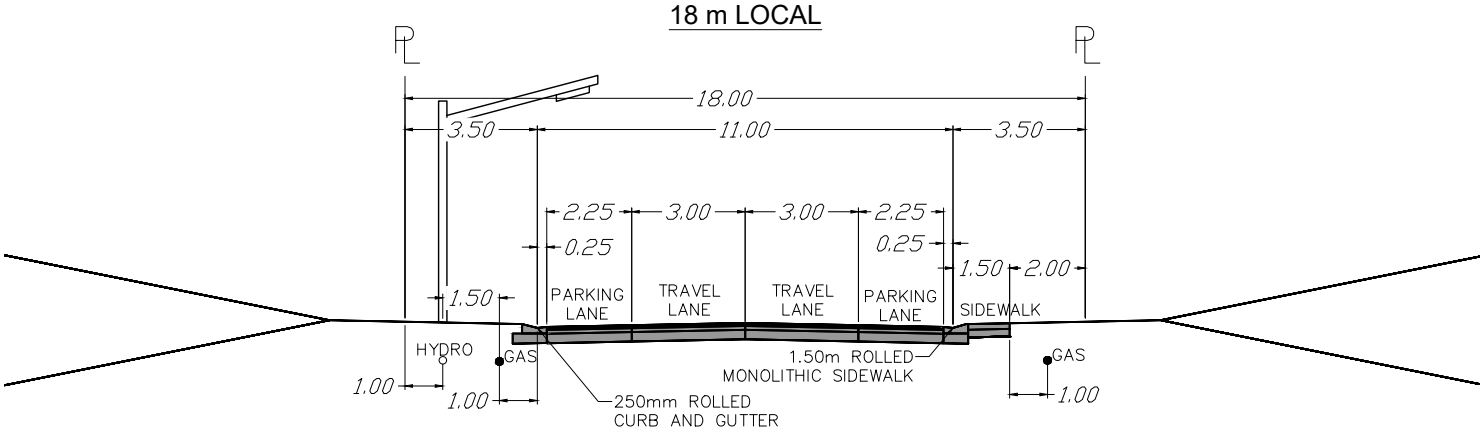
22 m COLLECTOR



20 m COLLECTOR



18 m LOCAL



1:200

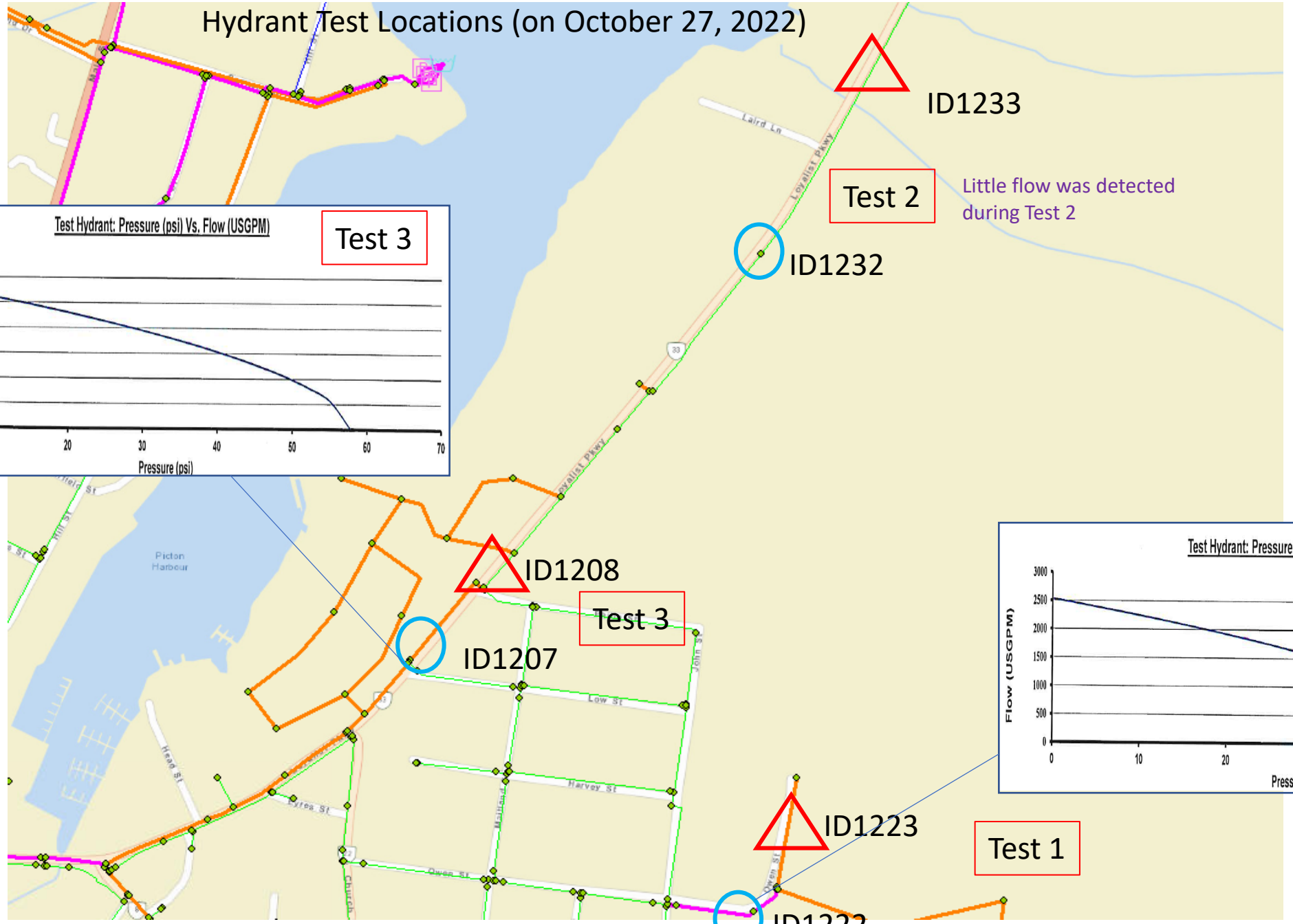
CLIENT: HILDEN HOMES 393 SIDNEY STREET BELLEVILLE, ON K9P 3Z9	PROJECT NAME: TULIP ESTATES SUBDIVISION PICTON, ON	IBI GROUP Unit 110 - 650 Dalton Avenue Kingston ON K7M 8N7 Canada tel 613 531 4440 fax 613 531 7789 ibigroup.com	
	SCALE: 1:200 / DATE: 2020-10-15 PROJECT ENG: BT / DRAWN BY: CA CHECKED BY: BT / APPROVED BY: BT PROJECT NO: 115791	FIGURE NAME: TYPICAL ROAD CROSS SECTIONS	FIGURE NO.: 2 REVISION: 0

SCALE CHECK 1 in 10mm

File Location: \\caneast.ibigroup.com\JITO\115791_HildenPicton\5.9 Drawings\59civillayouts\115791_Fig2_Road Cross Sections.dwg Last Saved: October 15, 2020, by maryam.haj.mir.fatta
Plotted: Wednesday, January 11, 2023 3:58:50 PM by Maryam Haj Mir Fattah

Appendix B – Water Distribution

Hydrant Test Locations (on October 27, 2022)

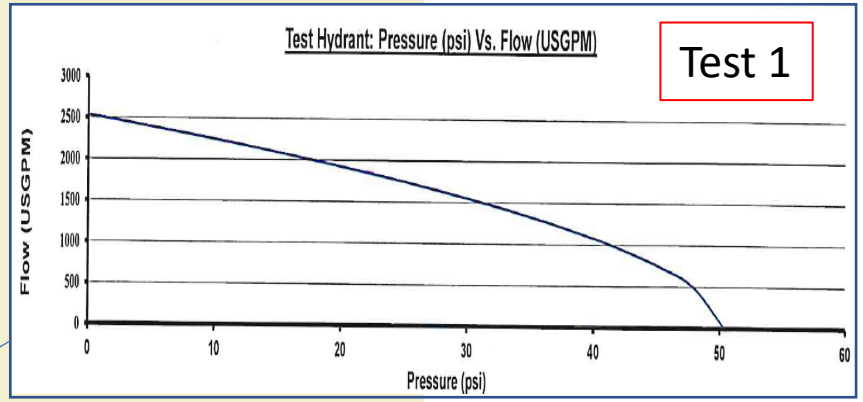


Legend

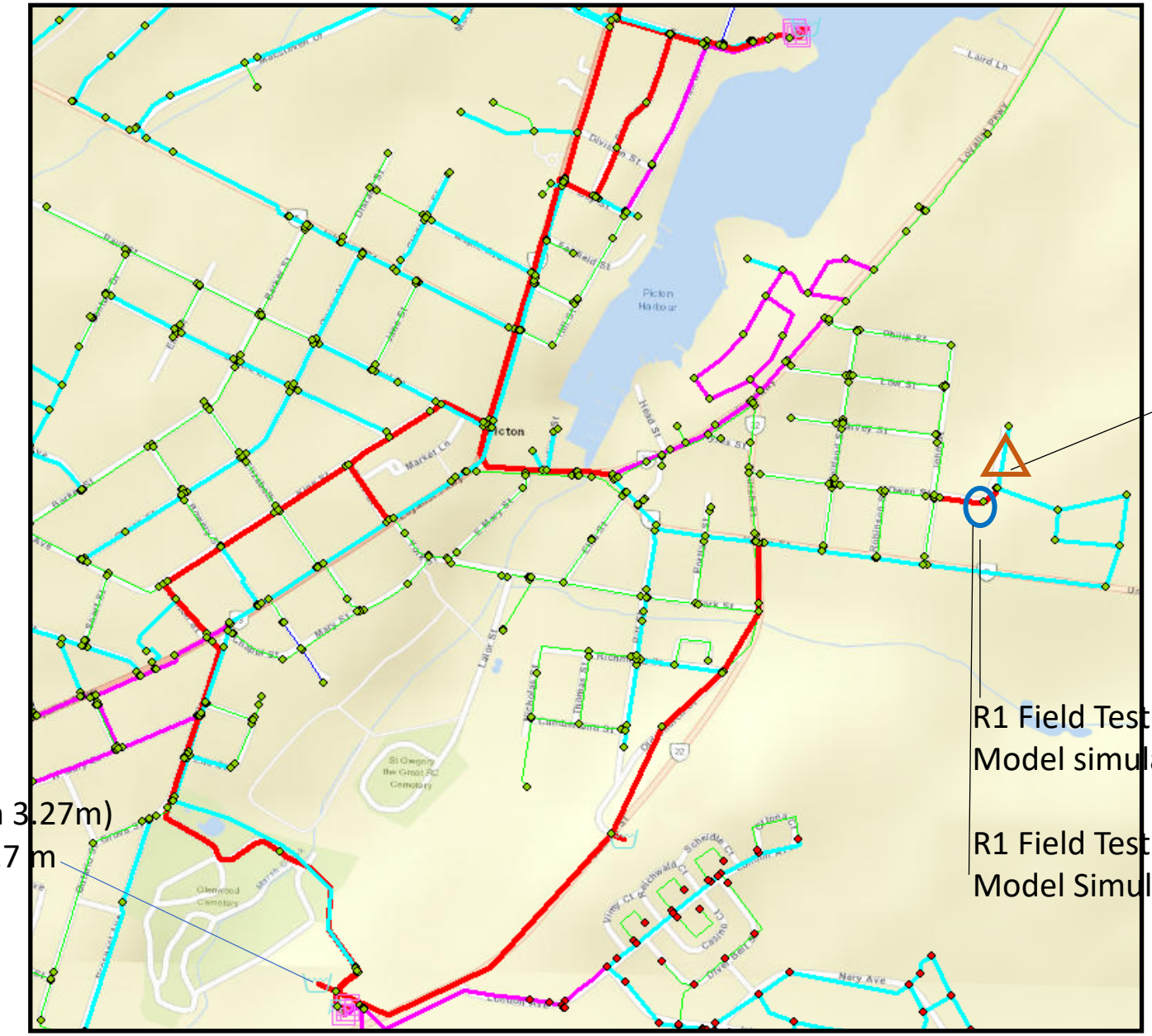
- Flowing Hydrant
- Residual Hydrant

Test 3

Test 1



Model Calibration – Test 1 (on October 27, 2022)



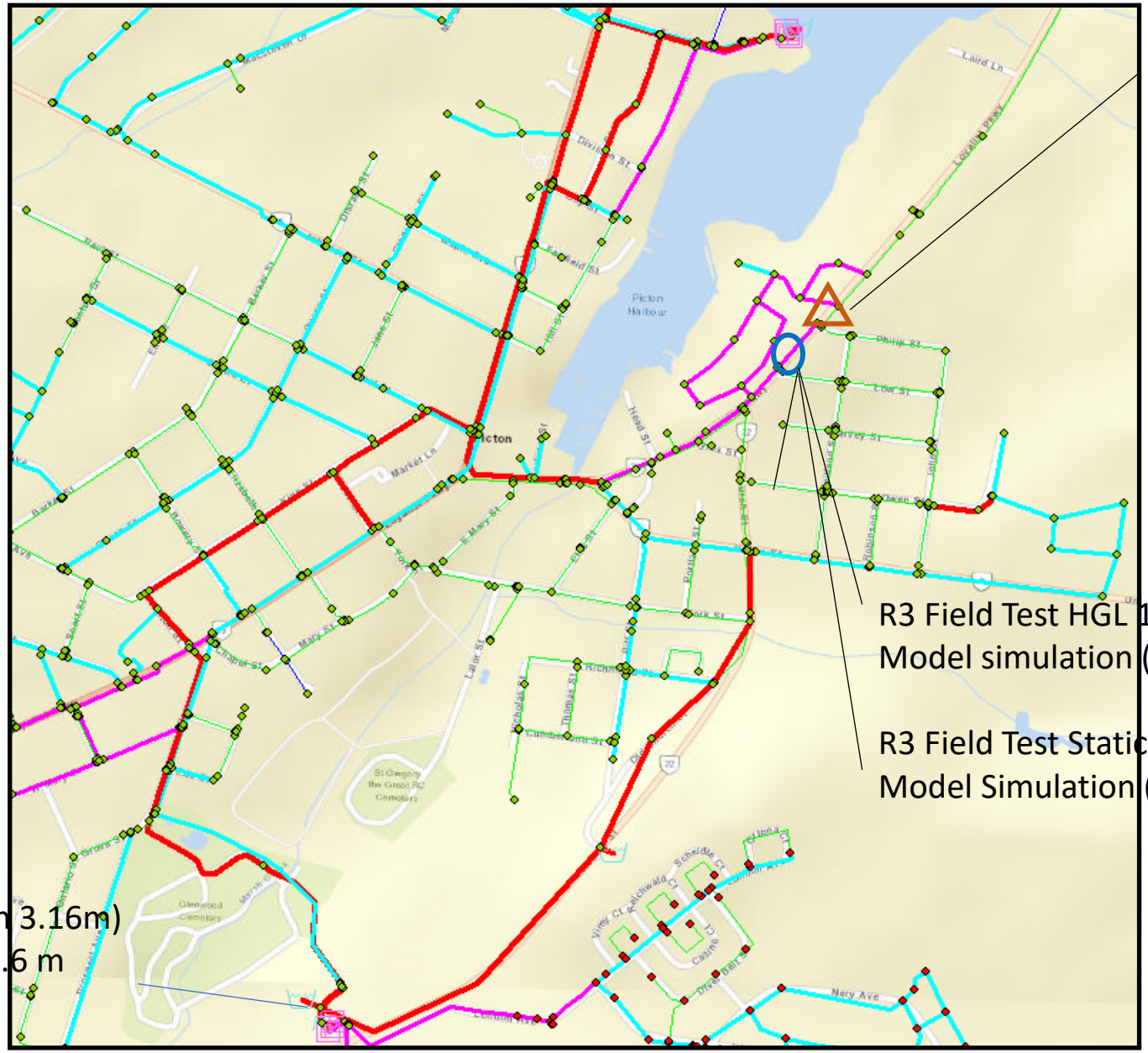
Field Test 1 (F1)=85L/s
Model Simulation (J1956)=85L/s

R1 Field Test HGL 127.0m (34.8 psi) at flow 85L/s
Model simulation (J1954) HGL 126.6m (34.3 psi)

R1 Field Test Static HGL: 138.0m(50.4 psi)
Model Simulation (J1954): 138.2m (50.8 psi)

High Level Reservoir
Water Level 139.7m (depth 3.27m)
Model simulation HGL 139.7 m

Model Calibration – Test 3 (on October 27, 2022)



Field Test 3 (F3)=95L/s (ID1223)
Model Simulation (J1740)=95L/s

R3 Field Test HGL 126.2m (40.7 psi) at 95L/s (ID1222)
Model simulation (J1742) HGL 127.3m (42.2 psi)

R3 Field Test Static HGL: 138.3m(57.9 psi) at 0L/s (ID1222)
Model Simulation (J1742): 137.7m (57.2 psi)

High Level Reservoir
Water Level 139.6m (depth 3.16m)
Model simulation HGL 139.6 m

TheCounty
PRINCE EDWARD COUNTY ✦ ONTARIO

The Corporation of the County of Prince Edward
Water and Wastewater Services
Datasheet

DS4: Fire Flow Testing

Document Type:	Datasheet					
Category:	Drinking Water					
Date of Fire Flow Testing	October 27th, 2022					
Field Operator(s)	Jesse Thomas, Jeff Brooks					
Facility Operator(s)	Cal Camplin					
Notification to Facility Operator:	Y ☑	N ☐	Initial:	JT	Signature:	Jesse Thomas

DWS Information

High Lift Pump (HLP) On or Off?:	On ☐	Off ☑	Verified By (Initial):	JT
High Level Reservoir (HLR) Level (m):	3.27m		Verified By (Initial):	JT
Bloomfield Tower Level (m):	N/A		Verified By (Initial):	JT

Test Hydrant Information

Hydrant Number:	1222			
Location:	Owen Street			
Test Number:	1			
N.F.P.A. Colour Code:	Blue			
Static Pressure:	50.4			
Residual Pressure:	34.8			
Validation: Pressure Drop Greater Than 25%?	Y/N:	Y	Actual Value:	31.0
Logger S/N:	206362			

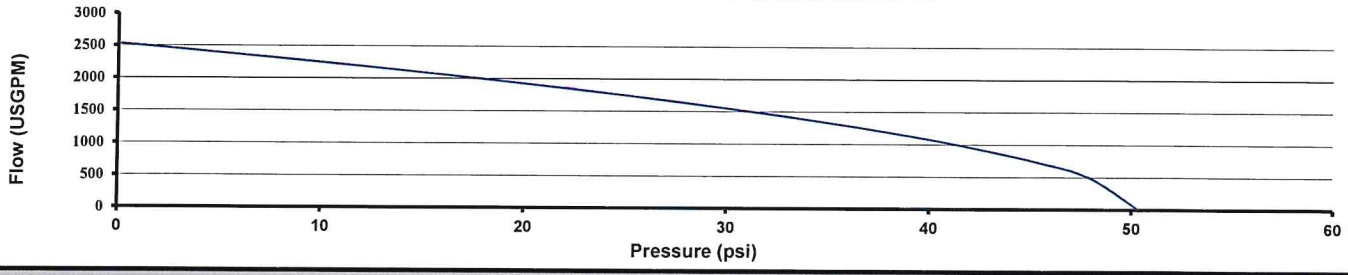
Flow Hydrant Information

Hydrant No.	Ports Flowed No.	Logger No.	Outlet Dia. (in.)	Coefficient (~0.9)	Pitot Gauge Reading (psi)	Flow (USGPM)
1223	2	431800737	2.5	0.9	19.9	1346
					Total Flow (USGPM)	1346

Test Hydrant Available Flow

Test Hydrant at 20 psi	1930	USGPM	1595	IGPM
Test Hydrant at 10 psi	2250	USGPM	1860	IGPM

Test Hydrant: Pressure (psi) Vs. Flow (USGPM)



Comments/Discrepencies/Diagram

Existing Colour Coding:	Green
Recommended Colour Coding	Blue

Acknowledgement

Operator Overseeing Fire Flow Testing (Print):	Jesse Thomas
Signature:	Jesse Thomas
Date:	November 3rd, 2022

DS4: Fire Flow Testing

Document Type:	Datasheet				
Category:	Drinking Water				
Date of Fire Flow Testing	October 27th, 2022				
Field Operator(s)	Jesse Thomas, Jeff Brooks				
Facility Operator(s)	Cal Camplin				
Notification to Facility Operator:	Y ☑	N ☐	Initial:	JT	Signature:

DWS Information

High Lift Pump (HLP) On or Off?:	On ☐	Off ☑	Verified By (Initial):	JT
High Level Reservoir (HLR) Level (m):	3.16m		Verified By (Initial):	JT
Bloomfield Tower Level (m):	N/A		Verified By (Initial):	JT

Test Hydrant Information

Hydrant Number:	1207			
Location:	Bridge Street			
Test Number:	3			
N.F.P.A. Colour Code:	Blue			
Static Pressure:	57.9			
Residual Pressure:	40.7			
Validation: Pressure Drop Greater Than 25%?	Y/N:	Y	Actual Value:	29.7
Logger S/N:	206362			

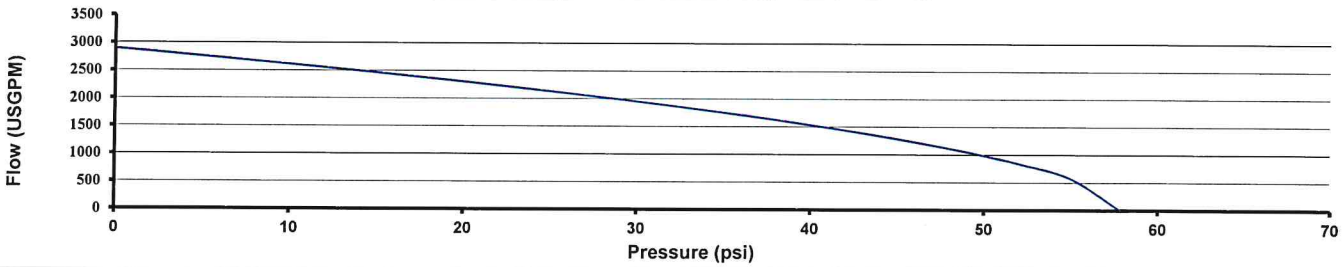
Flow Hydrant Information

Hydrant No.	Ports Flowed No.	Logger No.	Outlet Dia. (in.)	Coefficient (~0.9)	Pitot Gauge Reading (psi)	Flow (USGPM)
No ID	2	431800737	2.5	0.9	24.9	1506
					Total Flow (USGPM)	1506

Test Hydrant Available Flow

Test Hydrant at 20 psi	2307	USGPM	1906	IGPM
Test Hydrant at 10 psi	2618	USGPM	2163	IGPM

Test Hydrant: Pressure (psi) Vs. Flow (USGPM)



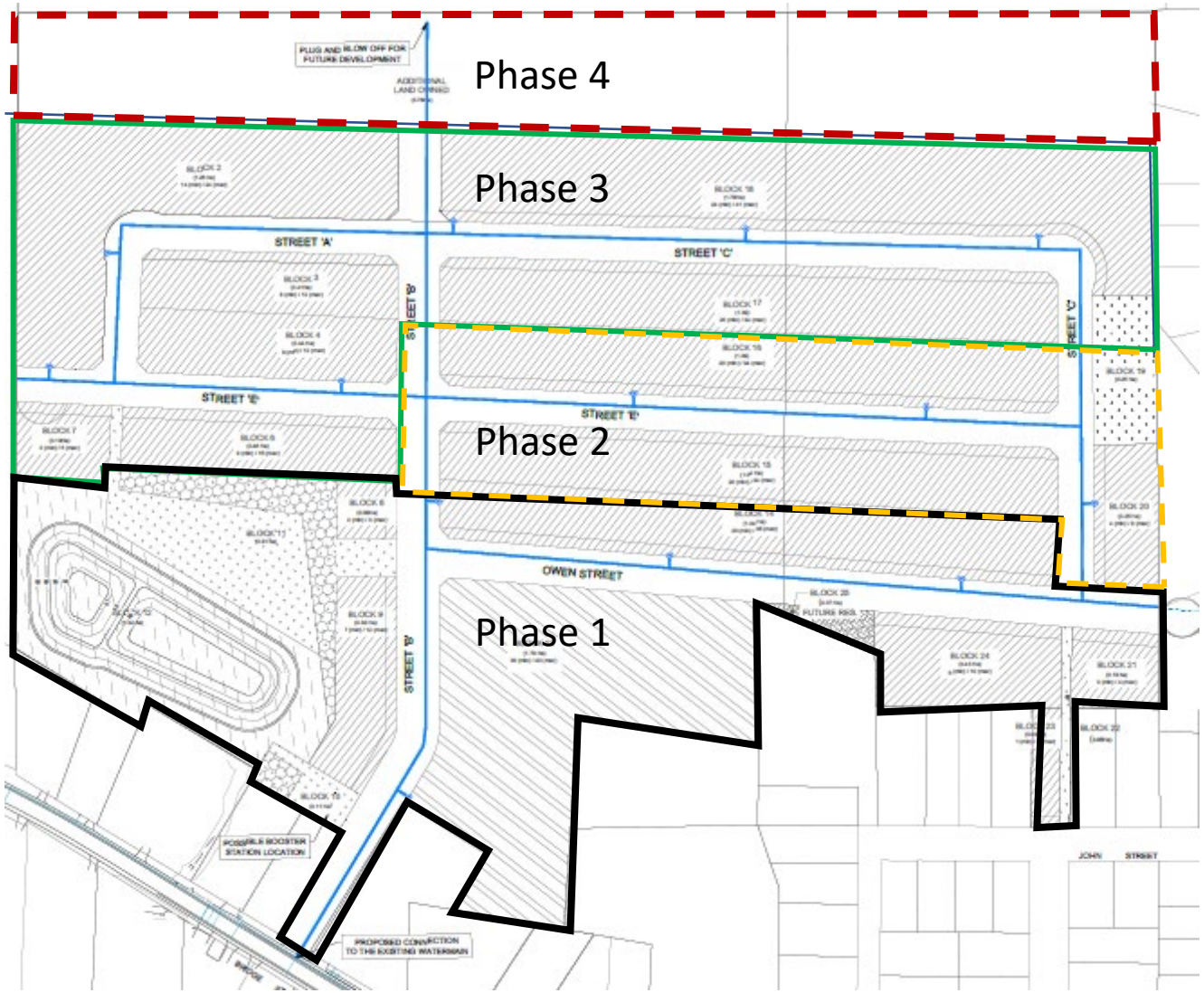
Comments/Discrepencies/Diagram

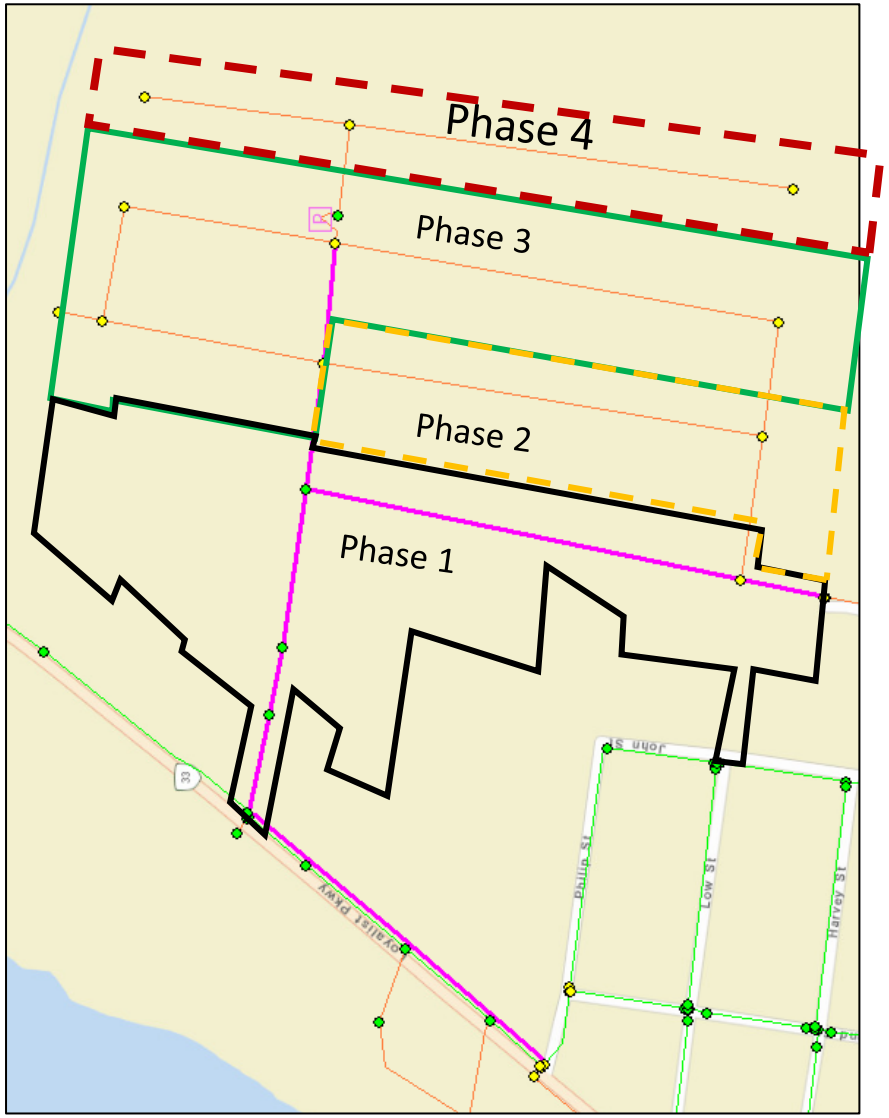
Flow Hydrant has not yet been assigned an ID Number. It is at the enterance to Port Picton homes.

Existing Colour Coding:	Green
Recommended Colour Coding	Blue

Acknowledgement

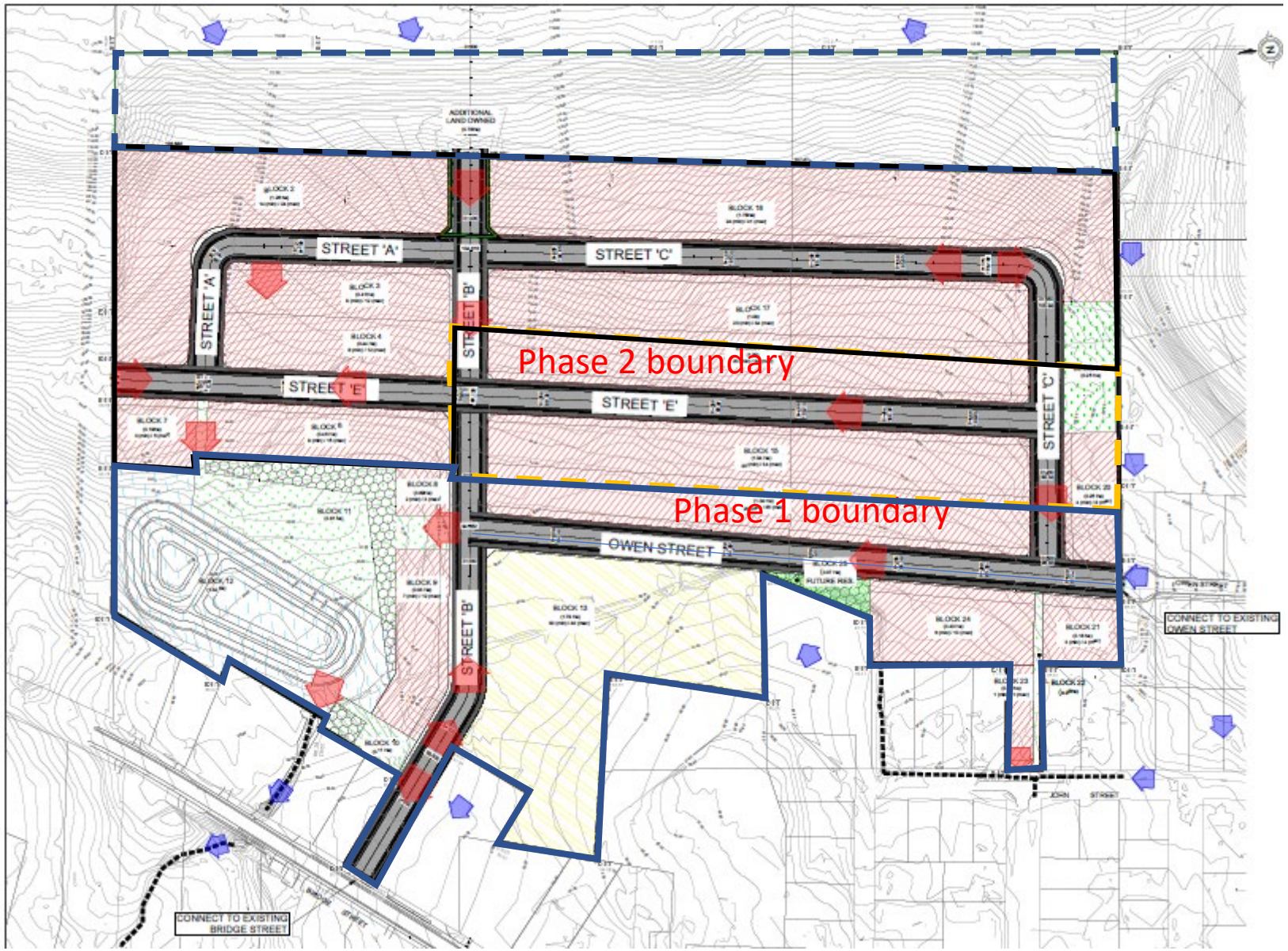
Operator Overseeing Fire Flow Testing (Print):	Jesse Thomas
Signature:	Jesse Thomas
Date:	November 3rd, 2022

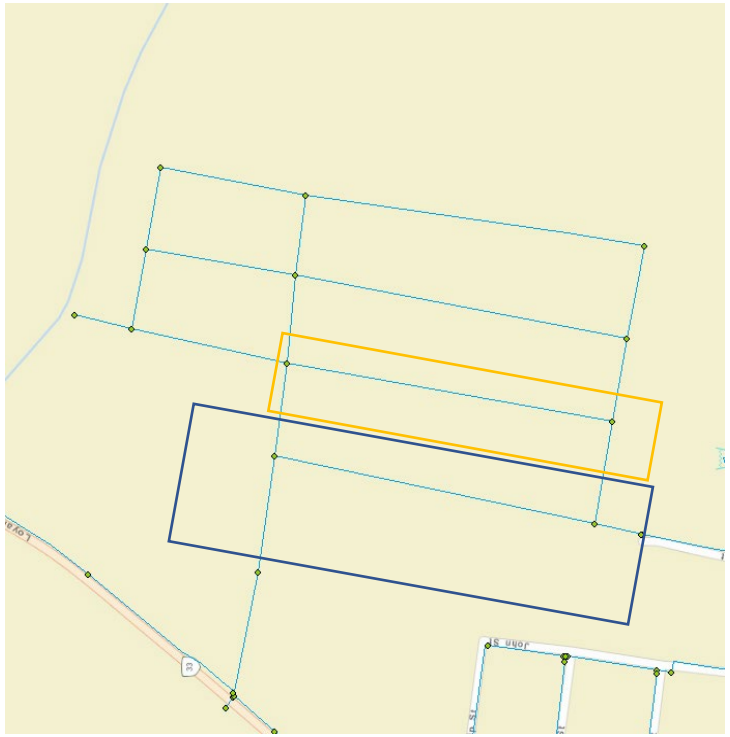

Phase 4
Phase 3
Phase 2
Phase 1
STREET 'A'
STREET 'C'
STREET 'E'
STREET 'B'
STREET 'D'
OWEN STREET
JOHN STREET


Phase 4
Phase 3
Phase 2
Phase 1

Phase 1

Phase 2 ok if 250mm along Owen St





Tulip Subdivision, County of Prince Edward

Residential Development

DOMESTIC WATER DEMAND CALCULATIONS

Project Name: Tulip Subdivision, County of Prince Edward
Project Number: 115791
Date: December 2022
Designed By: SK

1. Based on the County of Prince Edward Standards
2. ADD =350 L/cap/day for residential uses

Peaking Factors		
Land Use	Peak Hour	Maximum Day
Apartments	4.25	2.40

Total Site							*(ADDxP.F.)*	*(ADDxP.F.)*
Component	Area (ha)	Min Units / Area	Max Units / Area	Density	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Phase 1	4	68	104	-	293	1.2	5.0	2.8
Phase 2	3	44	76	-	215	0.9	3.7	2.1
Phase 3	25	86	143	-	403	1.6	6.9	3.9
Phase 4	4	51	87	-	244	1.0	4.2	2.4
Total	**35**	**249**	**410**	-	**1,155**	**5**	**20**	**11**

Phase 1							*(ADDxP.F.)*	*(ADDxP.F.)*
Component	Area (ha)	Min Units / Area	Max Units / Area	Density	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Block 21	0.18	3 units	4 units	2.8 pp/unit	12	0.0	0.2	0.1
Block 24	0.43	6 units	10 units	2.8 pp/unit	28	0.1	0.5	0.3
Block 13	1.79	30 units	40 units	2.8 pp/unit	112	0.5	1.9	1.1
Block 14	1.04	20 units	35 units	2.8 pp/unit	98	0.4	1.7	1.0
Block 8	0.09	2 units	3 units	2.8 pp/unit	9	0.0	0.2	0.1
Block 9	0.33	7 units	12 units	2.8 pp/unit	34	0.1	0.6	0.3
Totals	**4**	**68**	**104**	**-**	**293**	**1.2**	**5.0**	**2.8**

Phase 2							*(ADDxP.F.)*	*(ADDxP.F.)*
Component	Area (ha)	Min Units / Area	Max Units / Area	Density	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Block 20	0.25	4 units	8 units	2.8 pp/unit	23	0.1	0.4	0.2
Block 19	0.25	units	units	2.8 pp/unit	0	0.0	0.0	0.0
Block 15	1.04	20 units	34 units	2.8 pp/unit	96	0.4	1.7	0.9
Block 16	1.09	20 units	34 units	2.8 pp/unit	96	0.4	1.7	0.9
Totals	**3**	**44**	**76**	**11**	**215**	**0.9**	**3.7**	**2.1**

Phase 3							*(ADDxP.F.)*	*(ADDxP.F.)*
Component		Min Units / Area	Max Units / Area	Density	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Block 18	1.78	24 units	41 units	2.8 pp/unit	115	0.5	2.0	1.1
Block 17	1.09	20 units	34 units	2.8 pp/unit	96	0.4	1.7	0.9
Block 2	1.26	14 units	24 units	2.8 pp/unit	68	0.3	1.2	0.7
Block 3	0.41	8 units	12 units	2.8 pp/unit	34	0.1	0.6	0.3
Block 4	0.44	8 units	12 units	2.8 pp/unit	34	0.1	0.6	0.3
Block 6	15	9 units	15 units	2.8 pp/unit	42	0.2	0.7	0.4
Block 7	5	3 units	5 units	2.8 pp/unit	14	0.1	0.2	0.1
Totals	**25**	**86**	**143**	**20**	**403**	**1.6**	**6.9**	**3.9**

Phase 4 (Full Build-out)							*(ADDxP.F.)*	*(ADDxP.F.)*
Component		Min Units / Area	Max Units / Area	Density	Population	ADD (L/s)	PHD (L/s)	MDD (L/s)
Additional Land	3.78	51 units	87 units	2.8 pp/unit	244	1.0	4.2	2.4
Totals	**4**	**51**	**87**	**3**	**244**	**1.0**	**4.2**	**2.4**

Tulip Subdivision, County of Prince Edward

Residential Development

FIRE FLOW DEMAND CALCULATIONS
Single Family Detached (1900 ft2)

Project Name: Tulip Subdivision, County of Prince Edward
Project Number: 115791
Date: December 2022
Designed By: SK

Based on the Water Supply for Public Fire Protection Manual, 1999 by the Fire Underwriters Survey

Step 1: Calculate Fire Flow (based on area)

Construction Coefficient	1.5	
Largest Floor Area	177	m2
Floor Above		m2
Floor Below =		m2
Area =	177	m2
Fire Flow (F) =	**4,000**	L/min

$$F = 220C\sqrt{A}$$

F = required fire flow (L/min)
C = coefficient related to type of construction
0.6 for fire resistive (fully protected, 3-hr ratings)
0.8 for non combustible (i.e. unprotected metal buildings)
1.0 for ordinary construction
1.5 for wood frame construction
A = total floor area excluding basements 50% below grade

** If vertical openings are inadequately protected, consider two largest two largest adjoining floors plus 50% of each of any floors above up to eight floors.*

** If vertical openings are adequately protected (one hour rating), consider largest floor area + 25% of two immediately floors.*

Step 2: Adjustment for Building Occupancy (shall not be less than 2000 L/s)

Occupancy Adjustment =	-0.15		Non-Combust.	-25%	Free Burning	15%
F_1 = Fire Flow x Adjustment =	**3,400**	L/min	Limited Comb.	-15%	Rapid Burning	25%
			Combustible	No change		

Sprinkler Adjustment =	0%	Automatic Sprinklers (monitored)	-50%

Step 3: Adjust F1 for Fire Suppression System

F_2 = F_1 x Adjustment =	**0**	L/min	Adequately Designed System	-30%	25%

Step 4: Adjust F1 for Exposure / Proximity (shall not exceed 75%)

Proximity Adjustment =	60%	(max 75%)
F_3 = F_1 x Factor =	**2,040**	L/min

Separation	Adjustment	Separation	Adjustment
0m to 3m	25%	20.1m to 30m	10%
3.1m to 10m	20%	30.1m to 45m	5%

Step 5: Calculate Adjusted Fire Flow (shall not be less than 2000 L/min or greater than 45,000 L/min)

F_1 =	3,400	L/min
- F_2 =	0	L/min
+ F3 =	2,040	L/min
Fire Flow =	5,000	L/min
Fire Flow =	**83.3**	L/s
Total Demand (Fire Flow + MDD) =	**94.6**	L/s

$$\text{Fire Flow} = F_1 - F_2 + F_3$$

Checks:
Fire Flow greater than 2000 L/min
Fire Flow less than 45,000 L/min

Tulip Subdivision, County of Prince Edward

Residential Development

2-hour Fire Wall every unit

FIRE FLOW DEMAND CALCULATIONS
Town Homes (1394 ft2 each unit)

Project Name: Tulip Subdivision, County of Prince Edward
Project Number: 115791
Date: December 2022
Designed By: SK

Based on the Water Supply for Public Fire Protection Manual, 1999 by the Fire Underwriters Survey

Step 1: Calculate Fire Flow (based on area)

Construction Coefficient	1.5	
Largest Floor Area	130	m2
Floor Above		m2
Floor Below =		m2
Area =	130	m2
Fire Flow (F) =	**4,000**	L/min

$$F = 220C\sqrt{A}$$

F = required fire flow (L/min)
C = coefficient related to type of construction
- 0.6 for fire resistive (fully protected, 3-hr ratings)
- 0.8 for non combustible (i.e. unprotected metal buildings)
- 1.0 for ordinary construction
- 1.5 for wood frame construction

A = total floor area excluding basements 50% below grade

** If vertical openings are inadequately protected, consider two largest two largest adjoining floors plus 50% of each of any floors above up to eight floors.*

** If vertical openings are adequately protected (one hour rating), consider largest floor area + 25% of two immediately floors.*

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Occupancy Adjustment =	-0.15	Non-Combust.	-25%	Free Burning	15%
F_1 = Fire Flow x Adjustment =	**3,400** L/min	Limited Comb.	-15%	Rapid Burning	25%
		Combustible	No change		
Sprinkler Adjustment =	0%	Automatic Sprinklers (monitored)		-50%	

Step 3: Adjust F1 for Fire Suppression System

$F_2 = F_1$ x Adjustment =	**0** L/min	Adequately Designed System	-30%	25%

Step 4: Adjust F1 for Exposure / Proximity (shall not exceed 75%)

Proximity Adjustment =	60%	(max 75%)
$F_3 = F_1$ x Factor =	**2,040**	L/min

Separation	Adjustment	Separation	Adjustment
0m to 3m	25%	20.1m to 30m	10%
3.1m to 10m	20%	30.1m to 45m	5%

Step 5: Calculate Adjusted Fire Flow (shall not be less than 2000 L/min or greater than 45,000 L/min)

F_1 =	3,400	L/min
- F_2 =	0	L/min
+ F3 =	2,040	L/min
Fire Flow =	5,000	L/min
Fire Flow =	**83.3**	L/s
Total Demand (Fire Flow + MDD) =	**94.6**	L/s

$$\text{Fire Flow} = F_1 - F_2 + F_3$$

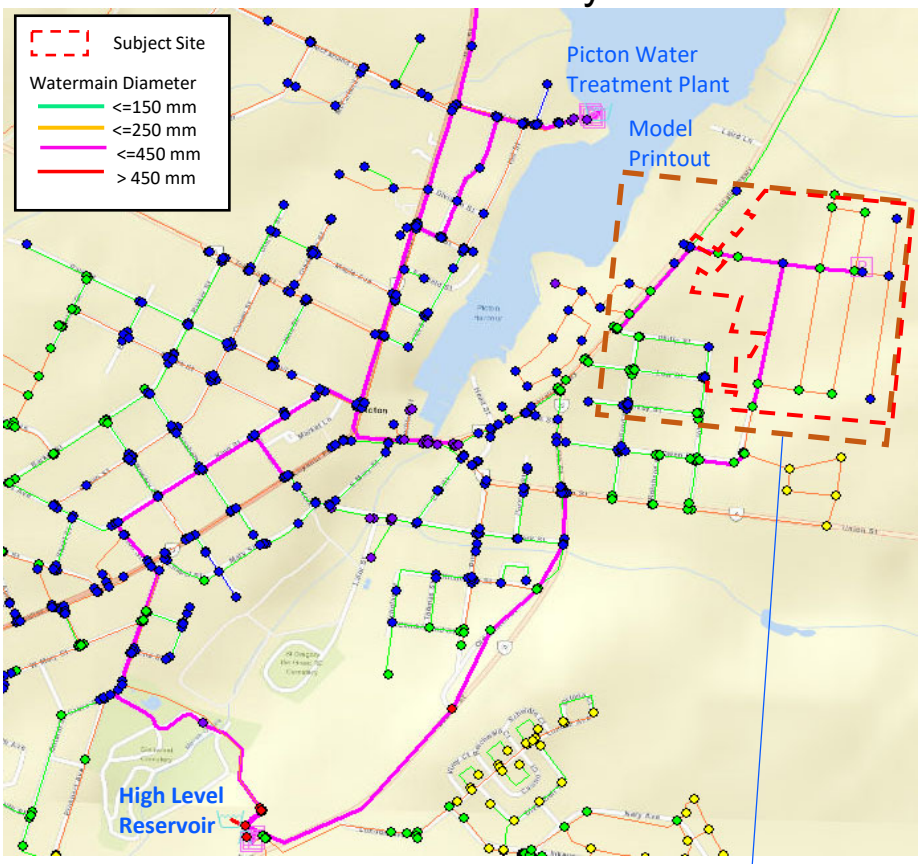
Checks:

Fire Flow greater than 2000 L/min

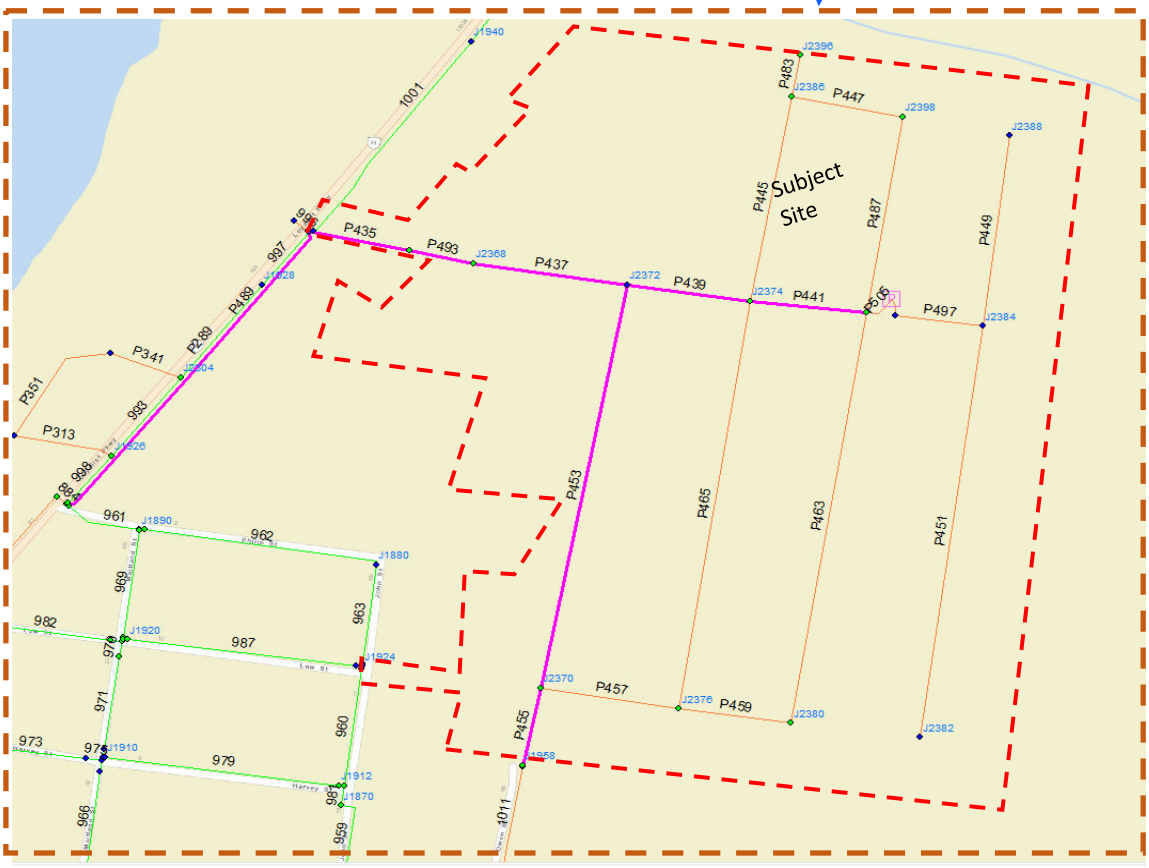
Fire Flow less than 45,000 L/min

Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022

Model Layout



Enlarged area



Model Layout

Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 1
Junction Table

Proposed Condition

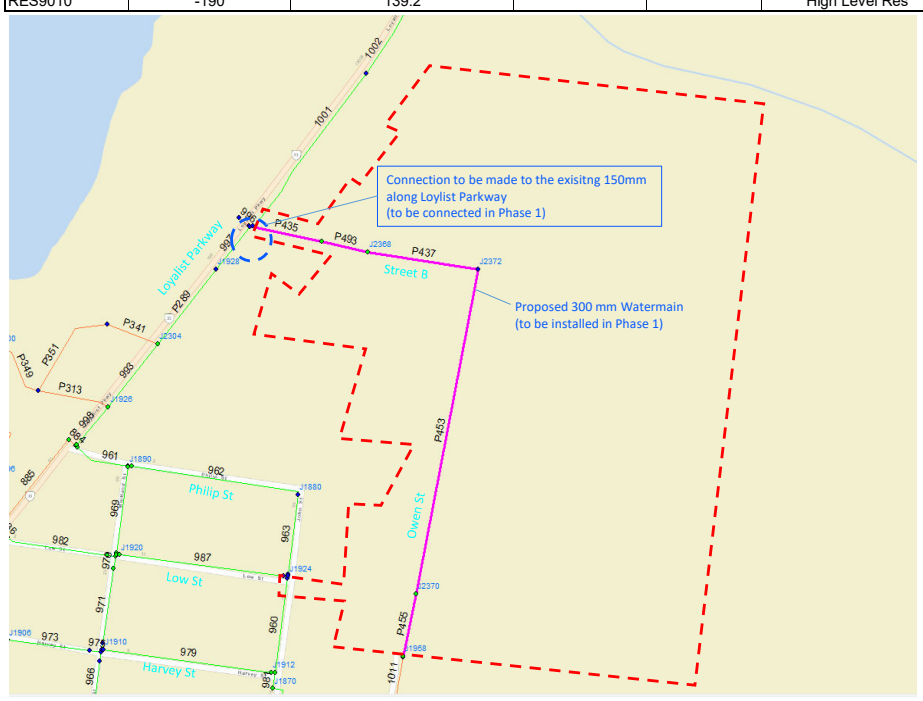
Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	137.2	384	
J1740	0.1	98.3	137.2	382	
J1870	0.1	95.1	137.4	415	
J1872	0.1	94.9	137.3	416	
J1874	0.1	93.8	137.3	427	
J1876	0.1	99.1	137.2	375	
J1878	0.1	98.5	137.2	380	
J1880	0.1	93.5	137.3	430	
J1882	0.1	99.0	137.2	376	
J1884	0.1	93.6	137.3	429	
J1888	0.1	91.9	137.4	447	
J1890	0.1	99.1	137.2	375	
J1892	0.1	95.6	137.2	409	
J1894	0.1	95.2	137.3	413	
J1896	0.1	95.5	137.2	410	
J1898	0.1	92.4	137.3	441	
J1900	0.1	92.2	137.3	444	
J1902	0.1	92.2	137.3	443	
J1908	0.1	92.2	137.3	444	
J1910	0.1	92.1	137.3	444	
J1912	0.1	94.7	137.3	419	
J1916	0.1	95.5	137.2	410	
J1918	0.1	95.6	137.2	409	
J1920	0.1	95.5	137.2	410	
J1922	0.1	93.7	137.3	428	
J1924	0.1	93.6	137.3	429	
J1926	0.1	96.7	137.2	397	
J1928	0.1	93.0	137.2	434	
J1930	0.1	92.3	137.2	440	
J1932	0.1	92.4	137.2	440	
J1934	0.1	92.4	137.2	440	
J1936	0.1	92.3	137.2	440	
J1938	0.1	98.3	137.2	382	
J1940	0.1	87.9	137.2	483	
J1956	0.1	99.1	137.4	376	
J1958	0.1	99.1	137.4	377	
J2304	0.0	95.0	137.2	414	
J2310	0.9	92.8	137.2	436	
J2368	0.0	95.0	137.4	416	
J2370	0.7	97.0	137.4	397	
J2372	4.3	94.0	137.4	426	
J2374	87.1	99.2	-	-	Dummy Node (Phases 2-4)
J2376	0.4	100.0	-	-	Dummy Node (Phases 2-4)
J2378	0.0	105.0	-	-	Dummy Node (Phases 2-4)
J2380	3.7	106.0	-	-	Dummy Node (Phases 2-4)
J2382	1.4	113.0	-	-	Dummy Node (Phases 2-4)
J2384	1.4	116.0	-	-	Dummy Node (Phases 2-4)
J2386	1.0	99.5	-	-	Dummy Node (Phases 2-4)
J2388	1.4	116.0	-	-	Dummy Node (Phases 2-4)
J2396	0.2	98.0	-	-	Dummy Node (Phases 2-4)
J2398	1.8	101.0	-	-	Dummy Node (Phases 2-4)
J2400	0.0	95.5	137.4	411	
J2402	0.0	105.0	-	-	Dummy Node (Phases 2-4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-113	139.2			High Level Res

Proposed Condition -Fire flow

Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	132.5	384	
J1740	0.1	98.3	132.5	382	
J1870	0.1	95.1	129.4	415	
J1872	0.1	94.9	129.9	416	
J1874	0.1	93.8	131.0	427	
J1876	0.1	99.1	131.8	375	
J1878	0.1	98.5	132.5	380	
J1880	0.1	93.5	131.2	430	
J1882	0.1	99.0	131.8	376	
J1884	0.1	93.6	131.0	429	
J1888	0.1	91.9	131.1	447	
J1890	0.1	99.1	131.8	375	
J1892	0.1	95.6	131.7	409	
J1894	0.1	95.2	131.6	413	
J1896	0.1	95.5	131.7	410	
J1898	0.1	92.4	131.1	441	
J1900	0.1	92.2	131.1	444	
J1902	0.1	92.2	131.1	443	
J1908	0.1	92.2	131.1	444	
J1910	0.1	92.1	131.1	444	
J1912	0.1	94.7	129.9	419	
J1916	0.1	95.5	131.7	410	
J1918	0.1	95.6	131.7	409	
J1920	0.1	95.5	131.7	410	
J1922	0.1	93.7	131.0	428	
J1924	0.1	93.6	131.0	429	
J1926	0.1	96.7	132.6	397	
J1928	0.1	93.0	132.6	434	
J1930	0.1	92.3	132.6	440	
J1932	0.1	92.4	132.6	440	
J1934	0.1	92.4	132.6	440	
J1936	0.1	92.3	132.6	440	
J1938	0.1	98.3	132.5	382	
J1940	0.1	87.9	132.6	483	
J1956	0.1	99.1	119.9	376	
J1958	0.1	99.1	119.9	377	
J2304	0.0	95.0	132.6	414	
J2310	0.9	92.8	132.6	436	
J2368	0.0	95.0	117.7	416	
J2370	0.7	97.0	119.6	397	
J2372	88.3	94.0	117.7	426	
J2374	87.1	99.2	-	-	Dummy Node (Phases 2-4)
J2376	0.4	100.0	-	-	Dummy Node (Phases 2-4)
J2378	0.0	105.0	-	-	Dummy Node (Phases 2-4)
J2380	3.7	106.0	-	-	Dummy Node (Phases 2-4)
J2382	1.4	113.0	-	-	Dummy Node (Phases 2-4)
J2384	1.4	116.0	-	-	Dummy Node (Phases 2-4)
J2386	1.0	99.5	-	-	Dummy Node (Phases 2-4)
J2388	1.4	116.0	-	-	Dummy Node (Phases 2-4)
J2396	0.2	98.0	-	-	Dummy Node (Phases 2-4)
J2398	1.8	101.0	-	-	Dummy Node (Phases 2-4)
J2400	0.0	95.5	137.4	411	
J2402	0.0	105.0	-	-	Dummy Node (Phases 2-4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-190	139.2			High Level Res



Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 1
Pipe Table

Proposed Condition - Peak Hour

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	2.4	0.0	0.0	0.1	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	5.1	0.2	0.0	0.2	Open	
884	J1738	J1740	9	250	70	1.0	0.0	0.0	0.0	Open	
885	J1742	J1738	112	250	70	0.9	0.0	0.0	0.0	Open	
959	J1870	J1816	110	150	70	2.6	0.1	0.1	0.7	Open	
960	J1872	J1874	92	150	70	2.6	0.1	0.1	0.7	Open	
961	J1876	J1878	57	150	70	2.5	0.1	0.0	0.6	Open	
962	J1880	J1882	178	150	70	1.1	0.1	0.0	0.1	Open	
963	J1884	J1880	78	150	70	1.2	0.1	0.0	0.2	Open	
966	J1886	J1888	97	150	70	3.6	0.2	0.1	1.2	Open	
967	J1882	J1876	4	150	60	1.1	0.1	0.0	0.2	Open	
968	J1890	J1876	1	150	60	1.5	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.6	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.7	0.2	0.0	1.0	Open	
971	J1898	J1894	73	150	60	2.8	0.2	0.1	1.0	Open	
972	J1888	J1900	9	150	100	3.5	0.2	0.0	0.6	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.9	0.2	0.0	1.1	Open	
977	J1910	J1908	2	150	60	0.3	0.0	0.0	0.0	Open	
978	J1900	J1908	3	150	60	3.2	0.2	0.0	1.3	Open	
979	J1910	J1912	175	150	70	0.2	0.0	0.0	0.0	Open	
980	J1912	J1872	4	150	60	0.1	0.0	0.0	0.0	Open	
981	J1870	J1872	16	150	70	2.5	0.1	0.0	0.7	Open	
982	J1914	J1916	106	150	70	2.0	0.1	0.0	0.4	Open	
983	J1916	J1896	9	150	70	2.0	0.1	0.0	0.4	Open	
984	J1896	J1918	2	150	60	0.6	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	1.2	0.1	0.0	0.2	Open	
988	J1922	J1924	5	150	60	1.2	0.1	0.0	0.2	Open	
989	J1924	J1884	2	150	60	1.3	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.6	0.1	0.0	0.9	Open	
991	J1920	J1918	3	150	60	1.1	0.1	0.0	0.2	Open	
992	J1918	J1892	1	150	60	1.6	0.1	0.0	0.4	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.2	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.6	0.0	0.0	0.1	Open	
998	J1938	J1926	49	150	60	1.3	0.1	0.0	0.3	Open	
999	J1938	J1740	2	150	60	1.4	0.1	0.0	0.3	Open	
P289	J2304	J1928	94	150	60	0.7	0.0	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	1.0	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.5	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.4	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	0.0	0.0	0.0	0.0	Closed	
P437	J2368	J2372	116	300	120	0.0	0.0	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 2)
P441	J2374	J2378	87	300	120	40.7	0.6	0.1	1.4	Open	Dummy Pipe (Phase 3)
P445	J2374	J2386	163	250	110	41.2	0.8	0.7	4.1	Open	Dummy Pipe (Phase 3)
P447	J2386	J2398	84	250	110	42.4	0.9	0.4	4.3	Open	Dummy Pipe (Phase 3)
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	4.3	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	5.0	0.1	0.0	0.0	Open	
P457	J2370	J2376	104	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 2)
P459	J2376	J2380	84	250	110	5.6	0.1	0.0	0.1	Open	Dummy Pipe (Phase 3)
P463	J2380	J2378	325	250	110	9.3	0.2	0.1	0.3	Open	Dummy Pipe (Phase 3)
P465	J2376	J2374	322	250	110	5.2	0.1	0.0	0.1	Open	Dummy Pipe (Phase 3)
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P487	J2378	J2398	155	250	110	50.0	1.0	0.9	5.9	Open	Dummy Pipe (Phase 3)
P489	J1740	J1930	283	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P493	J2400	J2368	49	300	120	0.0	0.0	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Proposed Condition - Fire Flow

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	2.4	0.0	0.0	0.1	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	5.1	0.2	0.0	0.2	Open	
884	J1738	J1740	9	250	70	1.0	0.0	0.0	0.0	Open	
885	J1742	J1738	112	250	70	0.9	0.0	0.0	0.0	Open	
959	J1870	J1816	110	150	70	2.6	0.1	0.1	0.7	Open	
960	J1872	J1874	92	150	70	2.6	0.1	0.1	0.7	Open	
961	J1876	J1878	57	150	70	2.5	0.1	0.0	0.6	Open	
962	J1880	J1882	178	150	70	1.1	0.1	0.0	0.1	Open	
963	J1884	J1880	78	150	70	1.2	0.1	0.0	0.2	Open	
966	J1886	J1888	97	150	70	3.6	0.2	0.1	1.2	Open	
967	J1882	J1876	4	150	60	1.1	0.1	0.0	0.2	Open	
968	J1890	J1876	1	150	60	1.5	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.6	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.7	0.2	0.0	1.0	Open	
971	J1898	J1894	73	150	60	2.8	0.2	0.1	1.0	Open	
972	J1888	J1900	9	150	100	3.5	0.2	0.0	0.6	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.9	0.2	0.0	1.1	Open	
977	J1910	J1908	2	150	60	0.3	0.0	0.0	0.0	Open	
978	J1900	J1908	3	150	60	3.2	0.2	0.0	1.3	Open	
979	J1910	J1912	175	150	70	0.2	0.0	0.0	0.0	Open	
980	J1912	J1872	4	150	60	0.1	0.0	0.0	0.0	Open	
981	J1870	J1872	16	150	70	2.5	0.1	0.0	0.7	Open	
982	J1914	J1916	106	150	70	2.0	0.1	0.0	0.4	Open	
983	J1916	J1896	9	150	70	2.0	0.1	0.0	0.4	Open	
984	J1896	J1918	2	150	60	0.6	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	1.2	0.1	0.0	0.2	Open	
988	J1922	J1924	5	150	60	1.2	0.1	0.0	0.2	Open	
989	J1924	J1884	2	150	60	1.3	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.6	0.1	0.0	0.9	Open	
991	J1920	J1918	3	150	60	1.1	0.1	0.0	0.2	Open	
992	J1918	J1892	1	150	60	1.6	0.1	0.0	0.4	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.2	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.6	0.0	0.0	0.1	Open	
998	J1938	J1926	49	150	60	1.3	0.1	0.0	0.3	Open	
999	J1938	J1740	2	150	60	1.4	0.1	0.0	0.3	Open	
P289	J2304	J1928	94	150	60	0.7	0.0	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	1.0	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.5	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.4	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	0.0	0.0	0.0	0.0	Closed	
P437	J2368	J2372	116	300	120	0.0	0.0	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 2)
P441	J2374	J2378	87	300	120	40.7	0.6	0.1	1.4	Open	Dummy Pipe (Phase 3)
P445	J2374	J2386	163	250	110	41.2	0.8	0.7	4.1	Open	Dummy Pipe (Phase 3)
P447	J2386	J2398	84	250	110	42.4	0.9	0.4	4.3	Open	Dummy Pipe (Phase 3)
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	4.3	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	5.0	0.1	0.0	0.0	Open	
P457	J2370	J2376	104	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 2)
P459	J2376	J2380	84	250	110	5.6	0.1	0.0	0.1	Open	Dummy Pipe (Phase 3)
P463	J2380	J2378	325	250	110	9.3	0.2	0.1	0.3	Open	Dummy Pipe (Phase 3)
P465	J2376	J2374	322	250	110	5.2	0.1	0.0	0.1	Open	Dummy Pipe (Phase 3)
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P487	J2378	J2398	155	250	110	50.0	1.0	0.9	5.9	Open	Dummy Pipe (Phase 3)
P489	J1740	J1930	283	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P493	J2400	J2368	49	300	120	0.0	0.0	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 2
Junction Table

Proposed Condition

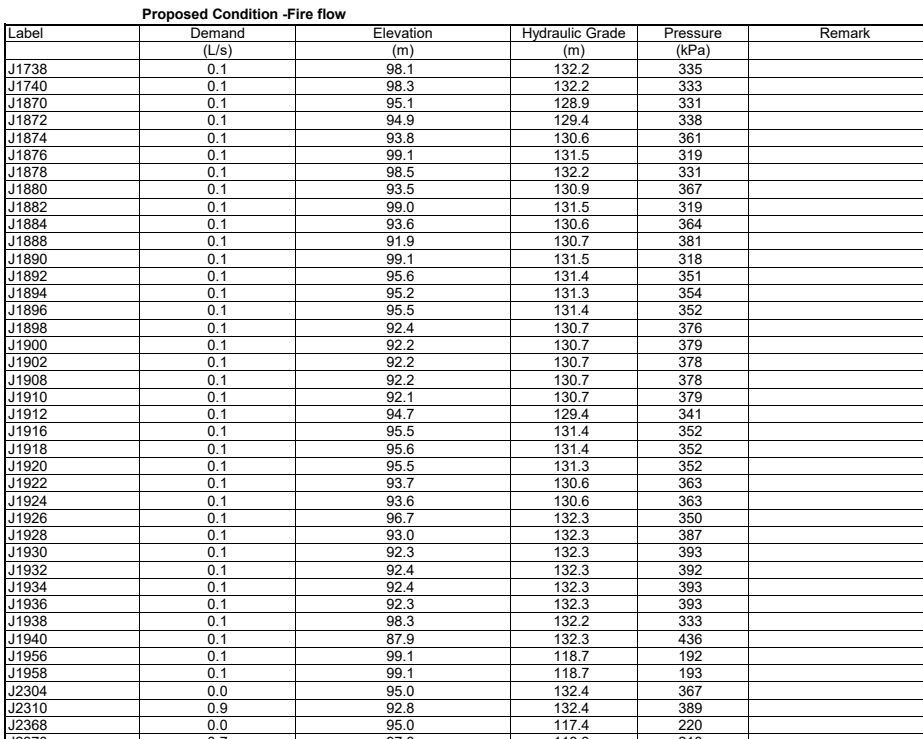
Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	137.1	382	
J1740	0.1	98.3	137.1	381	
J1870	0.1	95.1	137.2	413	
J1872	0.1	94.9	137.2	415	
J1874	0.1	93.8	137.1	425	
J1876	0.1	99.1	137.1	373	
J1878	0.1	98.5	137.1	379	
J1880	0.1	93.5	137.1	428	
J1882	0.1	99.0	137.1	374	
J1884	0.1	93.6	137.1	428	
J1888	0.1	91.9	137.2	445	
J1890	0.1	99.1	137.1	373	
J1892	0.1	95.6	137.1	408	
J1894	0.1	95.2	137.1	412	
J1896	0.1	95.5	137.1	409	
J1898	0.1	92.4	137.2	439	
J1900	0.1	92.2	137.2	442	
J1902	0.1	92.2	137.2	442	
J1908	0.1	92.2	137.2	442	
J1910	0.1	92.1	137.2	443	
J1912	0.1	94.7	137.2	417	
J1916	0.1	95.5	137.1	408	
J1918	0.1	95.6	137.1	408	
J1920	0.1	95.5	137.1	409	
J1922	0.1	93.7	137.1	426	
J1924	0.1	93.6	137.1	427	
J1926	0.1	96.7	137.1	396	
J1928	0.1	93.0	137.1	433	
J1930	0.1	92.3	137.1	439	
J1932	0.1	92.4	137.1	439	
J1934	0.1	92.4	137.1	439	
J1936	0.1	92.3	137.1	439	
J1938	0.1	98.3	137.1	381	
J1940	0.1	87.9	137.1	482	
J1956	0.1	99.1	137.1	373	
J1958	0.1	99.1	137.1	374	
J2304	0.0	95.0	137.1	413	
J2310	0.9	92.8	137.1	435	
J2368	0.0	95.0	137.1	414	
J2370	0.7	97.0	137.1	394	
J2372	4.3	94.0	137.1	423	
J2374	3.1	99.2	137.1	372	
J2376	0.4	100.0	137.1	365	
J2378	0.0	105.0	-	-	Dummy Node (Phases 3-4)
J2380	3.7	106.0	-	-	Dummy Node (Phases 3-4)
J2382	1.4	113.0	-	-	Dummy Node (Phases 3-4)
J2384	1.4	116.0	-	-	Dummy Node (Phases 3-4)
J2386	1.0	99.5	-	-	Dummy Node (Phases 3-4)
J2388	1.4	116.0	-	-	Dummy Node (Phases 3-4)
J2396	0.2	98.0	-	-	Dummy Node (Phases 3-4)
J2398	1.8	101.0	-	-	Dummy Node (Phases 3-4)
J2400	0.0	95.5	137.1	409	
J2402	0.0	105.0	-	-	Dummy Node (Phases 3-4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-117	139.2			High Level Res

Proposed Condition -Fire flow

Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	132.2	335	
J1740	0.1	98.3	132.2	333	
J1870	0.1	95.1	128.9	331	
J1872	0.1	94.9	129.4	338	
J1874	0.1	93.8	130.6	361	
J1876	0.1	99.1	131.5	319	
J1878	0.1	98.5	132.2	331	
J1880	0.1	93.5	130.9	367	
J1882	0.1	99.0	131.5	319	
J1884	0.1	93.6	130.6	364	
J1888	0.1	91.9	130.7	381	
J1890	0.1	99.1	131.5	318	
J1892	0.1	95.6	131.4	351	
J1894	0.1	95.2	131.3	354	
J1896	0.1	95.5	131.4	352	
J1898	0.1	92.4	130.7	376	
J1900	0.1	92.2	130.7	379	
J1902	0.1	92.2	130.7	378	
J1908	0.1	92.2	130.7	378	
J1910	0.1	92.1	130.7	379	
J1912	0.1	94.7	129.4	341	
J1916	0.1	95.5	131.4	352	
J1918	0.1	95.6	131.4	352	
J1920	0.1	95.5	131.3	352	
J1922	0.1	93.7	130.6	363	
J1924	0.1	93.6	130.6	363	
J1926	0.1	96.7	132.3	350	
J1928	0.1	93.0	132.3	387	
J1930	0.1	92.3	132.3	393	
J1932	0.1	92.4	132.3	392	
J1934	0.1	92.4	132.3	393	
J1936	0.1	92.3	132.3	393	
J1938	0.1	98.3	132.2	333	
J1940	0.1	87.9	132.3	436	
J1956	0.1	99.1	118.7	192	
J1958	0.1	99.1	118.7	193	
J2304	0.0	95.0	132.4	367	
J2310	0.9	92.8	132.4	389	
J2368	0.0	95.0	117.4	220	
J2370	0.7	97.0	118.3	210	
J2372	4.3	94.0	117.4	230	
J2374	87.1	99.2	117.2	177	
J2376	0.4	100.0	118.1	177	
J2378	0.0	105.0	-	-	Dummy Node (Phases 3-4)
J2380	3.7	106.0	-	-	Dummy Node (Phases 3-4)
J2382	1.4	113.0	-	-	Dummy Node (Phases 3-4)
J2384	1.4	116.0	-	-	Dummy Node (Phases 3-4)
J2386	1.0	99.5	-	-	Dummy Node (Phases 3-4)
J2388	1.4	116.0	-	-	Dummy Node (Phases 3-4)
J2396	0.2	98.0	-	-	Dummy Node (Phases 3-4)
J2398	1.8	101.0	-	-	Dummy Node (Phases 3-4)
J2400	0.0	95.5	117.4	215	
J2402	0.0	105.0	-	-	Dummy Node (Phases 3-4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-194	139.2			High Level Res



Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 2
Pipe Table

Proposed Condition - Peak Hour

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	1.8	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	8.6	0.3	0.1	0.6	Open	
884	J1738	J1740	9	250	70	0.5	0.0	0.0	0.0	Open	
885	J1742	J1738	112	250	70	0.4	0.0	0.0	0.0	Open	
959	J1870	J1816	110	150	70	1.6	0.1	0.0	0.3	Open	
960	J1872	J1874	92	150	70	2.0	0.1	0.0	0.4	Open	
961	J1876	J1878	57	150	70	1.9	0.1	0.0	0.4	Open	
962	J1880	J1882	178	150	70	0.9	0.0	0.0	0.1	Open	
963	J1884	J1880	78	150	70	0.9	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	3.5	0.2	0.1	1.2	Open	
967	J1882	J1876	4	150	60	0.8	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.2	0.1	0.0	0.2	Open	
969	J1892	J1890	84	150	100	1.3	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.2	0.1	0.0	0.7	Open	
971	J1898	J1894	73	150	60	2.3	0.1	0.1	0.7	Open	
972	J1888	J1900	9	150	100	3.4	0.2	0.0	0.6	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.4	0.1	0.0	0.8	Open	
977	J1910	J1908	2	150	60	0.7	0.0	0.0	0.1	Open	
978	J1900	J1908	3	150	60	3.2	0.2	0.0	1.3	Open	
979	J1910	J1912	175	150	70	0.7	0.0	0.0	0.1	Open	
980	J1912	J1872	4	150	60	0.6	0.0	0.0	0.1	Open	
981	J1870	J1872	16	150	70	1.5	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.5	0.1	0.0	0.3	Open	
983	J1916	J1896	9	150	70	1.6	0.1	0.0	0.3	Open	
984	J1896	J1918	2	150	60	0.6	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.9	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.1	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.0	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.0	0.1	0.0	0.5	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.3	0.1	0.0	0.3	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.2	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.6	0.0	0.0	0.1	Open	
998	J1938	J1926	49	150	60	1.2	0.1	0.0	0.2	Open	
999	J1938	J1740	2	150	60	1.2	0.1	0.0	0.2	Open	
P289	J2304	J1928	94	150	60	0.7	0.0	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	0.9	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.5	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.4	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	0.0	0.0	0.0	0.0	Closed	
P437	J2368	J2372	116	300	120	0.0	0.0	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	0.7	0.0	0.0	0.0	Open	
P441	J2374	J2378	87	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P445	J2374	J2386	163	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P447	J2386	J2398	84	250	110	1.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	5.0	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	8.5	0.1	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	2.8	0.1	0.0	0.0	Open	
P459	J2376	J2380	84	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P463	J2380	J2378	325	250	110	3.7	0.1	0.0	0.0	Open	Dummy Pipe (Phase 3)
P465	J2376	J2374	322	250	110	2.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P487	J2378	J2398	155	250	110	3.7	0.1	0.0	0.0	Open	Dummy Pipe (Phase 3)
P489	J1740	J1930	283	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P493	J2400	J2368	49	300	120	0.0	0.0	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Proposed Condition - Fire Flow

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	1.8	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	8.6	0.3	0.1	0.6	Open	
884	J1738	J1740	9	250	70	0.5	0.0	0.0	0.0	Open	
885	J1742	J1738	112	250	70	0.4	0.0	0.0	0.0	Open	
959	J1870	J1816	110	150	70	1.6	0.1	0.0	0.3	Open	
960	J1872	J1874	92	150	70	2.0	0.1	0.0	0.4	Open	
961	J1876	J1878	57	150	70	1.9	0.1	0.0	0.4	Open	
962	J1880	J1882	178	150	70	0.9	0.0	0.0	0.1	Open	
963	J1884	J1880	78	150	70	0.9	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	3.5	0.2	0.1	1.2	Open	
967	J1882	J1876	4	150	60	0.8	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.2	0.1	0.0	0.2	Open	
969	J1892	J1890	84	150	100	1.3	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.2	0.1	0.0	0.7	Open	
971	J1898	J1894	73	150	60	2.3	0.1	0.1	0.7	Open	
972	J1888	J1900	9	150	100	3.4	0.2	0.0	0.6	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.4	0.1	0.0	0.8	Open	
977	J1910	J1908	2	150	60	0.7	0.0	0.0	0.1	Open	
978	J1900	J1908	3	150	60	3.2	0.2	0.0	1.3	Open	
979	J1910	J1912	175	150	70	0.7	0.0	0.0	0.1	Open	
980	J1912	J1872	4	150	60	0.6	0.0	0.0	0.1	Open	
981	J1870	J1872	16	150	70	1.5	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.5	0.1	0.0	0.3	Open	
983	J1916	J1896	9	150	70	1.6	0.1	0.0	0.3	Open	
984	J1896	J1918	2	150	60	0.6	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.9	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.1	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.0	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.0	0.1	0.0	0.5	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.3	0.1	0.0	0.3	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.2	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.6	0.0	0.0	0.1	Open	
998	J1938	J1926	49	150	60	1.2	0.1	0.0	0.2	Open	
999	J1938	J1740	2	150	60	1.2	0.1	0.0	0.2	Open	
P289	J2304	J1928	94	150	60	0.7	0.0	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	0.9	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.5	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.4	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	0.0	0.0	0.0	0.0	Closed	
P437	J2368	J2372	116	300	120	0.0	0.0	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	0.7	0.0	0.0	0.0	Open	
P441	J2374	J2378	87	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P445	J2374	J2386	163	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P447	J2386	J2398	84	250	110	1.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	5.0	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	8.5	0.1	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	2.8	0.1	0.0	0.0	Open	
P459	J2376	J2380	84	250	110	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P463	J2380	J2378	325	250	110	3.7	0.1	0.0	0.0	Open	Dummy Pipe (Phase 3)
P465	J2376	J2374	322	250	110	2.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	Dummy Pipe (Phase 3)
P487	J2378	J2398	155	250	110	3.7	0.1	0.0	0.0	Open	Dummy Pipe (Phase 3)
P489	J1740	J1930	283	300	120	0.0	0.0	0.0	0.0	Closed	Dummy Pipe (Phase 3)
P493	J2400	J2368	49	300	120	0.0	0.0	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 3
Junction Table

Proposed Condition

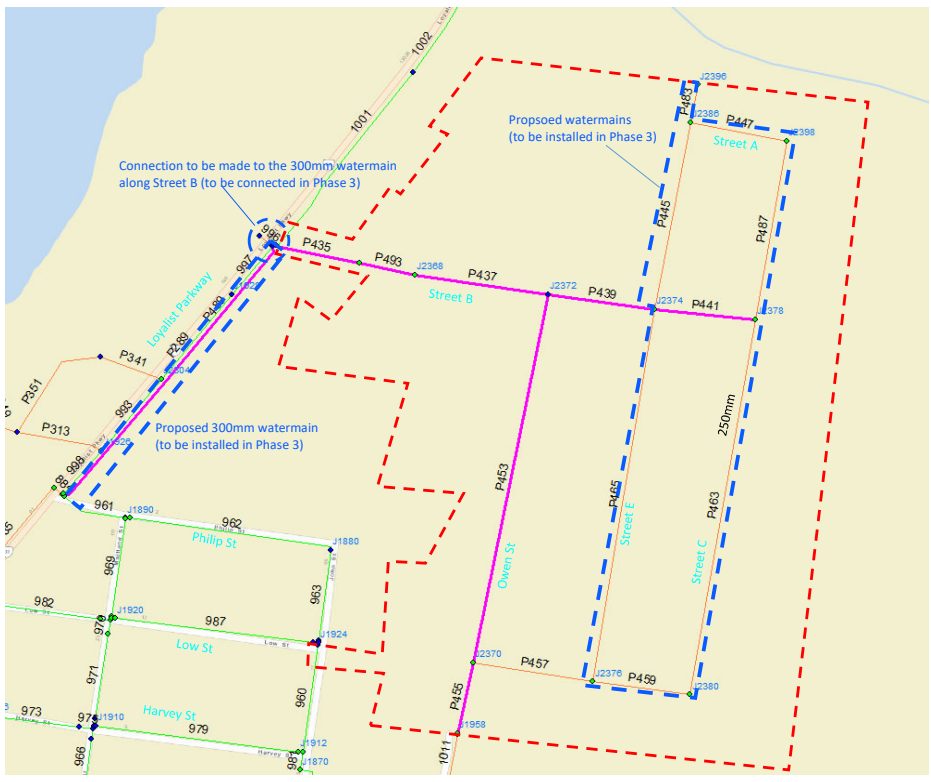
Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	136.7	379	
J1740	0.1	98.3	136.7	378	
J1870	0.1	95.1	136.8	410	
J1872	0.1	94.9	136.8	412	
J1874	0.1	93.8	136.8	422	
J1876	0.1	99.1	136.8	370	
J1878	0.1	98.5	136.7	376	
J1880	0.1	93.5	136.8	425	
J1882	0.1	99.0	136.8	371	
J1884	0.1	93.6	136.8	425	
J1888	0.1	91.9	136.9	442	
J1890	0.1	99.1	136.8	370	
J1892	0.1	95.6	136.8	405	
J1894	0.1	95.2	136.8	409	
J1896	0.1	95.5	136.8	405	
J1898	0.1	92.4	136.9	436	
J1900	0.1	92.2	136.9	439	
J1902	0.1	92.2	136.9	438	
J1908	0.1	92.2	136.9	439	
J1910	0.1	92.1	136.9	439	
J1912	0.1	94.7	136.8	414	
J1916	0.1	95.5	136.8	405	
J1918	0.1	95.6	136.8	405	
J1920	0.1	95.5	136.8	406	
J1922	0.1	93.7	136.8	423	
J1924	0.1	93.6	136.8	424	
J1926	0.1	96.7	136.7	393	
J1928	0.1	93.0	136.7	430	
J1930	0.1	92.3	136.7	436	
J1932	0.1	92.4	136.7	436	
J1934	0.1	92.4	136.7	436	
J1936	0.1	92.3	136.7	436	
J1938	0.1	98.3	136.7	377	
J1940	0.1	87.9	136.7	479	
J1956	0.1	99.1	136.8	369	
J1958	0.1	99.1	136.8	370	
J2304	0.0	95.0	136.7	410	
J2310	0.9	92.8	136.7	432	
J2368	0.0	95.0	136.7	410	
J2370	0.7	97.0	136.7	390	
J2372	4.3	94.0	136.7	420	
J2374	3.1	99.2	136.7	369	
J2376	0.4	100.0	136.7	361	
J2378	0.0	105.0	136.7	312	
J2380	3.7	106.0	136.7	302	
J2382	1.4	113.0	-	-	Dummy Node (Phase 4)
J2384	1.4	116.0	-	-	Dummy Node (Phase 4)
J2386	1.0	99.5	136.7	366	
J2388	1.4	116.0	-	-	Dummy Node (Phase 4)
J2396	0.2	98.0	136.7	-	
J2398	1.8	101.0	136.7	351	
J2400	0.0	95.5	136.7	405	
J2402	0.0	105.0	-	-	Dummy Node (Phase 4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-123	139.2			High Level Res

Proposed Condition -Fire flow

Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	128.8	301	
J1740	0.1	98.3	128.7	299	
J1870	0.1	95.1	129.3	335	
J1872	0.1	94.9	129.3	338	
J1874	0.1	93.8	129.3	348	
J1876	0.1	99.1	129.1	295	
J1878	0.1	98.5	128.7	297	
J1880	0.1	93.5	129.2	350	
J1882	0.1	99.0	129.1	296	
J1884	0.1	93.6	129.2	351	
J1888	0.1	91.9	129.7	372	
J1890	0.1	99.1	129.1	295	
J1892	0.1	95.6	129.2	331	
J1894	0.1	95.2	129.3	335	
J1896	0.1	95.5	129.3	332	
J1898	0.1	92.4	129.6	365	
J1900	0.1	92.2	129.7	369	
J1902	0.1	92.2	129.7	368	
J1908	0.1	92.2	129.7	368	
J1910	0.1	92.1	129.7	369	
J1912	0.1	94.7	129.3	340	
J1916	0.1	95.5	129.3	331	
J1918	0.1	95.6	129.3	331	
J1920	0.1	95.5	129.3	332	
J1922	0.1	93.7	129.3	349	
J1924	0.1	93.6	129.3	350	
J1926	0.1	96.7	129.4	321	
J1928	0.1	93.0	128.6	350	
J1930	0.1	92.3	128.2	352	
J1932	0.1	92.4	128.2	352	
J1934	0.1	92.4	128.2	352	
J1936	0.1	92.3	128.2	352	
J1938	0.1	98.3	128.7	299	
J1940	0.1	87.9	128.2	395	
J1956	0.1	99.1	127.8	281	
J1958	0.1	99.1	127.8	282	
J2304	0.0	95.0	129.4	338	
J2310	0.9	92.8	129.4	360	
J2368	0.0	95.0	127.9	323	
J2370	0.7	97.0	127.7	301	
J2372	4.3	94.0	127.6	330	
J2374	3.1	99.2	127.3	276	
J2376	0.4	100.0	127.4	269	
J2378	0.0	105.0	127.2	218	
J2380	3.7	106.0	127.4	210	
J2382	1.4	113.0	-	-	Dummy Node (Phase 4)
J2384	1.4	116.0	-	-	Dummy Node (Phase 4)
J2386	1.0	99.5	126.7	267	
J2388	1.4	116.0	-	-	Dummy Node (Phase 4)
J2396	0.2	98.0	126.7	282	
J2398	85.8	101.0	126.4	249	
J2400	0.0	95.5	128.0	319	
J2402	0.0	105.0	-	-	Dummy Node (Phase 4)

ID	Flow (L/s)	Head (m)			Remark
RES9010	-199	139.2			High Level Res



Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 3
Pipe Table

Proposed Condition - Peak Hour

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	2.0	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	10.9	0.3	0.1	0.9	Open	
884	J1738	J1740	9	250	70	2.9	0.1	0.0	0.1	Open	
885	J1742	J1738	112	250	70	3.0	0.1	0.0	0.1	Open	
959	J1870	J1816	110	150	70	1.3	0.1	0.0	0.2	Open	
960	J1872	J1874	92	150	70	2.0	0.1	0.0	0.4	Open	
961	J1876	J1878	57	150	70	2.1	0.1	0.0	0.5	Open	
962	J1880	J1882	178	150	70	0.9	0.0	0.0	0.1	Open	
963	J1884	J1880	78	150	70	0.9	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	3.9	0.2	0.1	1.4	Open	
967	J1882	J1876	4	150	60	0.8	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.3	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.4	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.3	0.1	0.0	0.8	Open	
971	J1898	J1894	73	150	60	2.4	0.1	0.1	0.8	Open	
972	J1888	J1900	9	150	100	3.8	0.2	0.0	0.7	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.5	0.1	0.0	0.8	Open	
977	J1910	J1908	2	150	60	1.0	0.1	0.0	0.2	Open	
978	J1900	J1908	3	150	60	3.5	0.2	0.0	1.6	Open	
979	J1910	J1912	175	150	70	0.9	0.1	0.0	0.1	Open	
980	J1912	J1872	4	150	60	0.9	0.0	0.0	0.1	Open	
981	J1870	J1872	16	150	70	1.2	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.4	0.1	0.0	0.2	Open	
983	J1916	J1896	9	150	70	1.5	0.1	0.0	0.2	Open	
984	J1896	J1918	2	150	60	0.8	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.8	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.0	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.0	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	1.9	0.1	0.0	0.5	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.5	0.1	0.0	0.3	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.0	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.4	0.0	0.0	0.0	Open	
998	J1938	J1926	49	150	60	0.2	0.0	0.0	0.0	Open	
999	J1938	J1740	2	150	60	0.2	0.0	0.0	0.0	Open	
P289	J2304	J1928	94	150	60	0.5	0.0	0.0	0.0	Open	
P313	J2308	J1926	75	250	140	0.1	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.4	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.3	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	4.4	0.1	0.0	0.0	Open	
P437	J2368	J2372	116	300	120	4.4	0.1	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	5.0	0.1	0.0	0.0	Open	
P441	J2374	J2378	87	300	120	1.8	0.0	0.0	0.0	Open	
P445	J2374	J2386	163	250	110	1.6	0.0	0.0	0.0	Open	
P447	J2386	J2398	84	250	110	0.4	0.0	0.0	0.0	Open	
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	4.9	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	10.7	0.2	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	5.1	0.1	0.0	0.1	Open	
P459	J2376	J2380	84	250	110	3.3	0.1	0.0	0.0	Open	
P463	J2380	J2378	325	250	110	0.4	0.0	0.0	0.0	Open	
P465	J2376	J2374	322	250	110	1.4	0.0	0.0	0.0	Open	
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	
P487	J2378	J2398	155	250	110	1.4	0.0	0.0	0.0	Open	
P489	J1740	J1930	283	300	120	4.6	0.1	0.0	0.0	Open	
P493	J2400	J2368	49	300	120	4.4	0.1	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Proposed Condition - Fire Flow

Pipe ID	Start Node	Stop Node	Length (m)	Diameter (mm)	Hazen-Williams C	Flow (L/s)	Velocity (m/s)	Headloss (m)	Headloss (m/1000m)	Status (Initial)	Remark
1000	J1740	J1878	3	250	70	2.0	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	10.9	0.3	0.1	0.9	Open	
884	J1738	J1740	9	250	70	2.9	0.1	0.0	0.1	Open	
885	J1742	J1738	112	250	70	3.0	0.1	0.0	0.1	Open	
959	J1870	J1816	110	150	70	1.3	0.1	0.0	0.2	Open	
960	J1872	J1874	92	150	70	2.0	0.1	0.0	0.4	Open	
961	J1876	J1878	57	150	70	2.1	0.1	0.0	0.5	Open	
962	J1880	J1882	178	150	70	0.9	0.0	0.0	0.1	Open	
963	J1884	J1880	78	150	70	0.9	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	3.9	0.2	0.1	1.4	Open	
967	J1882	J1876	4	150	60	0.8	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.3	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.4	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.3	0.1	0.0	0.8	Open	
971	J1898	J1894	73	150	60	2.4	0.1	0.1	0.8	Open	
972	J1888	J1900	9	150	100	3.8	0.2	0.0	0.7	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.5	0.1	0.0	0.8	Open	
977	J1910	J1908	2	150	60	1.0	0.1	0.0	0.2	Open	
978	J1900	J1908	3	150	60	3.5	0.2	0.0	1.6	Open	
979	J1910	J1912	175	150	70	0.9	0.1	0.0	0.1	Open	
980	J1912	J1872	4	150	60	0.9	0.0	0.0	0.1	Open	
981	J1870	J1872	16	150	70	1.2	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.4	0.1	0.0	0.2	Open	
983	J1916	J1896	9	150	70	1.5	0.1	0.0	0.2	Open	
984	J1896	J1918	2	150	60	0.8	0.0	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.8	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.0	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.0	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	1.9	0.1	0.0	0.5	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.5	0.1	0.0	0.3	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.0	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.4	0.0	0.0	0.0	Open	
998	J1938	J1926	49	150	60	0.2	0.0	0.0	0.0	Open	
999	J1938	J1740	2	150	60	0.2	0.0	0.0	0.0	Open	
P289	J2304	J1928	94	150	60	0.5	0.0	0.0	0.0	Open	
P313	J2308	J1926	75	250	140	0.1	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.4	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.3	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	4.4	0.1	0.0	0.0	Open	
P437	J2368	J2372	116	300	120	4.4	0.1	0.0	0.0	Open	
P439	J2372	J2374	92	300	120	5.0	0.1	0.0	0.0	Open	
P441	J2374	J2378	87	300	120	1.8	0.0	0.0	0.0	Open	
P445	J2374	J2386	163	250	110	1.6	0.0	0.0	0.0	Open	
P447	J2386	J2398	84	250	110	0.4	0.0	0.0	0.0	Open	
P449	J2388	J2384	150	250	110	2.8	0.1	0.0	0.0	Open	Dummy Pipe (Phase 4)
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P453	J2372	J2370	321	300	120	4.9	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	10.7	0.2	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	5.1	0.1	0.0	0.1	Open	
P459	J2376	J2380	84	250	110	3.3	0.1	0.0	0.0	Open	
P463	J2380	J2378	325	250	110	0.4	0.0	0.0	0.0	Open	
P465	J2376	J2374	322	250	110	1.4	0.0	0.0	0.0	Open	
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	
P487	J2378	J2398	155	250	110	1.4	0.0	0.0	0.0	Open	
P489	J1740	J1930	283	300	120	4.6	0.1	0.0	0.0	Open	
P493	J2400	J2368	49	300	120	4.4	0.1	0.0	0.0	Open	
P497	J2402	J2384	66	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P499	U7005	J2402	14	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)
P505	J2378	U7005	24	250	110	0.0	0.0	0.0	0.0	Open	Dummy Pipe (Phase 4)

Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022

Flow Scenario: Phase 4 (Full Build-out)

Junction Table

Proposed Condition

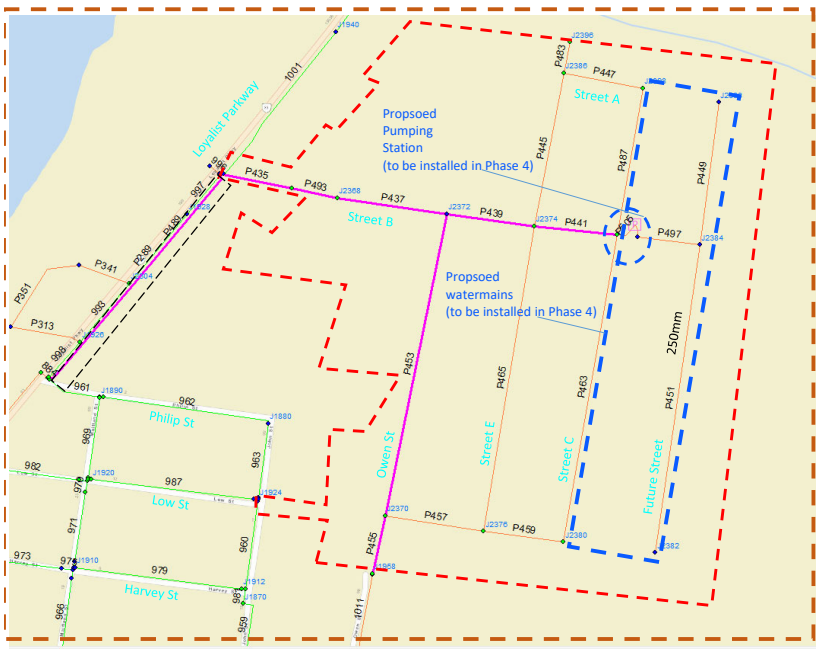
Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	136.5	377	
J1740	0.1	98.3	136.5	375	
J1870	0.1	95.1	136.6	407	
J1872	0.1	94.9	136.6	409	
J1874	0.1	93.8	136.6	420	
J1876	0.1	99.1	136.5	368	
J1878	0.1	98.5	136.5	373	
J1880	0.1	93.5	136.6	423	
J1882	0.1	99.0	136.5	369	
J1884	0.1	93.6	136.6	422	
J1888	0.1	91.9	136.6	440	
J1890	0.1	99.1	136.5	368	
J1892	0.1	95.6	136.6	402	
J1894	0.1	95.2	136.6	406	
J1896	0.1	95.5	136.6	403	
J1898	0.1	92.4	136.6	434	
J1900	0.1	92.2	136.6	437	
J1902	0.1	92.2	136.6	436	
J1908	0.1	92.2	136.6	437	
J1910	0.1	92.1	136.6	437	
J1912	0.1	94.7	136.6	412	
J1916	0.1	95.5	136.6	403	
J1918	0.1	95.6	136.6	403	
J1920	0.1	95.5	136.6	403	
J1922	0.1	93.7	136.6	421	
J1924	0.1	93.6	136.6	422	
J1926	0.1	96.7	136.5	391	
J1928	0.1	93.0	136.5	427	
J1930	0.1	92.3	136.5	434	
J1932	0.1	92.4	136.5	433	
J1934	0.1	92.4	136.5	433	
J1936	0.1	92.3	136.5	434	
J1938	0.1	98.3	136.5	375	
J1940	0.1	87.9	136.5	477	
J1956	0.1	99.1	136.5	367	
J1958	0.1	99.1	136.5	368	
J2304	0.0	95.0	136.5	408	
J2310	0.9	92.8	136.5	430	
J2368	0.0	95.0	136.5	407	
J2370	0.7	97.0	136.5	388	
J2372	4.3	94.0	136.5	417	
J2374	3.1	99.2	136.5	366	
J2376	0.4	100.0	136.5	358	
J2378	0.0	105.0	136.5	309	
J2380	3.7	106.0	136.5	299	
J2382	1.4	113.0	158.4	446	Phase 4
J2384	1.4	116.0	158.4	417	Phase 4
J2386	1.0	99.5	136.5	363	
J2388	1.4	116.0	158.4	417	Phase 4
J2396	0.2	98.0	136.5	378	
J2398	1.8	101.0	136.5	348	
J2400	0.0	95.5	136.5	403	
J2402	0.0	105.0	158.5	525	Phase 4

ID	Flow (L/s)	Head (m)			Remark
RES9010	-127	139.2			High Level Res

Proposed Condition -Fire flow

Label	Demand	Elevation	Hydraulic Grade	Pressure	Remark
	(L/s)	(m)	(m)	(kPa)	
J1738	0.1	98.1	128.2	295	
J1740	0.1	98.3	128.1	293	
J1870	0.1	95.1	128.8	330	
J1872	0.1	94.9	128.8	332	
J1874	0.1	93.8	128.7	343	
J1876	0.1	99.1	128.5	289	
J1878	0.1	98.5	128.1	291	
J1880	0.1	93.5	128.7	345	
J1882	0.1	99.0	128.5	290	
J1884	0.1	93.6	128.7	345	
J1888	0.1	91.9	129.2	367	
J1890	0.1	99.1	128.5	289	
J1892	0.1	95.6	128.7	325	
J1894	0.1	95.2	128.8	330	
J1896	0.1	95.5	128.7	326	
J1898	0.1	92.4	129.1	360	
J1900	0.1	92.2	129.2	364	
J1902	0.1	92.2	129.2	363	
J1908	0.1	92.2	129.2	363	
J1910	0.1	92.1	129.1	364	
J1912	0.1	94.7	128.8	335	
J1916	0.1	95.5	128.7	326	
J1918	0.1	95.6	128.7	326	
J1920	0.1	95.5	128.7	326	
J1922	0.1	93.7	128.7	344	
J1924	0.1	93.6	128.7	345	
J1926	0.1	96.7	128.9	316	
J1928	0.1	93.0	128.1	344	
J1930	0.1	92.3	127.6	346	
J1932	0.1	92.4	127.6	346	
J1934	0.1	92.4	127.6	346	
J1936	0.1	92.3	127.6	346	
J1938	0.1	98.3	128.2	293	
J1940	0.1	87.9	127.6	389	
J1956	0.1	99.1	127.1	274	
J1958	0.1	99.1	127.1	275	
J2304	0.0	95.0	128.9	333	
J2310	0.9	92.8	128.9	355	
J2368	0.0	95.0	127.2	317	
J2370	0.7	97.0	127.0	294	
J2372	4.3	94.0	126.9	323	
J2374	3.1	99.2	126.6	269	
J2376	0.4	100.0	126.7	262	
J2378	0.0	105.0	126.4	210	
J2380	3.7	106.0	126.6	203	
J2382	1.4	113.0	142.6	291	Phase 4
J2384	1.4	116.0	142.6	261	Phase 4
J2386	1.0	99.5	126.5	265	
J2388	85.4	116.0	140.2	238	Phase 4
J2396	0.2	98.0	126.5	280	
J2398	1.8	101.0	126.4	250	
J2400	0.0	95.5	127.4	313	
J2402	0.0	105.0	143.7	380	Phase 4

ID	Flow (L/s)	Head (m)			Remark
RES9010	-203	139.2			High Level Res



Project: 115791_Tulip Subdivision_County of Prince Edward
Date: December 2022
Flow Scenario: Phase 4 (Full Build-out)
Pipe Table

Proposed Condition - Peak Hour

			Length	Diameter	Hazen-Williams	Flow	Velocity	Headloss	Headloss	Status	
Pipe ID	Start Node	Stop Node	(m)	(mm)	C	(L/s)	(m/s)	(m)	(m/1000m)	(Initial)	Remark
1000	J1740	J1878	3	250	70	2.2	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	12.1	0.4	0.1	1.1	Open	
884	J1738	J1740	9	250	70	4.2	0.1	0.0	0.1	Open	
885	J1742	J1738	112	250	70	4.3	0.1	0.0	0.1	Open	
959	J1870	J1816	110	150	70	1.2	0.1	0.0	0.2	Open	
960	J1872	J1874	92	150	70	2.1	0.1	0.0	0.5	Open	
961	J1876	J1878	57	150	70	2.3	0.1	0.0	0.6	Open	
962	J1880	J1882	178	150	70	0.9	0.1	0.0	0.1	Open	
963	J1884	J1880	78	150	70	1.0	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	4.2	0.2	0.2	1.7	Open	
967	J1882	J1876	4	150	60	0.9	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.5	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.6	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.5	0.1	0.0	0.9	Open	
971	J1898	J1894	73	150	60	2.6	0.1	0.1	0.9	Open	
972	J1888	J1900	9	150	100	4.1	0.2	0.0	0.8	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.6	0.1	0.0	0.9	Open	
977	J1910	J1908	2	150	60	1.1	0.1	0.0	0.2	Open	
978	J1900	J1908	3	150	60	3.8	0.2	0.0	1.9	Open	
979	J1910	J1912	175	150	70	1.1	0.1	0.0	0.1	Open	
980	J1912	J1872	4	150	60	1.0	0.1	0.0	0.2	Open	
981	J1870	J1872	16	150	70	1.2	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.4	0.1	0.0	0.2	Open	
983	J1916	J1896	9	150	70	1.5	0.1	0.0	0.2	Open	
984	J1896	J1918	2	150	60	1.0	0.1	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.8	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.1	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.1	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.0	0.1	0.0	0.6	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.7	0.1	0.0	0.4	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.4	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.9	0.1	0.0	0.1	Open	
998	J1938	J1926	49	150	60	0.8	0.0	0.0	0.1	Open	
999	J1938	J1740	2	150	60	0.7	0.0	0.0	0.1	Open	
P289	J2304	J1928	94	150	60	1.0	0.1	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	1.1	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.8	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.7	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	7.4	0.1	0.0	0.1	Open	
P437	J2368	J2372	116	300	120	7.4	0.1	0.0	0.1	Open	
P439	J2372	J2374	92	300	120	8.2	0.1	0.0	0.1	Open	
P441	J2374	J2378	87	300	120	4.7	0.1	0.0	0.0	Open	
P445	J2374	J2386	163	250	110	2.0	0.0	0.0	0.0	Open	
P447	J2386	J2398	84	250	110	0.8	0.0	0.0	0.0	Open	
P449	J2388	J2384	150	250	110	1.4	0.0	0.0	0.0	Open	Phase 4
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Phase 4
P453	J2372	J2370	321	300	120	5.1	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	12.0	0.2	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	6.2	0.1	0.0	0.1	Open	
P459	J2376	J2380	84	250	110	4.2	0.1	0.0	0.1	Open	
P463	J2380	J2378	325	250	110	0.5	0.0	0.0	0.0	Open	
P465	J2376	J2374	322	250	110	1.6	0.0	0.0	0.0	Open	
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	
P487	J2378	J2398	155	250	110	1.0	0.0	0.0	0.0	Open	
P489	J1740	J1930	283	300	120	7.1	0.1	0.0	0.1	Open	
P493	J2400	J2368	49	300	120	7.4	0.1	0.0	0.1	Open	
P497	J2402	J2384	66	250	110	4.2	0.1	0.0	0.1	Open	Phase 4
P499	U7005	J2402	14	250	110	4.2	0.1	0.0	0.1	Open	Phase 4
P505	J2378	U7005	24	250	110	4.2	0.1	0.0	0.1	Open	Phase 4

Proposed Condition - Fire Flow

			Length	Diameter	Hazen-Williams	Flow	Velocity	Headloss	Headloss	Status	
Pipe ID	Start Node	Stop Node	(m)	(mm)	C	(L/s)	(m/s)	(m)	(m/1000m)	(Initial)	Remark
1000	J1740	J1878	3	250	70	2.2	0.0	0.0	0.0	Open	
1001	J1934	J1940	190	150	60	0.3	0.0	0.0	0.0	Open	
1002	J1940	J1942	747	150	60	0.2	0.0	0.0	0.0	Open	
1010	J1956	J1958	1	200	110	0.1	0.0	0.0	0.0	Open	
1011	J1960	J1956	120	200	120	12.1	0.4	0.1	1.1	Open	
884	J1738	J1740	9	250	70	4.2	0.1	0.0	0.1	Open	
885	J1742	J1738	112	250	70	4.3	0.1	0.0	0.1	Open	
959	J1870	J1816	110	150	70	1.2	0.1	0.0	0.2	Open	
960	J1872	J1874	92	150	70	2.1	0.1	0.0	0.5	Open	
961	J1876	J1878	57	150	70	2.3	0.1	0.0	0.6	Open	
962	J1880	J1882	178	150	70	0.9	0.1	0.0	0.1	Open	
963	J1884	J1880	78	150	70	1.0	0.1	0.0	0.1	Open	
966	J1886	J1888	97	150	70	4.2	0.2	0.2	1.7	Open	
967	J1882	J1876	4	150	60	0.9	0.0	0.0	0.1	Open	
968	J1890	J1876	1	150	60	1.5	0.1	0.0	0.3	Open	
969	J1892	J1890	84	150	100	1.6	0.1	0.0	0.1	Open	
970	J1894	J1896	12	150	60	2.5	0.1	0.0	0.9	Open	
971	J1898	J1894	73	150	60	2.6	0.1	0.1	0.9	Open	
972	J1888	J1900	9	150	100	4.1	0.2	0.0	0.8	Open	
973	J1902	J1904	85	150	70	0.2	0.0	0.0	0.0	Open	
975	J1902	J1900	12	150	70	0.2	0.0	0.0	0.0	Open	
976	J1908	J1898	6	150	60	2.6	0.1	0.0	0.9	Open	
977	J1910	J1908	2	150	60	1.1	0.1	0.0	0.2	Open	
978	J1900	J1908	3	150	60	3.8	0.2	0.0	1.9	Open	
979	J1910	J1912	175	150	70	1.1	0.1	0.0	0.1	Open	
980	J1912	J1872	4	150	60	1.0	0.1	0.0	0.2	Open	
981	J1870	J1872	16	150	70	1.2	0.1	0.0	0.2	Open	
982	J1914	J1916	106	150	70	1.4	0.1	0.0	0.2	Open	
983	J1916	J1896	9	150	70	1.5	0.1	0.0	0.2	Open	
984	J1896	J1918	2	150	60	1.0	0.1	0.0	0.1	Open	
987	J1920	J1922	171	150	70	0.8	0.0	0.0	0.1	Open	
988	J1922	J1924	5	150	60	0.9	0.1	0.0	0.1	Open	
989	J1924	J1884	2	150	60	1.1	0.1	0.0	0.2	Open	
990	J1874	J1924	2	150	60	2.0	0.1	0.0	0.6	Open	
991	J1920	J1918	3	150	60	0.8	0.0	0.0	0.1	Open	
992	J1918	J1892	1	150	60	1.7	0.1	0.0	0.4	Open	
993	J1926	J2304	80	150	60	0.2	0.0	0.0	0.0	Open	
994	J1930	J1932	1	150	60	0.4	0.0	0.0	0.0	Open	
995	J1932	J1934	5	150	60	0.4	0.0	0.0	0.0	Open	
996	J1930	J1936	13	200	70	0.1	0.0	0.0	0.0	Open	
997	J1928	J1932	54	150	60	0.9	0.1	0.0	0.1	Open	
998	J1938	J1926	49	150	60	0.8	0.0	0.0	0.1	Open	
999	J1938	J1740	2	150	60	0.7	0.0	0.0	0.1	Open	
P289	J2304	J1928	94	150	60	1.0	0.1	0.0	0.1	Open	
P313	J2308	J1926	75	250	140	1.1	0.0	0.0	0.0	Open	
P341	J2310	J2304	56	250	140	0.8	0.0	0.0	0.0	Open	
P351	J2308	J2310	105	250	140	1.7	0.0	0.0	0.0	Open	
P435	J1930	J2400	77	300	120	7.4	0.1	0.0	0.1	Open	
P437	J2368	J2372	116	300	120	7.4	0.1	0.0	0.1	Open	
P439	J2372	J2374	92	300	120	8.2	0.1	0.0	0.1	Open	
P441	J2374	J2378	87	300	120	4.7	0.1	0.0	0.0	Open	
P445	J2374	J2386	163	250	110	2.0	0.0	0.0	0.0	Open	
P447	J2386	J2398	84	250	110	0.8	0.0	0.0	0.0	Open	
P449	J2388	J2384	150	250	110	1.4	0.0	0.0	0.0	Open	Phase 4
P451	J2384	J2382	324	250	110	1.4	0.0	0.0	0.0	Open	Phase 4
P453	J2372	J2370	321	300	120	5.1	0.1	0.0	0.0	Open	
P455	J2370	J1956	63	300	120	12.0	0.2	0.0	0.1	Open	
P457	J2370	J2376	104	250	110	6.2	0.1	0.0	0.1	Open	
P459	J2376	J2380	84	250	110	4.2	0.1	0.0	0.1	Open	
P463	J2380	J2378	325	250	110	0.5	0.0	0.0	0.0	Open	
P465	J2376	J2374	322	250	110	1.6	0.0	0.0	0.0	Open	
P483	J2386	J2396	33	250	110	0.2	0.0	0.0	0.0	Open	
P487	J2378	J2398	155	250	110	1.0	0.0	0.0	0.0	Open	
P489	J1740	J1930	283	300	120	7.1	0.1	0.0	0.1	Open	
P493	J2400	J2368	49	300	120	7.4	0.1	0.0	0.1	Open	
P497	J2402	J2384	66	250	110	4.2	0.1	0.0	0.1	Open	Phase 4
P499	U7005	J2402	14	250	110	4.2	0.1	0.0	0.1	Open	Phase 4
P505	J2378	U7005	24	250	110	4.2	0.1	0.0	0.1	Open	Phase 4

Appendix C – Sanitary Sewer Design Sheet

ARCADIS | IBI GROUP
61 Hyperion Court, Suite 6
Kingston, ON K7K 7K7 Canada
Tel 613 531 4440

SANITARY SEWER DESIGN SHEET

PROJECT: Tulip Estates
LOCATION: Prince Edward County
CLIENT: Hilden Homes

LOCATION	Tributary Area			RESIDENTIAL						INFILTRATION ALLOWANCE			TOTAL FLOW	PROPOSED SEWER DESIGN							
				UNIT		POPULATION		FLOWS													
Street	Area ID	From MH	To MH	Units	Area (Ha.)	INDIV.	CUM.	Peaking Factor	Peak Flow (l/s)	Incr. Area (Ha.)	Cum. Area (Ha.)	Flow (l/s)	(l/s)	Capacity (l/s)	Pipe Size (mm)	Length (m)	Slope (%)	Velocity @ Full (m/s)	Vel @ Design (m/s)	Avail. Cap. L/s	Avail. Cap. (%)
Street A	204	MH-17S	MH-05S	33	2.89	93	93	4.00	1.51	2.89	2.89	0.40	1.91	53.39	200	131.7	2.65	1.70	0.80	51.48	96.42
	208	MH-05S	MH-08S	3	0.45	9	102	4.00	1.65	0.45	3.34	0.47	2.12	62.06	200	80.9	3.58	1.98	0.92	59.94	96.58
Street C	202	MH-03S	MH-04S	62	4.87	174	174	4.00	2.82	4.87	4.87	0.68	3.50	23.19	200	296.7	0.50	0.74	0.53	19.69	84.90
	201	MH-02S	MH-01S	13	1.14	37	37	4.00	0.60	1.14	1.14	0.16	0.76	66.97	200	29.9	4.17	2.13	0.71	66.21	98.87
	209	MH-01S	MH-11S	12	1.05	34	71	4.00	1.15	1.05	2.19	0.31	1.46	69.96	200	179.8	4.55	2.23	0.88	68.50	97.92
Street E	205	MH-06S	MH-07S	68	2.72	191	191	4.00	3.09	2.72	2.72	0.38	3.48	24.54	200	326.2	0.56	0.78	0.55	21.06	85.84
	212	MH-09S	MH-08S	5	0.28	14	14	4.00	0.23	0.28	7.52	1.05	1.28	24.54	200	52.5	0.56	0.78	0.41	23.26	94.79
	207	MH-08S	MH-07S	27	1.18	76	192	4.00	3.11	1.18	7.24	1.01	4.12	20.48	200	154.8	0.39	0.65	0.51	16.36	79.86
Owen Street	210	MH-11S	MH-12S	46	2.38	129	200	4.00	3.24	2.38	4.57	0.64	3.88	24.10	200	337.6	0.54	0.77	0.56	20.22	83.90
Street B	206	MH-04S	MH-07S	0	0.15	0	174	4.00	2.82	0.15	5.02	0.70	3.52	83.36	200	83.9	6.46	2.65	1.31	79.84	95.77
	211	MH-07S	MH-12S	3	0.24	9	566	3.95	9.05	0.24	15.22	2.13	11.18	62.06	200	77.7	3.58	1.98	1.49	50.88	81.99
	213	MH-12S	MH-13S	48	2.23	135	901	3.83	13.97	2.23	22.02	3.08	17.06	42.05	250	96.2	0.50	0.86	0.81	24.99	59.44
	214	MH-13S	MH-14S	4	0.18	12	913	3.83	14.15	0.18	22.20	3.11	17.26	46.06	250	49.0	0.60	0.94	0.87	28.80	62.54
		MH-14S	MH-15S	0	0.00	0	913	3.83	14.15	0.00	22.20	3.11	17.26	70.86	250	21.1	1.42	1.44	1.19	53.60	75.65
Bridge Street		MH1S	Forcemain	0	0.00	0	913	3.83	14.15	0.00	22.20	3.11	17.26	FORCEMAIN CONNECTION							
				324	19.76																

Designed: MH			
Checked: BT	Update based on Revised Draft Plan		2022-04-01
	REVISION		**DATE**
Dwg Reference:	**File Ref:** 115791	**Date:** 2022-12-20	**Sheet No.** 1 of 1

Population Per Unit:	2.80	Capita/unit
Avg. Per Capita Flow Rate:	350	L/day/cap
Infiltration Allowance:	0.14	L/sec/Ha
Assumed pipe loss ceofficient =	0.013	
Residential Peaking Factor (PF):	1+(14/(4+(P/1000)^0.5)), where P = population	
[Max. PF = 4.0 , Min. PF = 2.0]		

Appendix D – Sewage Pumping Station

IBI GROUP
8133 Warden Ave, Unit 300
Markham ON L6G 1B3 Canada
tel 905 763 2322
ibigroup.com

Memorandum

To/Attention	Hilden Homes – Tulip Estates Subdivision, County of Prince Edward	**Date**	May 13, 2022
From		**Project No**	115791
cc			
Subject	Picton Tulip Sewage Pumping Station		

1.0 Introduction

1.1 Background

This memorandum is meant to be supplementary to the proposed sanitary sewer system proposed by IBI Group for Hilden Homes. The location of the Tulip Estate Subdivision is located at the north-eastern limit of the Picton-Hallowell area in Prince Edward County, Ontario.

There has been a proposal for the new sanitary sewer system to drain to property Block 10 on Street B. This proposed sanitary system will require the development of a new sewage pumping station (SPS) and wet well/overflow storage chamber to be constructed within Block 10 that will discharge sewage to the existing 200mm diameter sanitary sewer along Bridge Street.

The design of the proposed pump station is based off the information available including the CCS sanitary sewer design excel sheet and civil NFC plans prepared by IBI Group (December 2020), along with R.V. Anderson Associates Limited (RVA) Technical Memorandum – Picton Sanitary Model (April 16, 2021). The MOE Design Guidelines for Sewage Works (2008) has also been used as reference.

1.2 Design Assumptions

The following assumptions and parameters were used for these preliminary calculations. As more information becomes available, updates to the design basis will be required.

1. Limitations on wetwell sizing (depth and diameter) have based on the minimum surface plan area of 4.9m^2 (MOE Design Guideline section 7.2.7). Further variations in elevation or width availability at the site will affect both the pump and wetwell sizing.
2. Based on the Bridge Street sewer capacity limits, the design flow for Tulip SPS is 10 L/s (as noted in section 3.1 within RVA's report)
3. Discharge forcemain length for the pumping station is estimated assuming discharge to existing MH-569 on Bridge Street (approximately 500m)
4. It is assumed that a submersible pump with suction/discharge openings less than 100mm will be suitable when accompanied with an inlet sewage grinder

5. A 250m^3 equalization tank, as determined by RVA, will provide sufficient storage volume for flows above the design pumping capacity of 10 L/s, and allow for complete drawdown when incoming flows fall below 10 L/s.

2.0 Pumping Station Requirements

IBI Group is to determine the sizing of Tulip SPS with a maximum design flow of 10 L/s. Wastewater from the proposed subdivision will be conveyed to Tulip SPS located on Block 10 on Street "B". Wastewater will be temporarily stored within a 250 m^3 equalization tank and pumped at off-peak times to the existing 200mm diameter sanitary sewer MH 569 along Bridge Street.

2.1 Pumping Station Location

The location for the proposed pump station is to the north west corner of Tulip Estates Subdivision located within Block 10 shown on Figure 1.

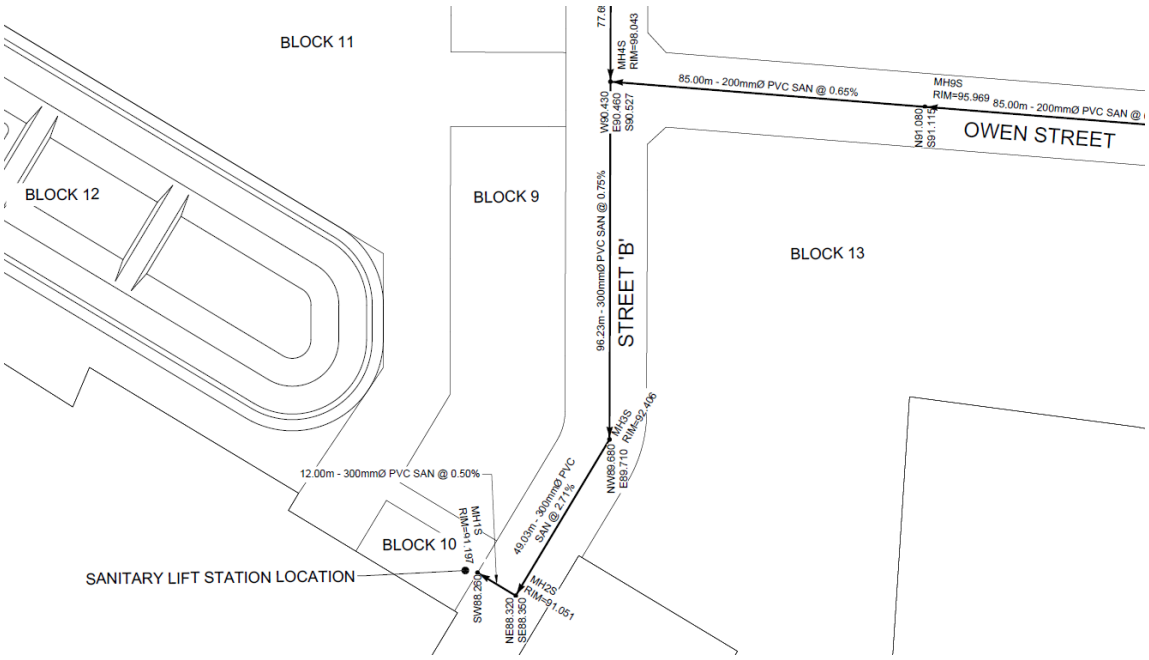


Figure 1. Location of Tulip SPS

The approximate gravity influent piping invert and wet well depth for the SPS is summarized in the following table:

Table 1: Design parameters for Tulip SPS

Ground Elevation (m)	Influent Piping Invert Elevation at PS (m)	Wet Well Depth (m)	Forcemain Piping Length (m)
91.0	88.22	7.76	500
Note 1: FM pipe length per drawing No. Fig 3.1A Rev.01 (RVA Technical Memorandum), ground elevation per IBI drawing C-200 grading plan Note 2: Wet well bottom set as required depth to achieve sufficient EQ tank volume (250m^3) below invert			

2.2 Design Criteria

In addition to the design parameters provided in Table 1, the following design criteria has been used:

Table 2. Design Criteria for Tulip SPS

Parameter	Value	Reference
Flow Rate	10.0 L/s	Based on the Bridge Street sewer capacity limits (RVA Technical Memorandum, section 3.1)
Influent pipe diameter	300 mm	IBI drawing C-302-Sanitary Servicing Plan
Overflow Storage Requirement	250 m^3	RVA Technical Memorandum, section 3.1
Overflow Invert Elevation	88.22 m	Based on a 3m long 300mm diameter pipe sloped at 0.5% connected to MH1S on drawing C-302
Discharge Piping High Point Elevation	97.0 m	Assumed as discharge to MH-569 as per drawing No. Fig 3.1B Rev.01 (RVA Technical Memorandum),
Relevant Design Guidelines		MOE Design Guidelines for Sewage Works – Chapter 7 Pumping Stations

2.3 Wet Well

2.3.1 Design

The following is a summary of the design calculations and pump selection.

Tulip SPS wet well is designed to accommodate two submersible pumps (one duty and one standby). As per MOE Design Guidelines, there will be one redundant pump of the same size to cover full capacity in the event of primary pump failure. The wet well is sized to provide a minimum 10-minute cycle time (maximum six starts per hour) at the design flow. The required working volume between pump starts is determined according to the following equation.

$$(1) \qquad V = t \times Q/2$$

Where:

T = time of one pumping cycle (seconds) = 10 min = 600 seconds
Q= Capacity of one pump (L/s) = 10 L/s
Therefore, working volume requirement is 1.5 m^3

Due to the difference between the average day flow (4.5 L/s) and the design flow (10 L/s), an additional check has been done to ensure that the calculated working volume is suitable:

$$(2) \qquad T_{cal} = \frac{V_{min}}{Q_{in}} + \frac{V_{min}}{Q_{out} - Q_{in}}$$

Where:

Vmin – working volume as calculated in Equation 1
Qin = Average Day Flow = 4.5 L/s
Qout = Capacity of one pump = 10 L/s
Tcal = actual calculated time of one pumping cycle = 10.1 min

As the actual calculated time of one pumping cycle is 10.1 minutes, which exceeds the 10-minute target, this working volume is acceptable.

The wet well internal dimensions will be a square shape with a length of 2.22 m, depth of 7.76 m and a surface area of 4.92 m^2. Based on a wet well of this size, the operating depth between pump start and stop level is 0.30 m. The wet well will house two submersible sewage pumps (one duty and one standby) and an immersible inline sewage grinder located at the sewer inlet.

2.4 Overflow Storage Chamber

In order to accommodate the estimated peak flow of 19.44 L/s, an overflow storage chamber will be required to limit the maximum discharge flow of the Tulip SPS to 10 L/s. This storage chamber (internal dimensions 7.91 m x 7.91 m x 6.78 m deep) with an operating depth of approximately 4.0 m, will be constructed to retain excess peak flows greater than 10 L/s, that will then be pumped to the Bridge Street sanitary sewer system during off peak times. The total overflow storage volume required will be 250 m^3 as noted in RVA's Technical Memorandum, section 3.1.

2.5 Inlet Sewage Grinder

A removable grinder will be provided in the wet well at the inlet of the gravity sewer on the wall of the wet well. The purpose of the grinder is to grind up large objects in the sanitary sewer to protect the pumps. The grinder will grind up larger objects but will not pose a flow restriction on incoming sewage. The grinder can be removed for maintenance as necessary by the station operators with the aid of a portable davit and hoist. An inline 10K series JWC Muffin Monster grinder will be considered during design of Tulip SPS.

2.6 Pump

2.6.1 Operating Levels

Operating levels for Tulip SPS are noted in Table 3.

Table 3. Operating Levels for Tulip SPS

Elevations (m)	Description	Pump Status
91.00	Pumping Station Ground Level	
88.52	Obvert Elevation of Inlet Sewer	
88.22	Overflow invert	
88.22	Invert Elevation of Inlet Sewer	
84.18	Pump Start Level	Pump 1 ON
83.88	Pump Stop Level	Pump 1 OFF
83.78	Minimum Water Level	
83.24	Wet Well Floor Elevation	

2.6.2 Head Loss Calculations

The system head curve is developed by calculating the total dynamic head (TDH) as the sum of static head and friction losses in piping and fittings.

2.6.3 Static Head

Static head values are based on the proposed operating levels in the wet well and the highest point in the discharge piping. The highest point of discharge was assumed to be ex. MH-569 at 97.0 m and lowest point to be the minimum pump submergence within the wet well of 83.78 m.

2.6.4 Friction Losses

Friction losses are calculated using the Hazen-Williams equation as follows:

$$(2) \qquad S = \frac{h_f}{L} = \frac{10.67\ Q^{1.852}}{C^{1.852}\ d^{4.8704}}$$

Where:
S = Hydraulic Slope
H_f = head loss in meters (water) over the length of the pipe
L= Length of pipe in meters
Q = Volumetric flow rate, m^3/s
C = Pipe Roughness Coefficient
d = Inside pipe diameter, m

According to the MOE Design Guideline section 7.2.3, a 'C' value of 120 should be used to generate the system curve for a low sewage level in the wet well.

- The system curve with C=120 is used; and
- In addition to friction losses in the pipes, local losses that occur in valves and fittings are calculated using

$$(3) \qquad h_m = k(\frac{V^2}{2g})$$

Where:

H_m = Minor losses in piping because of fittings
k = Friction Coefficient specific to fitting
V = Velocity of fluid in the pipe
g = acceleration due to gravity

The TDH is equal to the sum of the static lift, friction loss in pipes as well as minor losses.

Pump Selection

A summary of the TDH requirements for Tulip SPS is shown in Table 4.

Table 4: Tulip SPS Pump TDH Requirements

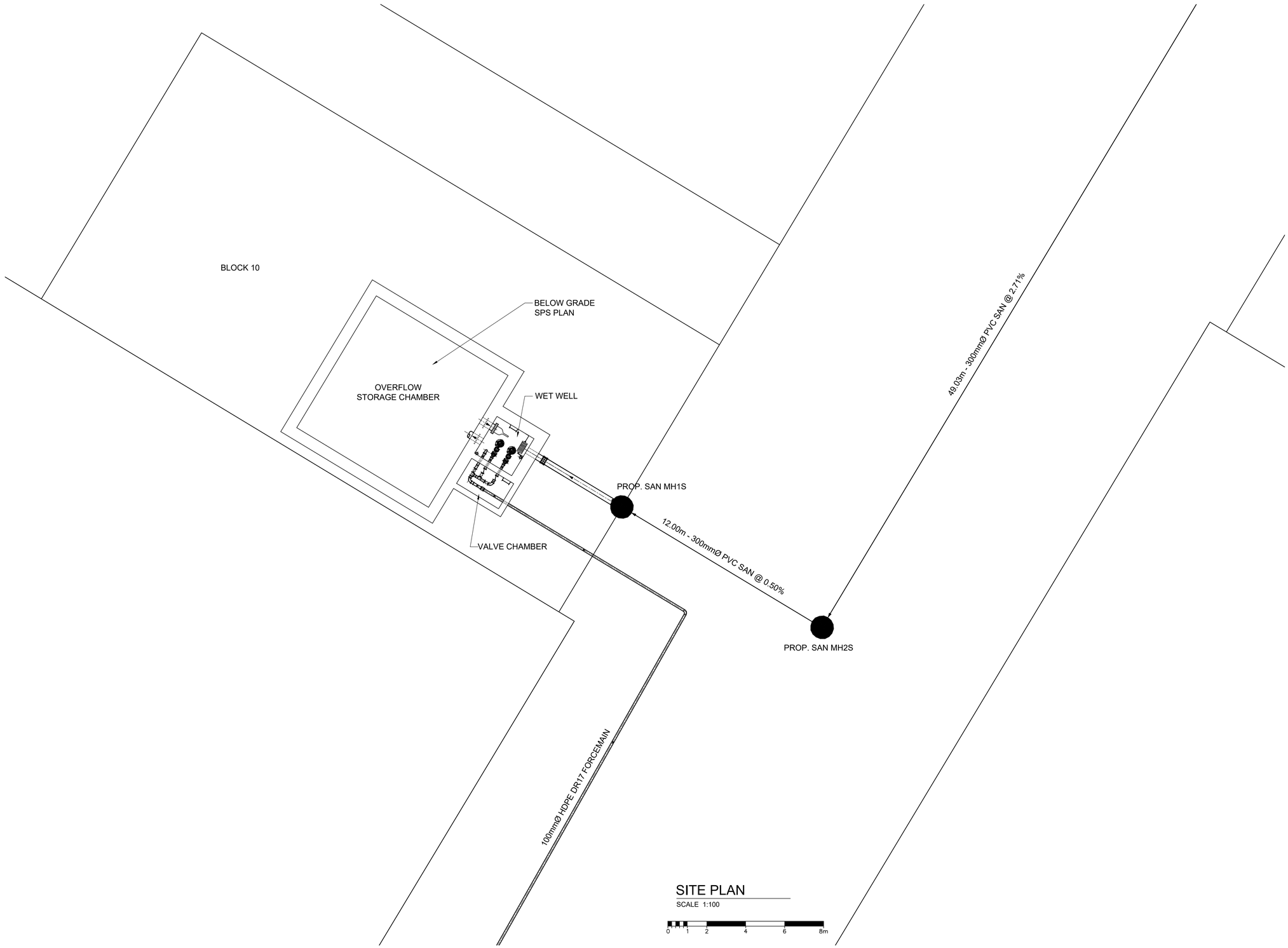
Low Level in Wet Well (m)	Static Head (m)	Friction Losses (m)	Total Dynamic Head (m)	Motor HP
83.78	13.22	11.94	25.16	7.5

3.0 SPS Cost Estimate

Please refer to table 5 below for the high level cost estimate of proposed Picton Tulip SPS. Cost for site works is not included.

Table 5: Tulip SPS Cost Estimate

ITEM	DESCRIPTION	AMOUNT
DIVISION 3	Concrete	$340,000
DIVISION 11	Equipment	$280,000
DIVISION 13	Control and Instrumentation	$160,000
DIVISION 15	Mechanical	$40,000
DIVISION 16	Electrical	$150,000
	Total	$970,000



No.	REVISIONS	DATE	BY

CONSULTANT OR DIVISION

IBI GROUP
Unit 300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
tel 905 763 2322 fax 905 763 9983
ibigroup.com

PRINCE EDWARD COUNTY
PROJECT No. 115791

ENGINEER'S STAMP

ENGINEER'S STAMP

NOTES

DESIGN	
DRAWN	
CHECKED	
APPROVED	
DATE	

SCALE 1:25

IBI PROJECT No. 115791

DATE APRIL 2022

TITLE TULIP ESTATES SUBDIVISION
SEWAGE PUMPING STATION

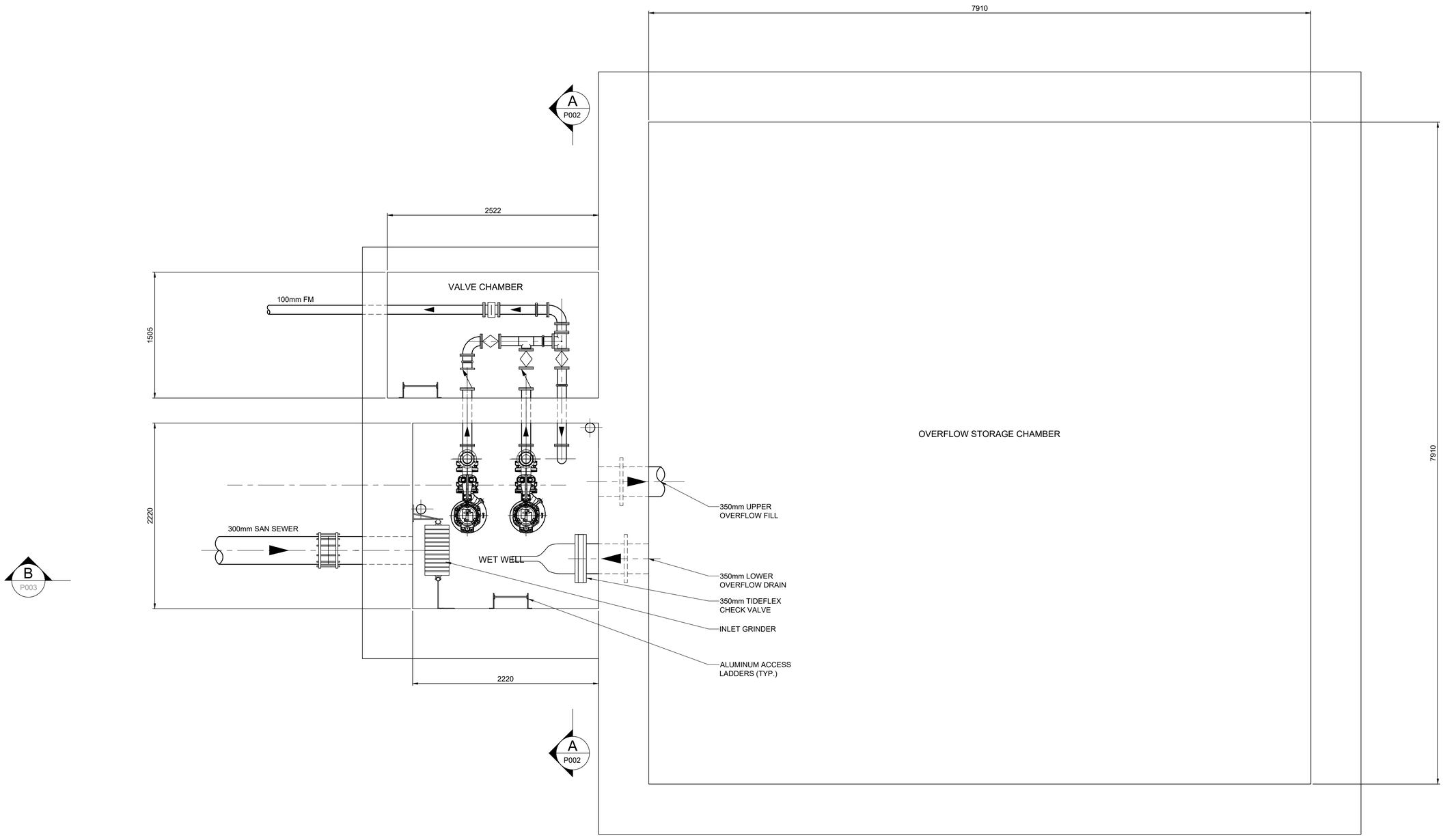
DISCIPLINE

DISCR.

CONTRACT No. X-XXXX

DRAWING No.

SHEET No. OF 100



PLAN AT BELOW GRADE

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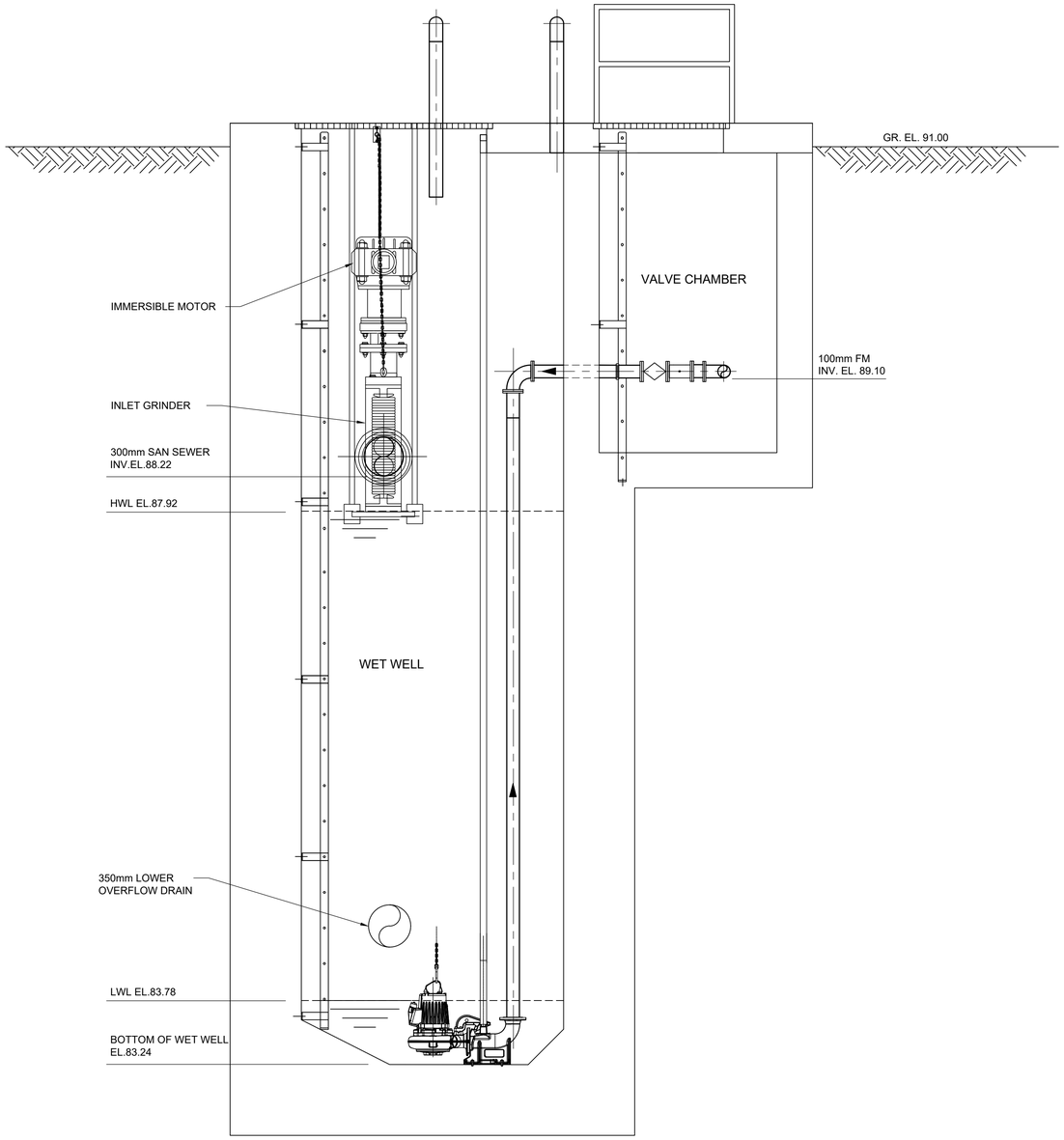

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SECTION

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ibigroup.com

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COUNTY
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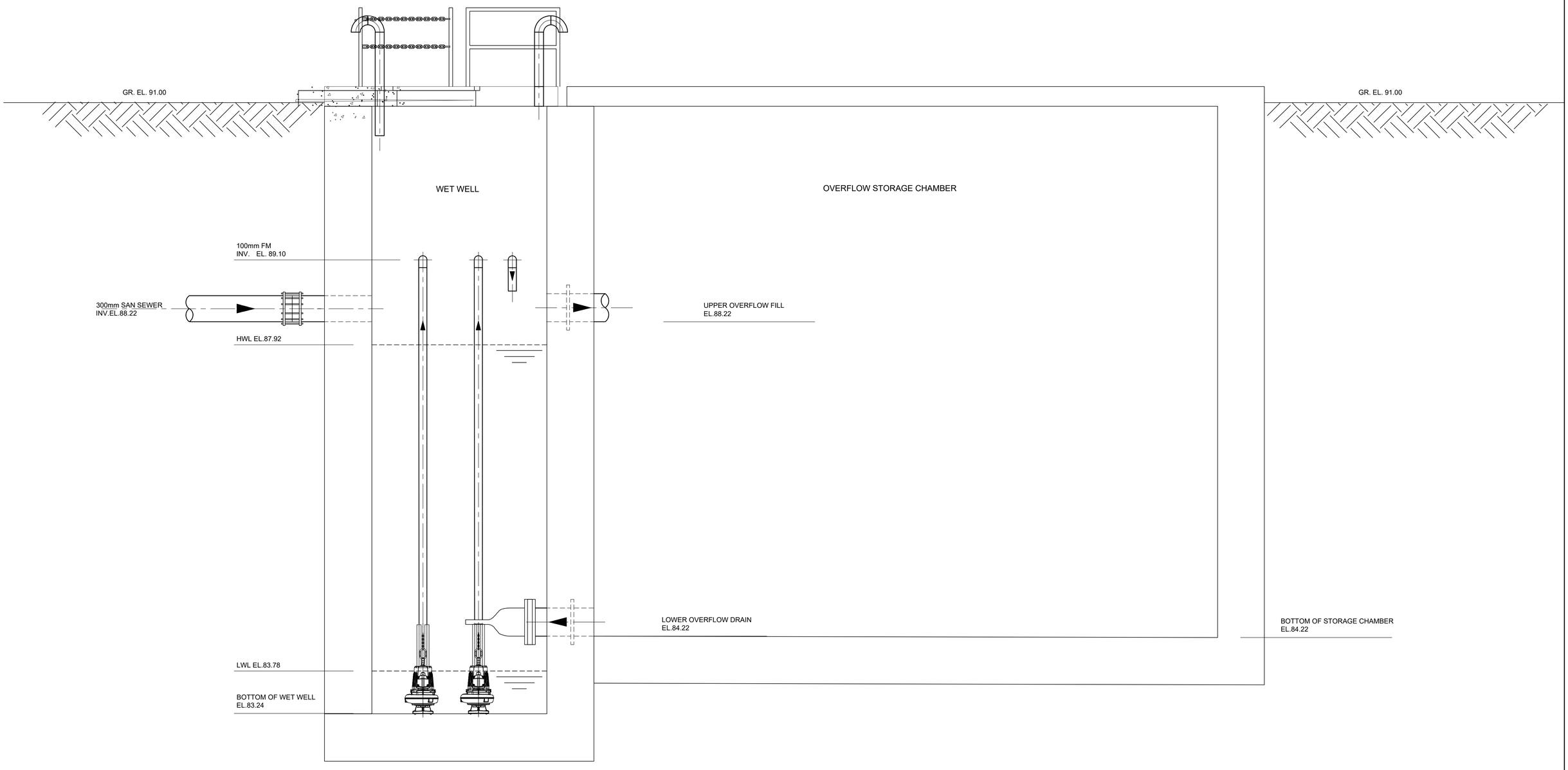

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SECTION

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Unit 300 – 8133 Warden Avenue
Markham ON L6G 1B3 Canada
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SEWAGE PUMPING STATION

DISCIPLINE

DISCR.

CONTRACT No. X-XXXX

DRAWING No.

SHEET No. OF 100

Appendix E – Stormwater Management Report

Preliminary

Draft Plan of Subdivision
Tulip Estates, Prince Edward County
Stormwater Management Report

ARCADIS
IBI GROUP

Prepared for Hilden Homes
Arcadis IBI Group

January 18, 2023

Document Control Page

CLIENT:	Hilden Homes
PROJECT NAME:	Draft Plan of Subdivision Tulip Estates, Prince Edward County
REPORT TITLE:	Draft Plan of Subdivision Tulip Estates, Prince Edward County Stormwater Management Report
IBI REFERENCE:	115791
VERSION:	
DIGITAL MASTER:	[\\caneast.ibigroup.com\J\TO\115791_HildenPicton\10.0 Reports\Stormwater\Final\December 2022\WTR_SWM_2022-12-20.docx\2023-01-18\AK]
ORIGINATOR:	Andy Kroess
REVIEWER:	
AUTHORIZATION:	
CIRCULATION LIST:	
HISTORY:	

Table of Contents

List of Tables

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List of Appendices

1 Introduction

Arcadis IBI Group was retained to prepare a Preliminary Stormwater Management Report in support of a Draft Plan application for the proposed Tulip Estates residential development in Picton, Ontario, Prince Edward County.

The property is located on the east side of Loyalist Parkway, north of Union Street (refer to location plans included with the engineering drawing set).

This Report summarizes the proposed stormwater management quantity and quality control requirements to accommodate the construction of a new residential subdivision on the lands.

2 Design Standards & Background Information

The following information was used in the preparation of the design:

- MECP Stormwater Management Planning and Design Manual (March 2003);
- Quinte Conservation Stormwater Management Submission Guidelines Municipal Guidelines (May 2012);
- Bay Of Quinte Remedial Action Plan Implementation Area Stormwater Management Design Guidelines (Revised – March 2006);
- Geotechnical and Hydrogeological Investigation (Malroz Engineering Inc., August 27, 2018); and
- Functional Stormwater Management Design Brief, Tulip Estates Subdivision, Prince Edward County (IBI Group, August 13, 2019).

3 Methodology

To complete the stormwater management design for the proposed development, the following specific tasks were undertaken:

- Determination of the existing and proposed conditions percent imperviousness of the lands and catchment parameters;
- Determination of the existing conditions peak flow rates for the 2 year to the 100 year storm events;
- Determination of the proposed conditions peak flow rates for the 2 year to the 100 year storm events
- Determination of the stormwater storage requirements to control proposed conditions peak flows to existing conditions levels; and
- Design of a stormwater management wet pond which controls peak flows up to the 100 year storm event and provides the required storage volume.

The Visual OTTHYMO stormwater management model was used to simulate the existing and proposed conditions, and to determine the required pond storage volumes.

4 Existing Conditions

The developing property consists of a 22.16 ha area containing pasture and wooded areas. The existing catchment areas are shown in the attached drawing C100. Existing undeveloped lands are located to the north, south, and east of the property, and a residential subdivision is located to the west. External lands from the east and the south drain onto the property. The property then drains to a watercourse located at the north part of the property, which flows west through existing residential lots on Loyalist Parkway, and then outlets to Picton Bay to the west.

Based on the Geotechnical and Hydrogeological Investigation, site soils include primarily silty sand, clayey sandy silt, and silty clay. Limestone bedrock is present from 1.3m below the existing ground surface. Based on these soil types and geological settings, a CN value of 72 was used for the stormwater modelling of pervious areas.

5 Proposed Conditions

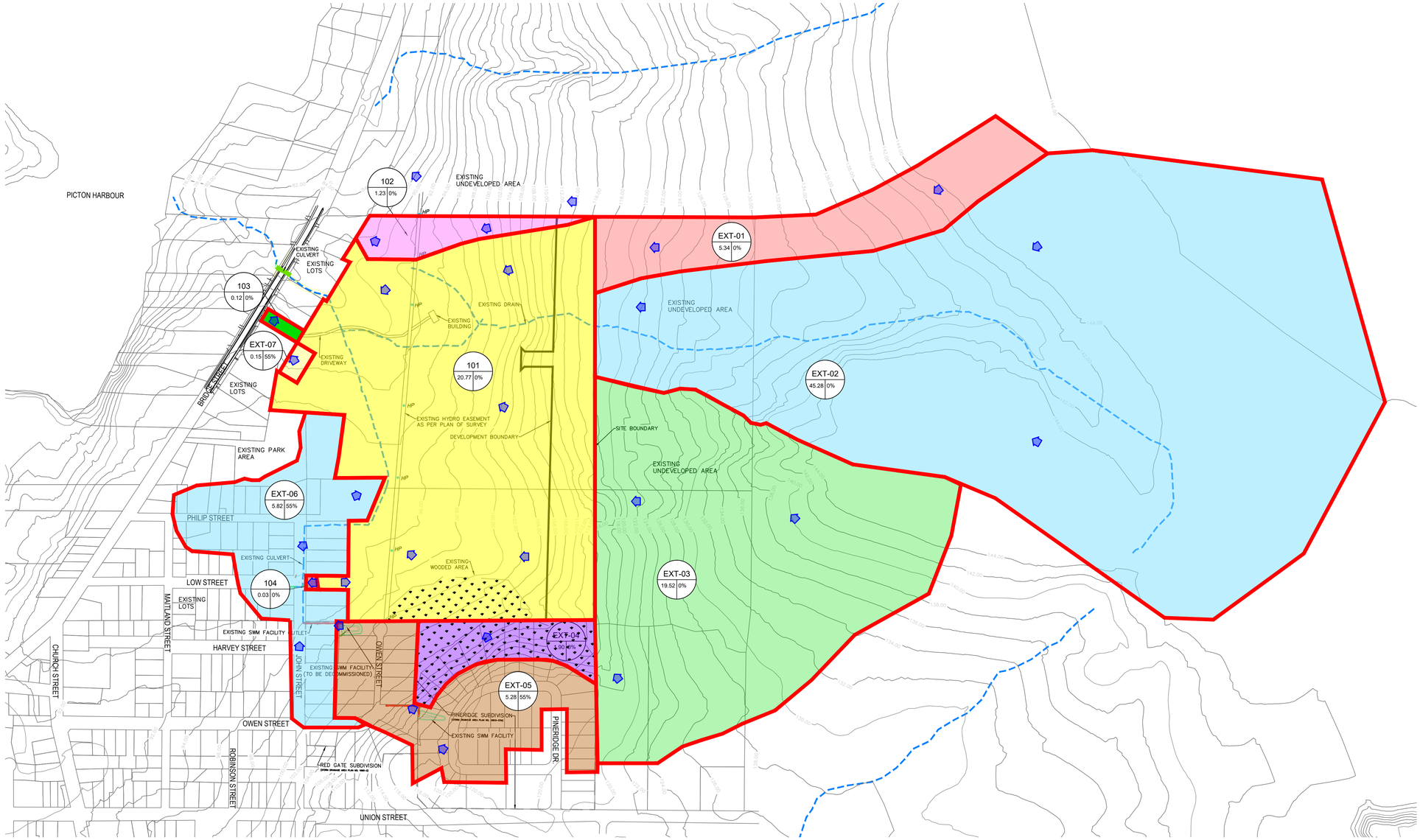
The proposed drainage areas are shown in the attached drawing C101. The property will be developed as a residential subdivision. On-site stormwater quantity and quality control will be provided within a proposed stormwater management pond to be located at the northwest limit of the subdivision.

All surface drainage will be routed via a proposed storm sewer and overland flow to the stormwater management pond. The drainage will also allow the external area to continue to drain through the property to the proposed stormwater management pond. The stormwater management pond will outlet toward Picton Bay via the existing watercourse.

6 Stormwater Management

The stormwater management criteria for this development are based on Quinte Conservation Authority and Prince Edward County requirements as follows:

- Stormwater management for quantity control is required to control proposed conditions peak flows to existing conditions levels for the 2 year to the 100 year storm events;
- Drainage from external areas must be accounted for in the stormwater management design; and
- Stormwater management for quality control is required to an Enhanced Protection Level as per MECP standards.



NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

1:3000

50 0 50 100 150 m

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

LEGEND

- DEVELOPMENT BOUNDARY
- EXISTING DRAINAGE PATH
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR
- EXISTING CULVERT
- HP - EXISTING HYDROPOLE
- EXT-04 / 8.24 / 55% — CATCHMENT AREA NUMBER; % IMPERVIOUSNESS; AREA (ha)
- EXISTING DRAINAGE DIRECTION
- WOODED AREA

IBI GROUP
Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

Drawing Title:
SWM FIGURE #01 - EXISTING STORMWATER CATCHMENT AREAS

Designed: M.M	Scale: 1:3000
Drawn By: M.H.	Drawing File: 115791_SWM Fig#01 - Ex SWM Catchment Areas.dwg
Checked: M.M.	Project No.: 115791
Date: JAN. 2023	Drawing No.: C402

\\Comcast.ibigroup.com\V\TO\115791_HildenPicton\5.0 Drawings\Civil\Layouts\[SWM Exhibits\115791_SWM Fig#01 - Ex SWM Catchment Areas.dwg 2023-01-13 1:52 PM Maryam Haj Mir Fatah

PICTON HARBOUR

EXISTING UNDEVELOPED AREA

EXISTING CULVERT

EXISTING LOTS

EXISTING DRAINAGE

103
0.18 | 55%

EXT-07
0.15 | 55%

BRIDGE STREET

EXISTING LOTS

EXISTING PARK AREA

EXT-06
5.82 | 55%

PHILIP STREET

EXISTING LOTS

102
0.03 | 55%

LOW STREET

EXISTING DITCH AND CULVERT

EXISTING LOTS

EXISTING SWM FACILITY OUTLET

MAITLAND STREET

CHURCH STREET

EXISTING SWM FACILITY (TO BE DECOMMISSIONED)

HARVEY STREET

JOHN STREET

EXT-05b
0.62 | 55%

OWEN STREET

OWEN STREET

ROBINSON STREET

RED GATE SUBDIVISION

UNION STREET

PROPOSED UNDERGROUND ROUTE FOR EXISTING HYDRO LINE

DEVELOPMENT BOUNDARY

101
18.16 | 55%

104
3.78 | 0%

SITE BOUNDARY

EXISTING UNDEVELOPED AREA

EXT-01
5.34 | 0%

EXISTING UNDEVELOPED AREA

GRADE THE DRAINAGE ON EASTERN BOUNDARY TOWARD THIS POINT

EXT-02
45.28 | 0%

EXISTING UNDEVELOPED AREA

EXT-03
19.52 | 0%

EXISTING WOODED AREA

EXT-04
1.90 | 0%

EXT-05a
4.67 | 55%

PINERIDGE SUBDIVISION

EXISTING SWM FACILITY

PINERIDGE DR.

NOTE:
EXISTING CONTOUR INFORMATION WITHIN THE SITE BOUNDARY HAS BEEN DERIVED FROM TOPOGRAPHIC FIELD SURVEY.
EXTERNAL AREAS CONTOUR INFORMATION HAS BEEN DERIVED FROM LIDAR AND GIS CONTOURS DATA.

1:3000

50 0 50 100 150 m

No.	By	Date	Revisions
1	MM	2023-01-XX	ISSUED FOR FSR APPROVAL

LEGEND

- DEVELOPMENT BOUNDARY
- CATCHMENTS AREA BOUNDARY
- EXISTING CONTOUR
- EXISTING CULVERT
- UNDERGROUND HYDRO LINE
- EXT-04 (8.24 | 55%) — CATCHMENT AREA NUMBER; % IMPERVIOUSNESS; AREA (ha)
- EXISTING DRAINAGE DIRECTION
- PROPOSED DRAINAGE DIRECTION
- EXISTING DRAINAGE PATH
- WOODED AREA

IBI GROUP
Unit 6 - 61 Hyperion Court
Kingston ON K7K 7K7 Canada
tel 613 531 4440
ibigroup.com

Project Title:
HILDEN HOMES
TULIP ESTATES SUBDIVISION
PRINCE EDWARD COUNTY

Drawing Title:
SWM FIGURE #02 - PROPOSED STORMWATER CATCHMENT AREAS

Designed : M.M	Scale: 1:3000
Drawn By: M.H.	Drawing File: 115791_SWM Fig#02 - Post-Dev Condition SWM Figure.dwg
Checked: M.M.	Project No.: 115791
Date: JAN. 2023	Drawing No.: C403

6.1 Stormwater Quantity Control

Six-hour duration Chicago-style storms derived from Atmospheric Environment Service IDF curves for Picton were used for the stormwater management modelling. The total depths of rainfall for the modelled storms are indicated in Table 1.

Table 1: Rainfall Depths

RETURN EVENT	STORM DURATION (HOURS)	RAINFALL DEPTH (MM)
2 Year	6	33.6
5 Year	6	46.1
10 Year	6	54.6
25 Year	6	63.0
50 Year	6	72.6
100 Year	6	80.4

Table 2: Visual OTTHYMO Modelling Variables

CATCHMENT ID	DESCRIPTION	AREA (HA)	TP (MIN.)	GRADIENT (%)	XIMP/TIMP	MANNING 'N'	PERVIOUS CN
EXISTING CONDITIONS							
101	Undeveloped Site	20.77	0.32	-	-	0.250	72
102	Undeveloped Site	1.23	0.10	-	-	0.250	72
EXT-01	External Undeveloped	5.34	0.49	-	-	0.250	72
EXT-02	External Undeveloped	45.28	0.73	-	-	0.250	72
EXT-03	External Undeveloped	19.62	0.34	-	-	0.250	72
EXT-04	External Undeveloped	1.90	0.14	-	-	0.250	72
EXT-05	External Residential	5.28	-	1	0.55	0.250	72
Total		**99.42**					
PROPOSED CONDITIONS							
201	Subdivision Area to Pond	22.16	-	1	0.55	0.250	72
EXT-01	External Undeveloped	5.34	0.49	-	-	0.250	72
EXT-02	External Undeveloped	45.28	0.73	-	-	0.250	72
EXT-03	External Undeveloped	19.62	0.34	-	-	0.250	72
EXT-04	External Undeveloped	1.90	0.14	-	-	0.250	72
EXT-05	External Residential	4.67	-	1	0.55	0.250	72
EXT-06	External Residential	0.62	-	1	0.55	0.250	72
Total		**99.59**					

Note that Area EXT-07 (existing residential) on Drawing C101 will be routed to the west to its existing outlet location and will bypass the stormwater management pond. The design of the conveyance will be completed as part of the detailed design stage.

Active surface storage of 10,786 m^3 will be provided within the proposed stormwater management pond, with orifice controls at the pond outlet providing peak flow control for minor storms and major storms. An overflow spillway will be provided to control major storms. The pond also includes 4,536 m^3 of permanent pool storage below the outlet elevation to provide stormwater quality control.

Minor and major flows from the proposed stormwater management pond will outlet to the existing watercourse located between the residential lots to the west, which drains to Picton Bay. The pond outlet elevation of 88.60m will be situated above the highest downstream channel elevation of 87.65 m, which will prevent any backwater impacts of the channel on the pond outlet hydraulics.

Existing and proposed conditions peak flows are shown in Table 3 and include contributions from external areas to the east and south.

Table 3: Peak Flows

RETURN EVENT	EXISTING CONDITIONS	PROPOSED CONDITIONS
	PEAK FLOW (M^3/S)	PEAK FLOW (M^3/S)
2 Year	0.695	0.523
5 Year	1.410	0.870
10 Year	2.017	1.486
25 Year	2.712	2.151
50 Year	3.528	2.951
100 Year	4.270	3.649

As indicated in Table 3, proposed conditions peak flows for the 2 year to the 100 year storm events will be attenuated to below existing conditions levels. The ponding characteristics are summarized in Table 4. The pond stage-storage-discharge calculations are included in Appendix A, and the Visual OTTHYMO model schematic and output are included in Appendix B.

Table 4: Ponding Characteristics

RETURN EVENT	PONDING DEPTH (M(	PONDING ELEVATION (M)	PONDING VOLUME (M^3)
2 Year	0.74	89.34	3,567
5 Year	1.28	89.88	6,650
10 Year	1.48	90.08	7,892
25 Year	1.59	90.19	8,661
50 Year	1.72	90.32	9,396
100 Year	1.79	90.39	9,967

* Normal Water Level = 88.60m

6.2 Stormwater Quality Control

The criteria provided by the Municipality and the Conservation Authority require that an Enhanced Protection Level for stormwater quality control be provided as outlined by the Ministry of Environment Stormwater Management Planning and Design Manual (MECP, 2003).

Stormwater quality control will be provided for the residential areas using a wet pond configuration. Based on an imperviousness level of 55 percent for a total drainage area of 26.83 ha (Areas 201, EXT-5), the required water quality storage volumes as per Table 3.2 of MECP (2003) are as follows:

- Total Required Quality Volume = 190 m^3/ha, based on a 55% impervious level;
- Required Extended Detention Storage = 40 m^3/ha (applied to entire drainage area);
- Required Permanent Pool Storage = 150 m^3/ha (applied to 55% impervious areas only).

The 40 m^3/ha extended detention volume is applied to the entire drainage area of the pond (98.97 ha), for a minimum required volume of 3,959 m^3.

The 150 m^3/ha permanent pool volume is applied only to the 55% impervious level catchments 201 and EXT-05 (26.83 ha), for a minimum required volume of 4,025 m^3.

The proposed wet pond design provides a permanent pool volume of 4,536 m^3 and an extended detention volume of 4,178 m^3, both of which exceed the required storage volumes. The extended detention storage is obtained at a depth of approximately 0.85m with a detention time of 27 hours.

The forebay invert is set at 86.60 m and the permanent pool elevation at 88.60 m so that a minimum depth of 2.00 m will be maintained in the forebay, and sediment re-suspension and scour will be minimized. Refer to Appendix C for stormwater quality calculations.

6.3 Stormwater Management Facilities

The stormwater management pond has been sized to provide the required storage volumes, and the grading and preliminary details have been provided on the engineering drawings. The total storage capacity of the pond is 15,322 m^3, of which active storage at 1.90m depth is 10,786 m^3.

The stormwater management pond will conform to the aesthetic standards established in MECP (2003) and by Prince Edward County. The maximum water level fluctuation for the 100 year storms is less than 1.90 m and the pond slopes are moderate (5:1 within the active pond area). Maintenance access routes will be provided to the inlet and outlet locations. A Landscape Plan complying with MECP (2003), Municipal, and Conservation Authority guidelines will be completed and submitted under a separate cover. Flows in excess of the 100 year storm event will spill from the pond to the downstream outlet.

7 Maintenance and Monitoring Program

7.1 Stormwater Management Facilities

Maintenance is important for any stormwater management facility to ensure its continued operation and efficiency. The maintenance requirements for the stormwater management facilities within this development will be based on information provided in MECP (2003).

The developer is responsible to demonstrate that the performance of stormwater management facilities during the maintenance period is in accordance with the Municipal and MECP standards for Monitoring and Operational procedures.

Monitoring will consist of the visual inspections of all stormwater management facilities as well as potentially sampling pond effluent if required. An annual monitoring Summary Report would be submitted to the Municipality at the end of the monitoring season, as required.

The Monitoring Program will also include regular inspections of the erosion and sediment control features during construction. Table 5 provides an overview of the monitoring requirements for stormwater management facilities. Note that additional monitoring may be required once comments have been received from the MECP.

Table 5: Monitoring Requirements

Facility	Task	During Construction		Subsequent Years	
		Frequency	Comments	Frequency	Comments
Stormwater Management Pond	Regular Inspection	After storm events (about 3 times/year)	General inspection of the facility	Once per year	General inspection of the facility, effluent sampling if required

7.1.1 Stormwater Management Pond

Monitoring and maintenance requirements for the pond will have several components:

- Regular inspections: The pond should be inspected regularly to ensure that it is operating as intended. During the first year, the pond should be inspected after each significant runoff event (3 times per year). During subsequent years, the pond should be inspected on an annual basis. The following items should be noted during the inspections:
    - Any noticeable damage to the pond structures (e.g., headwalls, trails, outlet structures, spreader outlet, maintenance access routes, etc.);
    - The condition of the vegetation in and around the pond;
    - If there is an oily sheen on the water, or if the water is frothy or is there any other indication of a spill; and
    - The pond is draining down within 72 hours.
    - If any of these checks uncover unusual results, then response actions are required as follows:
        - Effluent sampling for Total Suspended solids to determine if the pond is effective in removing/settling sediment;
        - Vegetation replanting: If the regular inspections reveal that the vegetation surrounding the pond is dead or dying, then it should be replaced with new material; and
        - Trash removal: During the regular inspections, any trash or debris in or around the facility and outlet should be collected and disposed of in an appropriate location.

8 Conclusions and Recommendations

This Stormwater Management Report demonstrates that the proposed conditions for the Tulip Estates Subdivision development satisfy the requirements for stormwater management established by the various review agencies and MECP (2003). It has been demonstrated that targets will be met as follows:

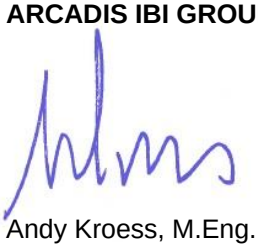
- A wet pond facility provided at the outlet of the drainage area will provide stormwater quantity control and stormwater quality control (to an Enhanced Protection Level), ensuring that peak flows do not exceed the existing target levels. The pond will meet MECP, Municipal, and Conservation Authority guidelines, and has accounted for drainage from external areas; and
- A monitoring and maintenance program has been provided.

Based on these conclusions, we recommend that this Preliminary Stormwater Management Report be accepted by the Review Agencies.

All of which is respectfully submitted.

Yours truly

ARCADIS IBI GROUP



Andy Kroess, M.Eng., P.Eng.
Senior Water Resources Engineer

Appendix A

Stormwater Quantity Calculations

6156533.txt
ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

DATA INTEGRATION DIVISION
LA DIVISION DU TRAITEMENT DES DONNEES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

****

TABLE 1 PICTON ONT 6156533

LATITUDE 4401 LONGITUDE 7708 ELEVATION/ALTITUDE 76 M

****

YEAR ANNEE	5 MIN	10 MIN	15 MIN	30 MIN	1 H	2 H	6 H	12 H	24 H
1966	7.6	10.2	10.7	11.4	20.1	20.1	34.3	40.1	40.1
1967	5.3	8.1	10.2	10.2	12.7	13.7	28.7	35.6	51.3
1968	6.6	10.2	13.5	14.5	18.8	28.2	41.1	61.5	70.1
1969	5.6	6.3	7.1	9.9	15.2	20.6	22.9	31.7	45.2
1970	7.4	8.9	11.4	18.8	33.0	50.5	52.1	57.7	62.2
1971	6.3	7.4	8.1	10.4	11.7	17.8	26.4	26.4	26.4
1972	12.4	15.2	17.8	25.4	29.0	33.8	41.7	41.9	41.9
1973	3.6	6.1	7.9	10.9	13.2	16.0	33.8	39.4	40.9
1974	2.5	4.1	4.8	9.1	11.9	16.5	25.9	30.5	33.0
1975	9.4	16.3	19.3	19.3	24.6	31.0	31.5	38.9	42.4
1976	22.1	31.0	43.2	46.0	49.3	56.1	74.2	74.2	74.2
1977	5.8	6.6	9.7	11.7	20.3	23.9	29.7	34.3	34.3
1978	4.3	5.8	7.5	12.9	14.2	21.0	39.8	43.3	43.3
1979	6.5	10.2	11.6	12.9	20.0	38.1	64.9	98.4	109.5
1980	7.3	12.7	17.5	23.3	34.5	53.5	67.5	67.8	75.0
1981	-99.9	-99.9	-99.9	20.8	26.2	29.4	40.0	45.0	55.2
1982	9.4	11.5	13.5	18.4	23.7	44.4	55.1	55.3	55.3
1983	11.5	16.0	22.9	26.3	26.4	26.4	26.4	26.4	30.4
1984	7.6	10.8	11.6	15.0	16.5	20.2	27.8	36.3	53.0
1985	5.0	7.6	9.6	13.2	20.0	32.8	33.8	33.8	34.0
1986	5.8	11.2	13.0	16.2	24.7	36.8	48.7	64.1	68.6
1987	4.4	7.8	10.7	12.7	14.5	17.2	29.7	35.0	48.8
1988	4.2	5.1	5.1	7.6	12.4	12.5	-99.9	-99.9	35.6
1989	4.7	6.0	8.7	9.1	18.2	32.4	47.4	48.0	48.0
1990	8.1	9.8	11.0	12.3	13.4	15.8	23.5	41.5	50.0
1991	4.5	7.2	8.0	11.1	12.4	13.4	16.4	22.9	29.5
1992	8.0	11.2	14.4	18.8	22.8	28.0	28.0	35.9	44.2
1994	8.4	12.8	16.0	24.8	30.0	33.8	40.6	42.8	45.0
# YRS. ANNEES	27	27	27	28	28	28	27	27	28
MEAN MOYENNE	7.2	10.2	12.8	16.2	21.1	28.0	38.2	44.8	49.5
STD. DEV. ECART-TYPE	3.8	5.3	7.4	7.9	8.7	12.3	14.5	16.9	17.7
SKEW DISSYMETRIE	2.52	2.46	2.81	2.16	1.40	.82	.99	1.50	1.57
KURTOSIS KURTOSIS	11.82	11.57	13.39	9.49	5.90	3.23	3.68	5.83	6.69

NOTE:-99.9 INDICATES MSG DATA
DONNEES MANQUANTES

WARNING / AVERTISSEMENT
YEAR 1976 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1976 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 22.1 100 YEAR/ANNEE = 19.0

WARNING / AVERTISSEMENT
YEAR 1976 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1976 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 31.0 100 YEAR/ANNEE = 26.8

WARNING / AVERTISSEMENT
YEAR 1976 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1976 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 43.2 100 YEAR/ANNEE = 36.1

WARNING / AVERTISSEMENT
YEAR 1976 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1976 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 46.0 100 YEAR/ANNEE = 41.0

WARNING / AVERTISSEMENT
YEAR 1976 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1976 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 49.3 100 YEAR/ANNEE = 48.3

WARNING / AVERTISSEMENT
YEAR 1979 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1979 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 98.4 100 YEAR/ANNEE = 97.7

WARNING / AVERTISSEMENT
YEAR 1979 HAD VALUE GREATER THAN 100 YEAR STORM.
EN 1979 L"INTENSITE DE LA PLUIE A DE PASSE
CELLE POUR UNE PERIODE DE RETOUR DE 100 ANS
DATA/LA VALEUR = 109.5 100 YEAR/ANNEE = 105.2

NOTE: -99.9 INDICATES LESS THAN 10 YEARS OF DATA AVAILABLE
INDIQUE MOINS DE 10 ANNEES DE DONNEES DISPONIBLES

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

****

TABLE 2 PICTON ONT 6156533

LATITUDE 4401 LONGITUDE 7708 ELEVATION/ALTITUDE 76 M

****

RETURN PERIOD RAINFALL AMOUNTS (MM)
PERIODE DE RETOUR QUANTITIES DE PLUIE (MM)

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS	# YEARS ANNEES
5 MIN	6.6	9.9	12.1	14.9	17.0	19.0	27
10 MIN	9.4	14.0	17.1	21.0	23.9	26.8	27
15 MIN	11.5	18.1	22.5	28.0	32.1	36.1	27
30 MIN	14.9	21.9	26.5	32.4	36.7	41.0	28
1 H	19.6	27.3	32.4	38.8	43.5	48.3	28
2 H	26.0	36.8	44.0	53.1	59.8	66.5	28
6 H	35.8	48.7	57.2	67.9	75.8	83.7	27
12 H	42.0	56.9	66.8	79.3	88.5	97.7	27
24 H	46.6	62.3	72.7	85.8	95.6	105.2	28

RETURN PERIOD RAINFALL RATES (MM/HR)-95% CONFIDENCE' LIMITS
INTENSITE DE LA PLUIE PAR PERIODE DE RETOUR (MM/H)-LIMITES DE CONFIANCE DE 95%

DURATION DUREE	2 YR/ANS	5 YR/ANS	10 YR/ANS	25 YR/ANS	50 YR/ANS	100 YR/ANS
5 MIN	78.9	118.9	145.5	179.0	203.8	228.5
	+/- 15.7	+/- 26.4	+/- 35.7	+/- 48.1	+/- 57.6	+/- 67.1
10 MIN	56.2	84.2	102.7	126.2	143.6	160.8
	+/- 11.0	+/- 18.5	+/- 25.0	+/- 33.7	+/- 40.3	+/- 46.9
15 MIN	46.2	72.5	90.0	112.0	128.3	144.6

	+/- 10.3	+/- 17.4	+/- 23.5	+/- 31.6	+/- 37.9	+/- 44.1
30 MIN	29.8	43.7	53.0	64.7	73.4	82.0
	+/- 5.4	+/- 9.1	+/- 12.2	+/- 16.5	+/- 19.8	+/- 23.0
1 H	19.6	27.3	32.4	38.8	43.5	48.3
	+/- 2.9	+/- 5.0	+/- 6.7	+/- 9.0	+/- 10.8	+/- 12.6
2 H	13.0	18.4	22.0	26.5	29.9	33.2
	+/- 2.1	+/- 3.5	+/- 4.7	+/- 6.4	+/- 7.7	+/- 8.9
6 H	6.0	8.1	9.5	11.3	12.6	14.0
	+/- .8	+/- 1.4	+/- 1.9	+/- 2.6	+/- 3.1	+/- 3.6
12 H	3.5	4.7	5.6	6.6	7.4	8.1
	+/- .5	+/- .8	+/- 1.1	+/- 1.5	+/- 1.8	+/- 2.1
24 H	1.9	2.6	3.0	3.6	4.0	4.4
	+/- .3	+/- .4	+/- .6	+/- .8	+/- .9	+/- 1.1

ATMOSPHERIC ENVIRONMENT SERVICE
SERVICE DE L"ENVIRONNEMENT ATMOSPHERIQUE

RAINFALL INTENSITY-DURATION FREQUENCY VALUES
INTENSITE, DUREE ET FREQUENCE DES PLUIES

GUMBEL - METHOD OF MOMENTS/METHODE DES MOMENTS - 1990

****

TABLE 3 PICTON ONT 6156533

LATITUDE 4401 LONGITUDE 7708 ELEVATION/ALTITUDE 76 M

****

INTERPOLATION EQUATION / EQUATION D"INTERPOLATION: R = A * T ** B
R = RAINFALL RATE / INTENSITE DE LA PLUIE (MM /HR)
T = TIME IN HOURS / TEMPS EN HEURES

STATISTICS STATISTIQUES	2 YR ANS	5 YR ANS	10 YR ANS	25 YR ANS	50 YR ANS	100 YR ANS
MEAN OF R MOYENNE DE R	28.3	42.2	51.5	63.1	71.8	80.4
STD. DEV. R ECART-TYPE	26.8	41.0	50.4	62.3	71.2	80.0
STD. ERROR ERREUR STANDARD	4.8	8.5	11.0	14.2	16.6	18.9
COEFF. (A) COEFFICIENT (A)	18.0	25.9	31.2	37.7	42.6	47.5
EXPONENT (B) EXPOSANT (B)	-.652	-.678	-.688	-.697	-.702	-.706
MEAN % ERROR % D'ERREUR	7.9	8.2	8.3	8.4	8.4	8.5

259.792 415.801 521.822 654.203 754.521 855,201

$i = \frac{18.0}{t^{0.652}}$

$18\,(60)^{0.652} = 259.792$

115791 - Tulip Estates Subdivision, Picton, ON
Time to Peak Calculations

	Area (ha)	C	L (m)	Elev. u/s (m)	Elev. d/s (m)	Sw (%)	Tc (hr)	Tp (hr)
Area 101	20.770	0.20	420	118.0	90.0	6.67	0.54	0.32
Area 102	1.230	0.20	100	118.0	95.0	23.00	0.17	0.10

Time of Concentration (Airport Method)
Tc = 3.26*(1.1-C)*(L^0.5)/Sw^0.33

HildenPicton Subdivision
Picton, ON

ARCADIS | IBI GROUP

Project Number: 115791
Date: January 18, 2023
Design By: MM

Time to Peak

External Area 01 (EXT-01) - Pre-Development Conditions:

Sub-Catchment Number	Area (ha)	C	AxC		CN		IA		Comments
EXT-01	5.340	0.25	1.335		72	384.480	5	26.700	Fallow Row Corps Good Contoured is Adopted

Area A	5.34	ha	Width of Catchment Area	61.57	m	
Composite C	0.25		Length of Catchment Area	674.53	m	
Length L =	(Area/Width-to-Length Ratio)$^{0.5}$		Width-to-Length Ratio	0.0912784		
Length L	764.87	m	Estimated Upstream Elevation	148	m	
Slope S	3.922		Estimated Downstream Elevation	118	m	
Composite CN	72					
Composite I	5.00					

Airport Method

$$Tc = \frac{3.26(1.1-C)L^{0.5}}{S^{0.33}}$$

Tc = Time of Concentration (min)
C = Runoff Coefficient
L = Catchment Length (m)
S = Catchment Slope (%)

Tc =	48.82	min
Tp =	**0.49**	**hr**

External Area 02 (EXT-02) - Pre-Development Conditions:

Sub-Catchment Number	Area (ha)	C	AxC		CN		IA		Comments
EXT-02	45.280	0.25	11.320		72	3260.160	5	226.400	Fallow Row Corps Good Contoured is Adopted

Area A	45.28	ha	Width of Catchment Area	356.47	m	
Composite C	0.25		Length of Catchment Area	1145.86	m	
Length L =	(Area/Width-to-Length Ratio)$^{0.5}$		Width-to-Length Ratio	0.3110939		
Length L	1206.44	m	Estimated Upstream Elevation	146	m	
Slope S	2.321		Estimated Downstream Elevation	118	m	
Composite CN	72					
Composite I	5.00					

Airport Method

$$Tc = \frac{3.26(1.1-C)L^{0.5}}{S^{0.33}}$$

Tc = Time of Concentration (min)
C = Runoff Coefficient
L = Catchment Length (m)
S = Catchment Slope (%)

Tc =	72.9	min
Tp =	**0.73**	**hr**

External Area 03 (EXT-03) - Pre-Development Conditions:

Sub-Catchment Number	Area (ha)	C	AxC		CN		IA		Comments
EXT-03	19.620	0.25	4.905		75	1471.500	5	98.100	Fallow Row Corps Good Contoured is Adopted

Area A	19.62	ha	Width of Catchment Area	411.64	m	
Composite C	0.25		Length of Catchment Area	533.39	m	
Length L =	(Area/Width-to-Length Ratio)$^{0.5}$		Width-to-Length Ratio	0.771743		
Length L	504.21	m	Estimated Upstream Elevation	147	m	
Slope S	6.347		Estimated Downstream Elevation	115	m	
Composite CN	75					
Composite I	5.00					

Airport Method

$$Tc = \frac{3.26(1.1-C)L^{0.5}}{S^{0.33}}$$

Tc = Time of Concentration (min)
C = Runoff Coefficient
L = Catchment Length (m)
S = Catchment Slope (%)

Tc =	33.81	min
Tp =	**0.34**	**hr**

115791 - Tulip Estates Subdivision, Picton, ON
Stormwater Management Pond Stage-Storage-Discharge Relationship

Orifice # 1 (Quality Extended Detention Control)

Orifice Invert =	88.60	m
Orifice Radius =	0.125	m
Orifice Diameter =	250	mm
Orifice Centreline =	88.72	m
Orifice Coefficient =	0.6	
Opening Area =	0.0491	m^2

Orifice # 2 (Minor Quantity Control)

Orifice Invert =	88.50	m
Orifice Radius =	0.300	m
Orifice Diameter =	600	mm
Orifice Centreline =	88.800	m
Orifice Coefficient =	0.6	
Opening Area =	0.2827	m^2

Overflow Weir (Major Quantity Control)

Weir Crest Elevation =	89.90	m
Weir Length =	5.00	m
Weir Coefficient =	1.6	

Orifice equation: $Q = C_o \times A \times (2 \times g \times h)^{0.5}$

Weir equation: $Q = C_w \times L \times H^{1.5}$

where:

A = orifice area (m^2)
g = 9.806 m/s^2
h = head above c/l of orifice (m)
L = weir length (m)
H = head above weir crest (m)

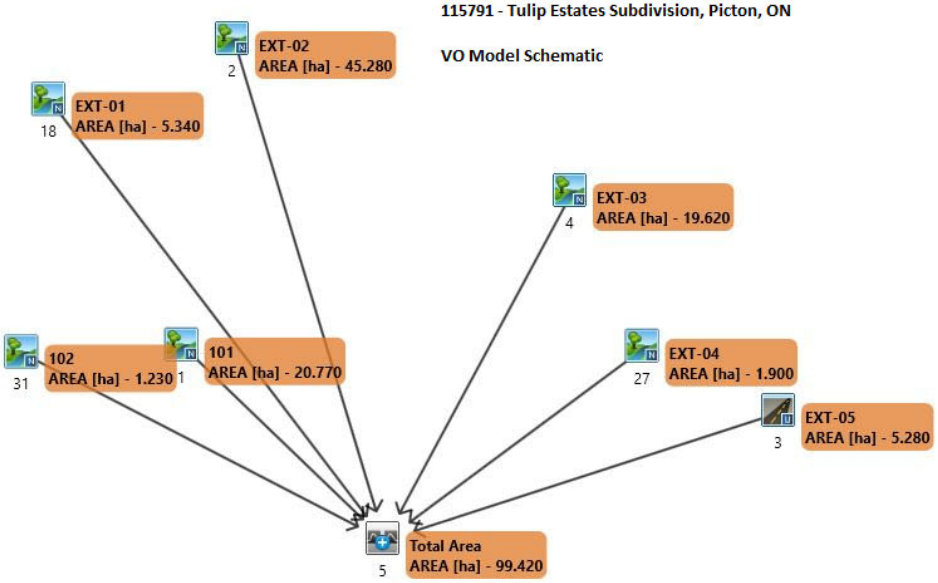
Active Depth (m)	Elevation (m)	Description	Orifice #1 Flow (m^3/s)	Orifice #2 Flow (m^3/s)	Weir Flow (m^3/s)	Total Flow (m^3/s)	Total Storage (m^3)	Active Storage (m^3)	Detention (hours)
-	86.60	Forebay Invert Elevation				-	0	-	
-	86.70						37	-	
-	86.80						79	-	
-	86.90					-	124	-	
-	87.00					-	173	-	
-	87.10					-	228	-	
-	87.20					-	409	-	
-	87.30					-	603	-	
-	87.40					-	812	-	
-	87.50					-	1035	-	
-	87.60					-	1272	-	
-	87.70					-	1525	-	
-	87.80					-	1793	-	
-	87.90					-	2077	-	
-	88.00					-	2377	-	
-	88.10					-	2693	-	
-	88.20					-	3026	-	
-	88.30					-	3377	-	
-	88.40					-	3745	-	
-	88.50					-	4131	-	
0.00	88.60	Normal Water Level	0.0000	0.0000	0.0000	0.0000	4536	0	0.0
0.05	88.65	Orifice #1 Operates	0.0100	0.0000	0.0000	0.0100	4754	218	12.1
0.10	88.70		0.0150	0.0000	0.0000	0.0150	4975	440	17.0
0.15	88.75		0.0206	0.0000	0.0000	0.0206	5200	665	20.5
0.20	88.80		0.0357	0.0000	0.0000	0.0357	5428	893	22.8
0.25	88.85		0.0461	0.0000	0.0000	0.0461	5660	1125	24.4
0.30	88.90		0.0546	0.0000	0.0000	0.0546	5895	1360	25.7
0.35	88.95	Orifice # 2 Operates	0.0000	0.2910	0.0000	0.2910	6134	1598	26.1
0.40	89.00		0.0000	0.3360	0.0000	0.3360	6376	1841	26.3
0.45	89.05		0.0000	0.3756	0.0000	0.3756	6622	2086	26.5
0.50	89.10		0.0000	0.4115	0.0000	0.4115	6871	2335	26.6
0.55	89.15		0.0000	0.4445	0.0000	0.4445	7123	2588	26.8
0.60	89.20		0.0000	0.4751	0.0000	0.4751	7380	2844	27.0
0.65	89.25		0.0000	0.5040	0.0000	0.5040	7639	3104	27.1
0.70	89.30		0.0000	0.5312	0.0000	0.5312	7902	3367	27.2
0.75	89.35		0.0000	0.5572	0.0000	0.5572	8169	3634	27.4
0.80	89.40		0.0000	0.5819	0.0000	0.5819	8440	3904	27.5
0.85	89.45	Extended Detention	0.0000	0.6057	0.0000	0.6057	8714	4178	27.6
0.90	89.50		0.0000	0.6286	0.0000	0.6286	8991	4456	27.8
0.95	89.55		0.0000	0.6506	0.0000	0.6506	9272	4737	27.9
1.00	89.60		0.0000	0.6719	0.0000	0.6719	9557	5022	28.0
1.05	89.65		0.0000	0.6926	0.0000	0.6926	9846	5310	28.1
1.10	89.70		0.0000	0.7127	0.0000	0.7127	10138	5602	28.2
1.15	89.75		0.0000	0.7322	0.0000	0.7322	10434	5898	28.4
1.20	89.80		0.0000	0.7513	0.0000	0.7513	10733	6197	28.5
1.25	89.85		0.0000	0.7698	0.0000	0.7698	11036	6501	28.6
1.30	89.90	Spill Elevation	0.0000	0.7879	0.0000	0.7879	11343	6808	28.7
1.35	89.95		0.0000	0.8056	0.0894	0.8951	11654	7118	28.8
1.40	90.00		0.0000	0.8230	0.2530	1.0759	11968	7433	28.9
1.45	90.05		0.0000	0.8399	0.4648	1.3047	12287	7751	28.9
1.50	90.10		0.0000	0.8566	0.7155	1.5721	12608	8073	29.0
1.55	90.15		0.0000	0.8729	1.0000	1.8729	12934	8399	29.1
1.60	90.20		0.0000	0.8889	1.3145	2.2034	13264	8728	29.1
1.65	90.25		0.0000	0.9046	1.6565	2.5611	13597	9062	29.1
1.70	90.30		0.0000	0.9201	2.0239	2.9440	13934	9399	29.2
1.75	90.35		0.0000	0.9353	2.4150	3.3503	14275	9740	29.2
1.80	90.40		0.0000	0.9503	2.8284	3.7787	14620	10085	29.2
1.85	90.45		0.0000	0.9650	3.2631	4.2281	14969	10433	29.3
1.90	90.50		0.0000	0.9795	3.7181	4.6976	15322	10786	29.3

Appendix B

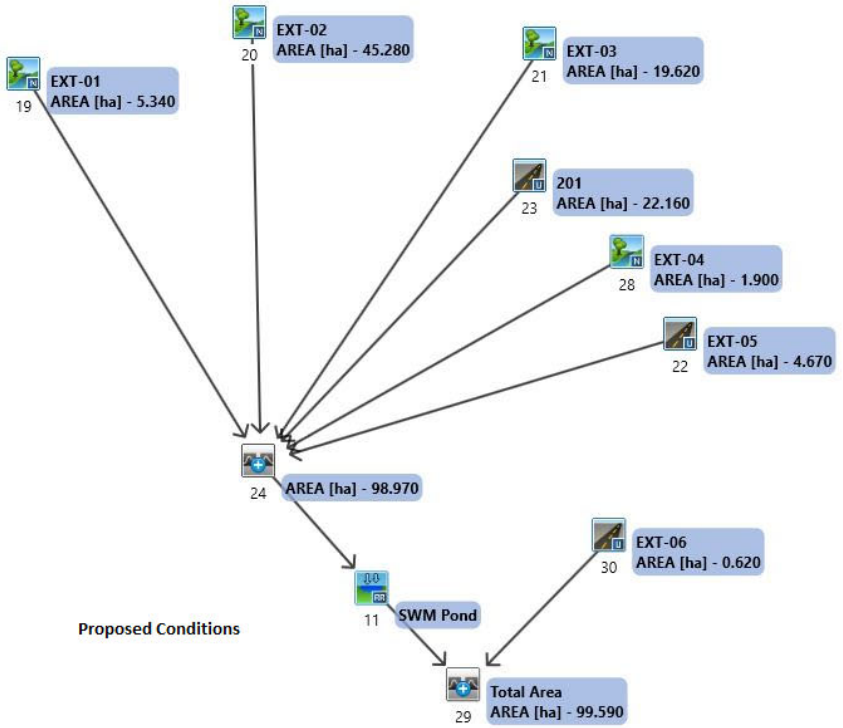
Visual OTTHYMO Model Output

115791 - Tulip Estates Subdivision, Picton, ON

VO Model Schematic



Existing Conditions



Proposed Conditions

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

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DATE: 12-21-2022                          TIME: 12:52:43

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  **********************************************
  ** SIMULATION : 25mm Storm                   **
  **********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 509.000
| Ptotal= 25.04 mm |                          B=   6.000
--------------------                          C=   0.799
```

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

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.40

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	1.47	1.00	4.03	2.00	5.77	3.00	2.08
0.08	1.54	1.08	4.82	2.08	4.98	3.08	1.98
0.17	1.63	1.17	6.04	2.17	4.38	3.17	1.89
0.25	1.72	1.25	8.13	2.25	3.92	3.25	1.81
0.33	1.83	1.33	12.55	2.33	3.55	3.33	1.74
0.42	1.96	1.42	27.24	2.42	3.25	3.42	1.67
0.50	2.11	1.50	74.95	2.50	3.00	3.50	1.61
0.58	2.28	1.58	31.45	2.58	2.79	3.58	1.56
0.67	2.49	1.67	16.84	2.67	2.61	3.67	1.50
0.75	2.74	1.75	11.37	2.75	2.45	3.75	1.46
0.83	3.06	1.83	8.58	2.83	2.31	3.83	1.41
0.92	3.47	1.92	6.89	2.92	2.19	3.92	1.37

CALIB NASHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 20.77 Curve Number (CN)= 72.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.32

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 0.158 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 3.379
TOTAL RAINFALL (mm)= 25.039
RUNOFF COEFFICIENT = 0.135

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

CALIB NASHYD (0002) | ID= 1 DT= 5.0 min	Area (ha)= 45.28 Curve Number (CN)= 72.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.73

Unit Hyd Qpeak (cms)= 2.369

PEAK FLOW (cms)= 0.202 (i)
TIME TO PEAK (hrs)= 2.583

```
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.143 (i)
     TIME TO PEAK    (hrs)=   2.000
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.031 (i)
     TIME TO PEAK    (hrs)=   2.250
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   5.28
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
```

```
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.95         5.77
               over (min)         5.00        30.00
     Storage Coeff.  (min)=       4.18 (ii)   26.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.24         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.48         0.02         0.479 (iii)
     TIME TO PEAK    (hrs)=       1.58         2.08          1.58
     RUNOFF VOLUME    (mm)=      24.04         4.53         15.26
     TOTAL RAINFALL   (mm)=      25.04        25.04         25.04
     RUNOFF COEFFICIENT   =       0.96         0.18          0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.027 (i)
     TIME TO PEAK    (hrs)=   1.667
     RUNOFF VOLUME    (mm)=   3.292
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.131

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.012 (i)
```

```
     TIME TO PEAK    (hrs)=   1.833
     RUNOFF VOLUME    (mm)=   3.373
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

```
--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   0.158     2.00     3.38
      + ID2= 2 (  0018):     5.34   0.031     2.25     3.38
        ================================================
        ID = 3 (  0005):    26.11   0.184     2.00     3.38

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   0.184     2.00     3.38
      + ID2= 2 (  0002):    45.28   0.202     2.58     3.38
        ================================================
        ID = 1 (  0005):    71.39   0.340     2.25     3.38

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

```
--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   0.340     2.25     3.38
      + ID2= 2 (  0027):     1.90   0.027     1.67     3.29
        ================================================
        ID = 3 (  0005):    73.29   0.347     2.25     3.38

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   0.347     2.25     3.38
```

```
      + ID2= 2 (  0003):     5.28   0.479     1.58    15.26
        ==================================================
        ID = 1 (  0005):    78.57   0.529     1.58     4.18

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   0.529     1.58     4.18
      + ID2= 2 (  0031):     1.23   0.012     1.83     3.37
        ==================================================
        ID = 3 (  0005):    79.80   0.533     1.58     4.16

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   0.533     1.58     4.16
      + ID2= 2 (  0004):    19.62   0.143     2.00     3.38
        ==================================================
        ID = 1 (  0005):    99.42   0.559     2.08     4.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.95         5.77
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       2.20 (ii)   24.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.30         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.00          0.067 (iii)
     TIME TO PEAK    (hrs)=       1.58         2.00           1.58
```

```
     RUNOFF VOLUME    (mm)=      24.04         4.53         15.24
     TOTAL RAINFALL   (mm)=      25.04        25.04         25.04
     RUNOFF COEFFICIENT   =       0.96         0.18          0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.031 (i)
     TIME TO PEAK    (hrs)=   2.250
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.202 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.143 (i)
     TIME TO PEAK    (hrs)=   2.000
     RUNOFF VOLUME    (mm)=   3.379
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.135

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   4.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.57         2.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     176.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.95         5.77
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       4.03 (ii)   26.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.24         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.43         0.02         0.429 (iii)
     TIME TO PEAK    (hrs)=       1.58         2.08          1.58
     RUNOFF VOLUME    (mm)=      24.04         4.53         15.26
     TOTAL RAINFALL   (mm)=      25.04        25.04         25.04
     RUNOFF COEFFICIENT   =       0.96         0.18          0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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 (  0023)|   Area    (ha)=  22.16
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      12.19         9.97
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     384.36        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.95         5.77
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       6.43 (ii)   28.52 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.18         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.67         0.09          1.683 (iii)
     TIME TO PEAK    (hrs)=       1.58         2.08           1.58
     RUNOFF VOLUME    (mm)=      24.04         4.53          15.26
     TOTAL RAINFALL   (mm)=      25.04        25.04          25.04
     RUNOFF COEFFICIENT   =       0.96         0.18           0.61


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0028)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.027 (i)
     TIME TO PEAK    (hrs)=   1.667
     RUNOFF VOLUME    (mm)=   3.292
     TOTAL RAINFALL   (mm)=  25.039
     RUNOFF COEFFICIENT   =   0.131

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

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0019):     5.34   0.031     2.25     3.38
      + ID2= 2 (  0020):    45.28   0.202     2.58     3.38
        ================================================
        ID = 3 (  0024):    50.62   0.229     2.50     3.38

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


--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0024):    50.62   0.229     2.50     3.38
      + ID2= 2 (  0021):    19.62   0.143     2.00     3.38
        ================================================
        ID = 1 (  0024):    70.24   0.334     2.25     3.38

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


--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0024):    70.24   0.334     2.25     3.38
      + ID2= 2 (  0022):     4.67   0.429     1.58    15.26
        ================================================
        ID = 3 (  0024):    74.91   0.456     1.58     4.12

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


--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0024):    74.91   0.456     1.58     4.12
      + ID2= 2 (  0023):    22.16   1.683     1.58    15.26
        ================================================
        ID = 1 (  0024):    97.07   2.139     1.58     6.66

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


--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0024):    97.07   2.139     1.58     6.66
```

```
      + ID2= 2 (  0028):     1.90   0.027     1.67     3.29
        ================================================
        ID = 3 (  0024):    98.97   2.158     1.58     6.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      2.158      1.58       6.60
   OUTFLOW: ID= 1 (  0011)     98.970      0.477      2.75       6.59

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.12
                  TIME SHIFT OF PEAK FLOW         (min)= 70.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2867

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):    98.97   0.477     2.75     6.59
      + ID2= 2 (  0030):     0.62   0.067     1.58    15.24
        ================================================
        ID = 3 (  0029):    99.59   0.481     2.67     6.65

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

 FINISH
================================================================================
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```

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================================================================================
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       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
C:\Users\andy.kroess\AppData\Local\Civica\VH5\56243236-036e-4408-aa5c-c6562e26430b\
66eba1b5-f2db-481e-a657-ccefedae8521\
  Summary filename:
C:\Users\andy.kroess\AppData\Local\Civica\VH5\56243236-036e-4408-aa5c-c6562e26430b\
66eba1b5-f2db-481e-a657-ccefedae8521\


DATE: 12-21-2022                          TIME: 12:52:40

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 2 Year - 6 Hour            **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 259.792
| Ptotal= 33.58 mm |                          B=   0.000
--------------------                          C=   0.652
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.01	1.50	5.54	3.00	4.53	4.50	2.58
0.08	2.07	1.58	6.46	3.08	4.32	4.58	2.53
0.17	2.13	1.67	7.88	3.17	4.13	4.67	2.48
0.25	2.20	1.75	10.56	3.25	3.96	4.75	2.43
0.33	2.28	1.83	18.79	3.33	3.81	4.83	2.39
0.42	2.36	1.92	90.97	3.42	3.67	4.92	2.34
0.50	2.45	2.00	22.78	3.50	3.55	5.00	2.30
0.58	2.55	2.08	14.83	3.58	3.43	5.08	2.26
0.67	2.66	2.17	11.52	3.67	3.32	5.17	2.22
0.75	2.79	2.25	9.61	3.75	3.22	5.25	2.19
0.83	2.93	2.33	8.35	3.83	3.13	5.33	2.15
0.92	3.09	2.42	7.43	3.92	3.05	5.42	2.12
1.00	3.27	2.50	6.74	4.00	2.97	5.50	2.09
1.08	3.48	2.58	6.19	4.08	2.89	5.58	2.06
1.17	3.74	2.67	5.74	4.17	2.82	5.67	2.03
1.25	4.04	2.75	5.36	4.25	2.76	5.75	2.00
1.33	4.42	2.83	5.04	4.33	2.70	5.83	1.97
1.42	4.90	2.92	4.77	4.42	2.64	5.92	1.94

CALIB NASHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 20.77	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.32	

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 0.188 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 6.411
TOTAL RAINFALL (mm)= 33.578
RUNOFF COEFFICIENT = 0.191

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

CALIB NASHYD (0002) ID= 1 DT= 5.0 min	Area (ha)= 45.28	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.259 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=   6.413
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.172 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=   6.411
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.038 (i)
     TIME TO PEAK    (hrs)=   2.667
     RUNOFF VOLUME    (mm)=   6.412
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      90.97         7.54
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       3.87 (ii)   23.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.25         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.57         0.03          0.574 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      32.58         7.86          21.45
     TOTAL RAINFALL   (mm)=      33.58        33.58          33.58
     RUNOFF COEFFICIENT   =       0.97         0.23           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.033 (i)
     TIME TO PEAK    (hrs)=   2.083
     RUNOFF VOLUME    (mm)=   6.246
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.186

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.014 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=   6.400
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

```
--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   0.188     2.42     6.41
      + ID2= 2 (  0018):     5.34   0.038     2.67     6.41
        ================================================
        ID = 3 (  0005):    26.11   0.222     2.42     6.41

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   0.222     2.42     6.41
      + ID2= 2 (  0002):    45.28   0.259     3.08     6.41
        ================================================
        ID = 1 (  0005):    71.39   0.423     2.75     6.41

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

```
--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   0.423     2.75     6.41
      + ID2= 2 (  0027):     1.90   0.033     2.08     6.25
        ================================================
        ID = 3 (  0005):    73.29   0.432     2.75     6.41

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   0.432     2.75     6.41
      + ID2= 2 (  0003):     5.28   0.574     2.00    21.45
        ================================================
        ID = 1 (  0005):    78.57   0.657     2.00     7.42

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   0.657     2.00     7.42
      + ID2= 2 (  0031):     1.23   0.014     2.17     6.40
        ================================================
        ID = 3 (  0005):    79.80   0.664     2.00     7.40

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   0.664     2.00     7.40
      + ID2= 2 (  0004):    19.62   0.172     2.42     6.41
        ================================================
        ID = 1 (  0005):    99.42   0.695     2.00     7.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      90.97         7.54
               over (min)        5.00        25.00
```

```
     Storage Coeff.  (min)=       2.04 (ii)   21.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.31         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00          0.081 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      32.58         7.86          21.43
     TOTAL RAINFALL   (mm)=      33.58        33.58          33.58
     RUNOFF COEFFICIENT   =       0.97         0.23           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.038 (i)
     TIME TO PEAK    (hrs)=   2.667
     RUNOFF VOLUME    (mm)=   6.412
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.259 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=   6.413
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191
```

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

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.172 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=   6.411
     TOTAL RAINFALL   (mm)=  33.578
     RUNOFF COEFFICIENT   =   0.191

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   4.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------

                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.57         2.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     176.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      90.97         7.54
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       3.73 (ii)   23.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.25         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.02          0.515 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.33           2.00
     RUNOFF VOLUME    (mm)=      32.58         7.86          21.45
     TOTAL RAINFALL   (mm)=      33.58        33.58          33.58
     RUNOFF COEFFICIENT   =       0.97         0.23           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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 (0023)	Area (ha)= 22.16				
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	12.19	9.97		
Dep. Storage	(mm)=	1.00	1.50		
Average Slope	(%)=	1.00	2.00		
Length	(m)=	384.36	40.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.	(mm/hr)=	90.97	7.54		
over	(min)	5.00	30.00		
Storage Coeff.	(min)=	5.95 (ii)	25.80 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	30.00		
Unit Hyd. peak	(cms)=	0.19	0.04		
				TOTALS	
PEAK FLOW	(cms)=	1.96	0.10	1.983 (iii)	
TIME TO PEAK	(hrs)=	2.00	2.42	2.00	
RUNOFF VOLUME	(mm)=	32.58	7.86	21.46	
TOTAL RAINFALL	(mm)=	33.58	33.58	33.58	
RUNOFF COEFFICIENT	=	0.97	0.23	0.64	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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				
NASHYD (0028)	Area (ha)=	1.90	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.10		
Unit Hyd Qpeak	(cms)=	0.726		
PEAK FLOW	(cms)=	0.033 (i)		
TIME TO PEAK	(hrs)=	2.083		
RUNOFF VOLUME	(mm)=	6.246		
TOTAL RAINFALL	(mm)=	33.578		
RUNOFF COEFFICIENT	=	0.186		

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

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0019):     5.34   0.038     2.67     6.41
     + ID2= 2 (  0020):    45.28   0.259     3.08     6.41
       ================================================
       ID = 3 (  0024):    50.62   0.292     3.00     6.41

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

--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0024):    50.62   0.292     3.00     6.41
     + ID2= 2 (  0021):    19.62   0.172     2.42     6.41
       ================================================
       ID = 1 (  0024):    70.24   0.417     2.75     6.41

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    70.24   0.417     2.75     6.41
     + ID2= 2 (  0022):     4.67   0.515     2.00    21.45
       ================================================
       ID = 3 (  0024):    74.91   0.561     2.00     7.35

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

--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0024):    74.91   0.561     2.00     7.35
     + ID2= 2 (  0023):    22.16   1.983     2.00    21.46
       ================================================
       ID = 1 (  0024):    97.07   2.545     2.00    10.57

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

```
--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0024):    97.07   2.545     2.00    10.57
      + ID2= 2 (  0028):     1.90   0.033     2.08     6.25
        ================================================
        ID = 3 (  0024):    98.97   2.574     2.00    10.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      2.574      2.00      10.49
   OUTFLOW: ID= 1 (  0011)     98.970      0.548      3.58      10.48

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.28
                  TIME SHIFT OF PEAK FLOW         (min)= 95.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.3567

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):    98.97   0.548     3.58    10.48
      + ID2= 2 (  0030):     0.62   0.081     2.00    21.43
        ================================================
        ID = 3 (  0029):    99.59   0.553     3.58    10.55

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

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
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66511daf-e9dd-4489-8aa0-05343ee09e34\
  Summary filename:
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66511daf-e9dd-4489-8aa0-05343ee09e34\


DATE: 12-21-2022                          TIME: 12:52:41

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 5 Year - 6 Hour            **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 415.801
| Ptotal= 46.12 mm |                          B=   0.000
--------------------                          C=   0.678
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.56	1.50	7.35	3.00	5.95	4.50	3.32
0.08	2.64	1.58	8.61	3.08	5.66	4.58	3.25
0.17	2.72	1.67	10.59	3.17	5.41	4.67	3.18
0.25	2.82	1.75	14.35	3.25	5.18	4.75	3.12
0.33	2.92	1.83	26.18	3.33	4.97	4.83	3.06
0.42	3.03	1.92	139.63	3.42	4.78	4.92	3.00
0.50	3.15	2.00	31.95	3.50	4.61	5.00	2.94
0.58	3.28	2.08	20.43	3.58	4.46	5.08	2.89
0.67	3.43	2.17	15.71	3.67	4.31	5.17	2.84
0.75	3.59	2.25	13.02	3.75	4.18	5.25	2.79
0.83	3.78	2.33	11.24	3.83	4.06	5.33	2.75
0.92	4.00	2.42	9.96	3.92	3.94	5.42	2.70
1.00	4.24	2.50	9.00	4.00	3.84	5.50	2.66
1.08	4.53	2.58	8.23	4.08	3.74	5.58	2.62
1.17	4.87	2.67	7.61	4.17	3.64	5.67	2.58
1.25	5.29	2.75	7.09	4.25	3.55	5.75	2.54
1.33	5.80	2.83	6.66	4.33	3.47	5.83	2.51
1.42	6.46	2.92	6.28	4.42	3.39	5.92	2.47

CALIB					
NASHYD (0001)	Area (ha)=	20.77	Curve Number (CN)=	72.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.32			

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 0.412 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 12.080
TOTAL RAINFALL (mm)= 46.115
RUNOFF COEFFICIENT = 0.262

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

CALIB					
NASHYD (0002)	Area (ha)=	45.28	Curve Number (CN)=	72.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.537 (i)
     TIME TO PEAK    (hrs)=   3.000
     RUNOFF VOLUME    (mm)=  12.084
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.375 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=  12.081
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.081 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  12.083
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     139.63        17.88
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       3.26 (ii)   17.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.92         0.06          0.942 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.25           2.00
     RUNOFF VOLUME    (mm)=      45.12        13.88          31.06
     TOTAL RAINFALL   (mm)=      46.12        46.12          46.12
     RUNOFF COEFFICIENT   =       0.98         0.30           0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.074 (i)
     TIME TO PEAK    (hrs)=   2.083
     RUNOFF VOLUME    (mm)=  11.770
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.255

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.033 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  12.061
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262

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

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   0.412     2.33    12.08
      + ID2= 2 (  0018):     5.34   0.081     2.58    12.08
        ================================================
        ID = 3 (  0005):    26.11   0.483     2.42    12.08

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   0.483     2.42    12.08
      + ID2= 2 (  0002):    45.28   0.537     3.00    12.08
        ================================================
        ID = 1 (  0005):    71.39   0.893     2.67    12.08

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   0.893     2.67    12.08
      + ID2= 2 (  0027):     1.90   0.074     2.08    11.77
        ================================================
        ID = 3 (  0005):    73.29   0.911     2.67    12.07

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   0.911     2.67    12.07
      + ID2= 2 (  0003):     5.28   0.942     2.00    31.06
        ================================================
        ID = 1 (  0005):    78.57   1.154     2.00    13.35

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   1.154     2.00    13.35
      + ID2= 2 (  0031):     1.23   0.033     2.17    12.06
        ================================================
        ID = 3 (  0005):    79.80   1.169     2.00    13.33

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   1.169     2.00    13.33
      + ID2= 2 (  0004):    19.62   0.375     2.42    12.08
        ================================================
        ID = 1 (  0005):    99.42   1.410     2.50    13.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
-------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     139.63        17.88
               over (min)        5.00        20.00
```

```
     Storage Coeff.  (min)=       1.71 (ii)   15.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.32         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.01          0.129 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.25           2.00
     RUNOFF VOLUME    (mm)=      45.12        13.88          31.05
     TOTAL RAINFALL   (mm)=      46.12        46.12          46.12
     RUNOFF COEFFICIENT   =       0.98         0.30           0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.081 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  12.083
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.537 (i)
     TIME TO PEAK    (hrs)=   3.000
     RUNOFF VOLUME    (mm)=  12.084
     TOTAL RAINFALL   (mm)=  46.115
     RUNOFF COEFFICIENT   =   0.262
```

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

CALIB			
NASHYD (0021)	Area (ha)= 19.62	Curve Number (CN)= 72.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.34		

Unit Hyd Qpeak (cms)= 2.204

PEAK FLOW (cms)= 0.375 (i)
TIME TO PEAK (hrs)= 2.417
RUNOFF VOLUME (mm)= 12.081
TOTAL RAINFALL (mm)= 46.115
RUNOFF COEFFICIENT = 0.262

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

CALIB			
STANDHYD (0022)	Area (ha)= 4.67		
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.57	2.10	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	176.45	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		139.63	17.88	
over (min)		5.00	20.00	
Storage Coeff. (min)=		3.14 (ii)	17.20 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.27	0.06	
				TOTALS
PEAK FLOW	(cms)=	0.83	0.06	0.844 (iii)
TIME TO PEAK	(hrs)=	2.00	2.25	2.00
RUNOFF VOLUME	(mm)=	45.12	13.88	31.06
TOTAL RAINFALL	(mm)=	46.12	46.12	46.12
RUNOFF COEFFICIENT	=	0.98	0.30	0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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 (0023)	Area (ha)= 22.16				
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	12.19	9.97		
Dep. Storage	(mm)=	1.00	1.50		
Average Slope	(%)=	1.00	2.00		
Length	(m)=	384.36	40.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.	(mm/hr)=	139.63	17.88		
over	(min)	5.00	20.00		
Storage Coeff.	(min)=	5.01 (ii)	19.07 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	20.00		
Unit Hyd. peak	(cms)=	0.21	0.06		
				TOTALS	
PEAK FLOW	(cms)=	3.25	0.26	3.319 (iii)	
TIME TO PEAK	(hrs)=	2.00	2.25	2.00	
RUNOFF VOLUME	(mm)=	45.12	13.88	31.06	
TOTAL RAINFALL	(mm)=	46.12	46.12	46.12	
RUNOFF COEFFICIENT	=	0.98	0.30	0.67	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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				
NASHYD (0028)	Area (ha)=	1.90	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.10		
Unit Hyd Qpeak	(cms)=	0.726		
PEAK FLOW	(cms)=	0.074 (i)		
TIME TO PEAK	(hrs)=	2.083		
RUNOFF VOLUME	(mm)=	11.770		
TOTAL RAINFALL	(mm)=	46.115		
RUNOFF COEFFICIENT	=	0.255		

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

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0019):     5.34   0.081     2.58    12.08
     + ID2= 2 (  0020):    45.28   0.537     3.00    12.08
       ================================================
       ID = 3 (  0024):    50.62   0.608     2.92    12.08

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

--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0024):    50.62   0.608     2.92    12.08
     + ID2= 2 (  0021):    19.62   0.375     2.42    12.08
       ================================================
       ID = 1 (  0024):    70.24   0.880     2.67    12.08

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    70.24   0.880     2.67    12.08
     + ID2= 2 (  0022):     4.67   0.844     2.00    31.06
       ================================================
       ID = 3 (  0024):    74.91   0.977     2.58    13.27

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

--------------------
| ADD HYD  (  0024)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0024):    74.91   0.977     2.58    13.27
     + ID2= 2 (  0023):    22.16   3.319     2.00    31.06
       ================================================
       ID = 1 (  0024):    97.07   4.286     2.00    17.33

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

```
--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0024):    97.07   4.286     2.00    17.33
      + ID2= 2 (  0028):     1.90   0.074     2.08    11.77
        ================================================
        ID = 3 (  0024):    98.97   4.357     2.00    17.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                    AREA     QPEAK     TPEAK       R.V.
                                    (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      4.357      2.00      17.22
   OUTFLOW: ID= 1 (  0011)     98.970      0.870      3.75      17.22

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.96
                  TIME SHIFT OF PEAK FLOW         (min)=105.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.6650

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0011):    98.97   0.870     3.75    17.22
      + ID2= 2 (  0030):     0.62   0.129     2.00    31.05
        ================================================
        ID = 3 (  0029):    99.59   0.876     3.75    17.30

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

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
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fd83494a-fb41-42a9-8774-f60cd3aec302\
  Summary filename:
C:\Users\andy.kroess\AppData\Local\Civica\VH5\56243236-036e-4408-aa5c-c6562e26430b\
fd83494a-fb41-42a9-8774-f60cd3aec302\


DATE: 12-21-2022                          TIME: 12:52:42

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 10 Year - 6 Hour           **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 521.822
| Ptotal= 54.57 mm |                          B=   0.000
--------------------                          C=   0.688
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.93	1.50	8.56	3.00	6.91	4.50	3.82
0.08	3.03	1.58	10.05	3.08	6.57	4.58	3.74
0.17	3.13	1.67	12.41	3.17	6.27	4.67	3.66
0.25	3.23	1.75	16.89	3.25	6.00	4.75	3.59
0.33	3.35	1.83	31.09	3.33	5.76	4.83	3.52
0.42	3.48	1.92	172.44	3.42	5.54	4.92	3.45
0.50	3.62	2.00	38.05	3.50	5.34	5.00	3.38
0.58	3.78	2.08	24.17	3.58	5.16	5.08	3.32
0.67	3.95	2.17	18.51	3.67	4.99	5.17	3.26
0.75	4.14	2.25	15.30	3.75	4.83	5.25	3.21
0.83	4.36	2.33	13.18	3.83	4.69	5.33	3.15
0.92	4.61	2.42	11.66	3.92	4.55	5.42	3.10
1.00	4.90	2.50	10.51	4.00	4.43	5.50	3.05
1.08	5.24	2.58	9.61	4.08	4.31	5.58	3.01
1.17	5.64	2.67	8.87	4.17	4.20	5.67	2.96
1.25	6.13	2.75	8.26	4.25	4.10	5.75	2.92
1.33	6.74	2.83	7.74	4.33	4.00	5.83	2.87
1.42	7.51	2.92	7.30	4.42	3.91	5.92	2.83

CALIB					
NASHYD (0001)	Area (ha)=	20.77	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.32		

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 0.601 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 16.556
TOTAL RAINFALL (mm)= 54.566
RUNOFF COEFFICIENT = 0.303

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

CALIB					
NASHYD (0002)	Area (ha)=	45.28	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.766 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  16.561
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.304

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.543 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=  16.557
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.303

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.117 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  16.560
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.303

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     172.44        25.12
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       3.00 (ii)   15.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.28         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.17         0.10          1.199 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.25           2.00
     RUNOFF VOLUME    (mm)=      53.57        18.55          37.80
     TOTAL RAINFALL   (mm)=      54.57        54.57          54.57
     RUNOFF COEFFICIENT   =       0.98         0.34           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.109 (i)
     TIME TO PEAK    (hrs)=   2.083
     RUNOFF VOLUME    (mm)=  16.131
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.296

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.049 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  16.530
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.303

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

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   0.601     2.33    16.56
      + ID2= 2 (  0018):     5.34   0.117     2.58    16.56
        ================================================
        ID = 3 (  0005):    26.11   0.700     2.42    16.56

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   0.700     2.42    16.56
      + ID2= 2 (  0002):    45.28   0.766     2.92    16.56
        ================================================
        ID = 1 (  0005):    71.39   1.284     2.58    16.56

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   1.284     2.58    16.56
      + ID2= 2 (  0027):     1.90   0.109     2.08    16.13
        ================================================
        ID = 3 (  0005):    73.29   1.310     2.58    16.55

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   1.310     2.58    16.55
      + ID2= 2 (  0003):     5.28   1.199     2.00    37.80
        ================================================
        ID = 1 (  0005):    78.57   1.526     2.00    17.98

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


--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   1.526     2.00    17.98
      + ID2= 2 (  0031):     1.23   0.049     2.17    16.53
        ================================================
        ID = 3 (  0005):    79.80   1.549     2.00    17.95

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


--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   1.549     2.00    17.95
      + ID2= 2 (  0004):    19.62   0.543     2.42    16.56
        ================================================
        ID = 1 (  0005):    99.42   2.017     2.42    17.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     172.44        25.12
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       1.58 (ii)   13.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.33         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.01          0.162 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.17           2.00
     RUNOFF VOLUME    (mm)=      53.57        18.55          37.79
     TOTAL RAINFALL   (mm)=      54.57        54.57          54.57
     RUNOFF COEFFICIENT   =       0.98         0.34           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.117 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  16.560
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.303

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   0.766 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  16.561
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.304
```

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

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.543 (i)
     TIME TO PEAK    (hrs)=   2.417
     RUNOFF VOLUME    (mm)=  16.557
     TOTAL RAINFALL   (mm)=  54.566
     RUNOFF COEFFICIENT   =   0.303

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   4.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------

                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.57         2.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     176.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     172.44        25.12
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       2.89 (ii)   15.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.28         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.05         0.09          1.072 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.25           2.00
     RUNOFF VOLUME    (mm)=      53.57        18.55          37.80
     TOTAL RAINFALL   (mm)=      54.57        54.57          54.57
     RUNOFF COEFFICIENT   =       0.98         0.34           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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 (0023)	Area (ha)= 22.16				
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	12.19	9.97		
Dep. Storage	(mm)=	1.00	1.50		
Average Slope	(%)=	1.00	2.00		
Length	(m)=	384.36	40.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.	(mm/hr)=	172.44	25.12		
over	(min)	5.00	20.00		
Storage Coeff.	(min)=	4.61 (ii)	16.87 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	20.00		
Unit Hyd. peak	(cms)=	0.22	0.06		
				TOTALS	
PEAK FLOW	(cms)=	4.16	0.39	4.267 (iii)	
TIME TO PEAK	(hrs)=	2.00	2.25	2.00	
RUNOFF VOLUME	(mm)=	53.57	18.55	37.81	
TOTAL RAINFALL	(mm)=	54.57	54.57	54.57	
RUNOFF COEFFICIENT	=	0.98	0.34	0.69	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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					
NASHYD (0028)	Area (ha)=	1.90	Curve Number (CN)=	72.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.10			
Unit Hyd Qpeak	(cms)=	0.726			
PEAK FLOW	(cms)=	0.109 (i)			
TIME TO PEAK	(hrs)=	2.083			
RUNOFF VOLUME	(mm)=	16.131			
TOTAL RAINFALL	(mm)=	54.566			
RUNOFF COEFFICIENT	=	0.296			

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

ADD HYD (0024)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0019):	5.34	0.117	2.58	16.56
+ ID2= 2 (0020):	45.28	0.766	2.92	16.56
ID = 3 (0024):	50.62	0.869	2.92	16.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0024):	50.62	0.869	2.92	16.56
+ ID2= 2 (0021):	19.62	0.543	2.42	16.56
ID = 1 (0024):	70.24	1.264	2.67	16.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0024):	70.24	1.264	2.67	16.56
+ ID2= 2 (0022):	4.67	1.072	2.00	37.80
ID = 3 (0024):	74.91	1.389	2.58	17.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0024):	74.91	1.389	2.58	17.88
+ ID2= 2 (0023):	22.16	4.267	2.00	37.81
ID = 1 (0024):	97.07	5.533	2.00	22.43

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    97.07   5.533     2.00    22.43
     + ID2= 2 (  0028):     1.90   0.109     2.08    16.13
       ================================================
       ID = 3 (  0024):    98.97   5.640     2.00    22.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      5.640      2.00      22.31
   OUTFLOW: ID= 1 (  0011)     98.970      1.474      3.25      22.30

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 26.13
                  TIME SHIFT OF PEAK FLOW         (min)= 75.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.7892

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):    98.97   1.474     3.25    22.30
     + ID2= 2 (  0030):     0.62   0.162     2.00    37.79
       ================================================
       ID = 3 (  0029):    99.59   1.483     3.25    22.40

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

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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
C:\Users\andy.kroess\AppData\Local\Civica\VH5\56243236-036e-4408-aa5c-c6562e26430b\
58dfbab0-66f4-4f5e-9a5d-d1065ff11c6a\
  Summary filename:
C:\Users\andy.kroess\AppData\Local\Civica\VH5\56243236-036e-4408-aa5c-c6562e26430b\
58dfbab0-66f4-4f5e-9a5d-d1065ff11c6a\


DATE: 12-21-2022                          TIME: 12:52:42

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 25 Year - 6 Hour           **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 654.203
| Ptotal= 63.00 mm |                          B=   0.000
--------------------                          C=   0.702
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.24	1.50	9.65	3.00	7.76	4.50	4.24
0.08	3.34	1.58	11.37	3.08	7.37	4.58	4.15
0.17	3.45	1.67	14.10	3.17	7.03	4.67	4.06
0.25	3.58	1.75	19.32	3.25	6.72	4.75	3.97
0.33	3.71	1.83	36.03	3.33	6.44	4.83	3.89
0.42	3.85	1.92	211.37	3.42	6.19	4.92	3.82
0.50	4.01	2.00	44.25	3.50	5.96	5.00	3.75
0.58	4.19	2.08	27.84	3.58	5.75	5.08	3.68
0.67	4.38	2.17	21.21	3.67	5.56	5.17	3.61
0.75	4.60	2.25	17.46	3.75	5.38	5.25	3.55
0.83	4.85	2.33	14.99	3.83	5.22	5.33	3.49
0.92	5.14	2.42	13.24	3.92	5.07	5.42	3.43
1.00	5.47	2.50	11.91	4.00	4.93	5.50	3.37
1.08	5.85	2.58	10.86	4.08	4.79	5.58	3.32
1.17	6.31	2.67	10.01	4.17	4.67	5.67	3.27
1.25	6.87	2.75	9.31	4.25	4.55	5.75	3.22
1.33	7.56	2.83	8.72	4.33	4.44	5.83	3.17
1.42	8.45	2.92	8.21	4.42	4.34	5.92	3.12

CALIB					
NASHYD (0001)	Area (ha)=	20.77	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.32		

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 0.831 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 21.449
TOTAL RAINFALL (mm)= 62.997
RUNOFF COEFFICIENT = 0.340

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

CALIB					
NASHYD (0002)	Area (ha)=	45.28	Curve Number (CN)=	72.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.037 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  21.455
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.341

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.750 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  21.450
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.340

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.160 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  21.454
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.341

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     211.37     ********
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.76 (ii)    7.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.47         0.22          1.585 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      62.00        23.60          44.72
     TOTAL RAINFALL   (mm)=      63.00        63.00          63.00
     RUNOFF COEFFICIENT   =       0.98         0.37           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.153 (i)
     TIME TO PEAK    (hrs)=   2.083
     RUNOFF VOLUME    (mm)=  20.898
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.332

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.068 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  21.414
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.340

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

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   0.831     2.33    21.45
      + ID2= 2 (  0018):     5.34   0.160     2.58    21.45
        ================================================
        ID = 3 (  0005):    26.11   0.966     2.33    21.45

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   0.966     2.33    21.45
      + ID2= 2 (  0002):    45.28   1.037     2.92    21.46
        ================================================
        ID = 1 (  0005):    71.39   1.752     2.58    21.45

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   1.752     2.58    21.45
      + ID2= 2 (  0027):     1.90   0.153     2.08    20.90
        ================================================
        ID = 3 (  0005):    73.29   1.785     2.58    21.44

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   1.785     2.58    21.44
      + ID2= 2 (  0003):     5.28   1.585     2.00    44.72
        ================================================
        ID = 1 (  0005):    78.57   2.053     2.00    23.00

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   2.053     2.00    23.00
      + ID2= 2 (  0031):     1.23   0.068     2.17    21.41
        ================================================
        ID = 3 (  0005):    79.80   2.086     2.00    22.98

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   2.086     2.00    22.98
      + ID2= 2 (  0004):    19.62   0.750     2.33    21.45
        ================================================
        ID = 1 (  0005):    99.42   2.712     2.42    22.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     211.37     ********
               over (min)        5.00        10.00
```

```
     Storage Coeff.  (min)=       1.45 (ii)    6.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.03          0.210 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      62.00        23.60          44.71
     TOTAL RAINFALL   (mm)=      63.00        63.00          63.00
     RUNOFF COEFFICIENT   =       0.98         0.37           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.160 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  21.454
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.341

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.037 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  21.455
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.341
```

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

CALIB			
NASHYD (0021)	Area (ha)= 19.62	Curve Number (CN)= 72.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.34		

Unit Hyd Qpeak (cms)= 2.204

PEAK FLOW (cms)= 0.750 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 21.450
TOTAL RAINFALL (mm)= 62.997
RUNOFF COEFFICIENT = 0.340

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

CALIB			
STANDHYD (0022)	Area (ha)= 4.67		
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.57	2.10	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	176.45	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		211.37	********	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.66 (ii)	7.49 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.29	0.13	
				TOTALS
PEAK FLOW	(cms)=	1.31	0.19	1.416 (iii)
TIME TO PEAK	(hrs)=	2.00	2.08	2.00
RUNOFF VOLUME	(mm)=	62.00	23.60	44.72
TOTAL RAINFALL	(mm)=	63.00	63.00	63.00
RUNOFF COEFFICIENT	=	0.98	0.37	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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 (  0023)|   Area    (ha)=  22.16
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      12.19         9.97
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     384.36        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     211.37     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.25 (ii)    9.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.24         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       5.27         0.83          5.706 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      62.00        23.60          44.72
     TOTAL RAINFALL   (mm)=      63.00        63.00          63.00
     RUNOFF COEFFICIENT   =       0.98         0.37           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0028)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.153 (i)
     TIME TO PEAK    (hrs)=   2.083
     RUNOFF VOLUME    (mm)=  20.898
     TOTAL RAINFALL   (mm)=  62.997
     RUNOFF COEFFICIENT   =   0.332
```

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

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0019):	5.34	0.160	2.58	21.45
	+ ID2= 2 (0020):	45.28	1.037	2.92	21.46
	ID = 3 (0024):	50.62	1.175	2.83	21.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	50.62	1.175	2.83	21.46
	+ ID2= 2 (0021):	19.62	0.750	2.33	21.45
	ID = 1 (0024):	70.24	1.719	2.58	21.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0024):	70.24	1.719	2.58	21.45
	+ ID2= 2 (0022):	4.67	1.416	2.00	44.72
	ID = 3 (0024):	74.91	1.852	2.58	22.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	74.91	1.852	2.58	22.90
	+ ID2= 2 (0023):	22.16	5.706	2.00	44.72
	ID = 1 (0024):	97.07	7.400	2.00	27.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    97.07   7.400     2.00    27.88
     + ID2= 2 (  0028):     1.90   0.153     2.08    20.90
       ================================================
       ID = 3 (  0024):    98.97   7.553     2.00    27.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      7.553      2.00      27.75
   OUTFLOW: ID= 1 (  0011)     98.970      2.140      2.92      27.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 28.34
                  TIME SHIFT OF PEAK FLOW         (min)= 55.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.8661

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):    98.97   2.140     2.92    27.74
     + ID2= 2 (  0030):     0.62   0.210     2.00    44.71
       ================================================
       ID = 3 (  0029):    99.59   2.152     2.92    27.85

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

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================================================================================
========================

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
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  Summary filename:
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695d9648-9cee-4da4-834f-fdf3f389c25a\


DATE: 12-21-2022                          TIME: 12:52:42

USER:



COMMENTS: _____________________________________________________________


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  ********************************************
  ** SIMULATION : 50 Year - 6 Hour           **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 754.521
| Ptotal= 72.66 mm |                          B=   0.000
--------------------                          C=   0.702
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.74	1.50	11.13	3.00	8.95	4.50	4.89
0.08	3.85	1.58	13.12	3.08	8.50	4.58	4.78
0.17	3.98	1.67	16.26	3.17	8.11	4.67	4.68
0.25	4.12	1.75	22.28	3.25	7.75	4.75	4.58
0.33	4.28	1.83	41.55	3.33	7.43	4.83	4.49
0.42	4.44	1.92	243.78	3.42	7.14	4.92	4.40
0.50	4.63	2.00	51.03	3.50	6.88	5.00	4.32
0.58	4.83	2.08	32.11	3.58	6.64	5.08	4.24
0.67	5.06	2.17	24.46	3.67	6.41	5.17	4.16
0.75	5.31	2.25	20.13	3.75	6.21	5.25	4.09
0.83	5.60	2.33	17.29	3.83	6.02	5.33	4.02
0.92	5.93	2.42	15.26	3.92	5.84	5.42	3.95
1.00	6.31	2.50	13.73	4.00	5.68	5.50	3.89
1.08	6.75	2.58	12.53	4.08	5.53	5.58	3.83
1.17	7.28	2.67	11.55	4.17	5.38	5.67	3.77
1.25	7.92	2.75	10.74	4.25	5.25	5.75	3.71
1.33	8.72	2.83	10.05	4.33	5.12	5.83	3.65
1.42	9.75	2.92	9.46	4.42	5.00	5.92	3.60

CALIB NASHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 20.77	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.32	

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 1.089 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 27.495
TOTAL RAINFALL (mm)= 72.658
RUNOFF COEFFICIENT = 0.378

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

CALIB NASHYD (0002) ID= 1 DT= 5.0 min	Area (ha)= 45.28	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.351 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  27.503
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.379

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.983 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  27.497
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.378

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.209 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  27.502
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.379

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

------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     243.78     ********
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.61 (ii)    7.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.72         0.29         1.876 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08          2.00
     RUNOFF VOLUME    (mm)=      71.66        29.80         52.82
     TOTAL RAINFALL   (mm)=      72.66        72.66         72.66
     RUNOFF COEFFICIENT   =       0.99         0.41          0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.202 (i)
     TIME TO PEAK    (hrs)=   2.000
     RUNOFF VOLUME    (mm)=  26.789
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.369

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.089 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  27.451
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.378

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

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   1.089     2.33    27.50
      + ID2= 2 (  0018):     5.34   0.209     2.58    27.50
        ================================================
        ID = 3 (  0005):    26.11   1.268     2.33    27.50

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   1.268     2.33    27.50
      + ID2= 2 (  0002):    45.28   1.351     2.92    27.50
        ================================================
        ID = 1 (  0005):    71.39   2.289     2.58    27.50

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   2.289     2.58    27.50
      + ID2= 2 (  0027):     1.90   0.202     2.00    26.79
        ================================================
        ID = 3 (  0005):    73.29   2.330     2.58    27.48

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   2.330     2.58    27.48
      + ID2= 2 (  0003):     5.28   1.876     2.00    52.82
        ================================================
        ID = 1 (  0005):    78.57   2.523     2.50    29.18

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   2.523     2.50    29.18
      + ID2= 2 (  0031):     1.23   0.089     2.17    27.45
        ================================================
        ID = 3 (  0005):    79.80   2.571     2.50    29.16

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   2.571     2.50    29.16
      + ID2= 2 (  0004):    19.62   0.983     2.33    27.50
        ================================================
        ID = 1 (  0005):    99.42   3.528     2.42    28.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     243.78     ********
               over (min)        5.00        10.00
```

```
     Storage Coeff.  (min)=       1.37 (ii)    5.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.04          0.246 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      71.66        29.80          52.82
     TOTAL RAINFALL   (mm)=      72.66        72.66          72.66
     RUNOFF COEFFICIENT   =       0.99         0.41           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.209 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  27.502
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.379

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.351 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  27.503
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.379
```

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

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   0.983 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  27.497
     TOTAL RAINFALL   (mm)=  72.658
     RUNOFF COEFFICIENT   =   0.378

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   4.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.57         2.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     176.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     243.78     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.51 (ii)    7.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.54         0.26          1.675 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      71.66        29.80          52.82
     TOTAL RAINFALL   (mm)=      72.66        72.66          72.66
     RUNOFF COEFFICIENT   =       0.99         0.41           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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 (0023)	Area (ha)=	22.16			
ID= 1 DT= 5.0 min	Total Imp(%)=	55.00	Dir. Conn.(%)=	55.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	12.19	9.97	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	384.36	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		243.78	********	
over (min)		5.00	10.00	
Storage Coeff. (min)=		4.01 (ii)	8.57 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.24	0.12	
				TOTALS
PEAK FLOW	(cms)=	6.22	1.10	6.810 (iii)
TIME TO PEAK	(hrs)=	2.00	2.08	2.00
RUNOFF VOLUME	(mm)=	71.66	29.80	52.82
TOTAL RAINFALL	(mm)=	72.66	72.66	72.66
RUNOFF COEFFICIENT	=	0.99	0.41	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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					
NASHYD (0028)	Area (ha)=	1.90	Curve Number (CN)=	72.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.10			

Unit Hyd Qpeak	(cms)=	0.726
PEAK FLOW	(cms)=	0.202 (i)
TIME TO PEAK	(hrs)=	2.000
RUNOFF VOLUME	(mm)=	26.789
TOTAL RAINFALL	(mm)=	72.658
RUNOFF COEFFICIENT	=	0.369

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

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0019):	5.34	0.209	2.58	27.50
	+ ID2= 2 (0020):	45.28	1.351	2.92	27.50
	ID = 3 (0024):	50.62	1.532	2.83	27.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	50.62	1.532	2.83	27.50
	+ ID2= 2 (0021):	19.62	0.983	2.33	27.50
	ID = 1 (0024):	70.24	2.247	2.58	27.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0024):	70.24	2.247	2.58	27.50
	+ ID2= 2 (0022):	4.67	1.675	2.00	52.82
	ID = 3 (0024):	74.91	2.404	2.58	29.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	74.91	2.404	2.58	29.08
	+ ID2= 2 (0023):	22.16	6.810	2.00	52.82
	ID = 1 (0024):	97.07	8.873	2.00	34.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    97.07   8.873     2.00    34.50
     + ID2= 2 (  0028):     1.90   0.202     2.00    26.79
       ================================================
       ID = 3 (  0024):    98.97   9.075     2.00    34.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970      9.075      2.00      34.35
   OUTFLOW: ID= 1 (  0011)     98.970      2.932      2.83      34.34

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 32.31
                  TIME SHIFT OF PEAK FLOW         (min)= 50.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.9396

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):    98.97   2.932     2.83    34.34
     + ID2= 2 (  0030):     0.62   0.246     2.00    52.82
       ================================================
       ID = 3 (  0029):    99.59   2.948     2.83    34.46

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

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

       V    V   I    SSSSS  U   U    A    L              (v 6.2.2007)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

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


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

  Output  filename:
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01f343b8-1920-413b-ae38-4fb59e716fc2\
  Summary filename:
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01f343b8-1920-413b-ae38-4fb59e716fc2\


DATE: 12-21-2022                          TIME: 12:52:43

USER:



COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------
------------------------
  ********************************************
  ** SIMULATION : 100 Year - 6 Hour           **
  ********************************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 855.201
| Ptotal= 80.44 mm |                          B=   0.000
--------------------                          C=   0.706
```

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

Duration of storm = 6.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	4.08	1.50	12.24	3.00	9.83	4.50	5.35
0.08	4.21	1.58	14.43	3.08	9.33	4.58	5.23
0.17	4.35	1.67	17.92	3.17	8.90	4.67	5.12
0.25	4.51	1.75	24.59	3.25	8.50	4.75	5.01
0.33	4.67	1.83	46.03	3.33	8.15	4.83	4.91
0.42	4.86	1.92	274.53	3.42	7.83	4.92	4.82
0.50	5.06	2.00	56.59	3.50	7.54	5.00	4.72
0.58	5.28	2.08	35.51	3.58	7.27	5.08	4.64
0.67	5.53	2.17	27.01	3.67	7.03	5.17	4.55
0.75	5.81	2.25	22.20	3.75	6.80	5.25	4.47
0.83	6.13	2.33	19.06	3.83	6.60	5.33	4.39
0.92	6.49	2.42	16.81	3.92	6.40	5.42	4.32
1.00	6.91	2.50	15.11	4.00	6.22	5.50	4.25
1.08	7.40	2.58	13.78	4.08	6.05	5.58	4.18
1.17	7.98	2.67	12.70	4.17	5.89	5.67	4.12
1.25	8.69	2.75	11.80	4.25	5.74	5.75	4.05
1.33	9.57	2.83	11.04	4.33	5.61	5.83	3.99
1.42	10.71	2.92	10.39	4.42	5.47	5.92	3.93

CALIB NASHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 20.77	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.32	

Unit Hyd Qpeak (cms)= 2.479

PEAK FLOW (cms)= 1.326 (i)
TIME TO PEAK (hrs)= 2.333
RUNOFF VOLUME (mm)= 32.655
TOTAL RAINFALL (mm)= 80.437
RUNOFF COEFFICIENT = 0.406

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

CALIB NASHYD (0002) ID= 1 DT= 5.0 min	Area (ha)= 45.28	Curve Number (CN)= 72.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00

```
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.633 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  32.664
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406

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

------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0004)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   1.199 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  32.657
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406

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

------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0018)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.254 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  32.663
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406

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

------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0003)|   Area    (ha)=   5.28
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.90         2.38
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     187.62        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     274.53     ********
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.49 (ii)    6.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.96         0.36         2.154 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08          2.00
     RUNOFF VOLUME    (mm)=      79.44        35.06         59.47
     TOTAL RAINFALL   (mm)=      80.44        80.44         80.44
     RUNOFF COEFFICIENT   =       0.99         0.44          0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0027)|   Area    (ha)=   1.90   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.10

     Unit Hyd Qpeak  (cms)=   0.726

     PEAK FLOW       (cms)=   0.249 (i)
     TIME TO PEAK    (hrs)=   2.000
     RUNOFF VOLUME    (mm)=  31.816
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.396

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0031)|   Area    (ha)=   1.23   Curve Number   (CN)= 72.0
```

```
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
-------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.235

     PEAK FLOW       (cms)=   0.109 (i)
     TIME TO PEAK    (hrs)=   2.167
     RUNOFF VOLUME    (mm)=  32.602
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.405

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

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0001):    20.77   1.326     2.33    32.65
      + ID2= 2 (  0018):     5.34   0.254     2.58    32.66
        ====================================================
        ID = 3 (  0005):    26.11   1.545     2.33    32.66

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    26.11   1.545     2.33    32.66
      + ID2= 2 (  0002):    45.28   1.633     2.92    32.66
        ====================================================
        ID = 1 (  0005):    71.39   2.775     2.58    32.66

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    71.39   2.775     2.58    32.66
      + ID2= 2 (  0027):     1.90   0.249     2.00    31.82
        ====================================================
        ID = 3 (  0005):    73.29   2.824     2.58    32.64

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

```
--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    73.29   2.824     2.58    32.64
      + ID2= 2 (  0003):     5.28   2.154     2.00    59.47
        ================================================
        ID = 1 (  0005):    78.57   3.045     2.50    34.44

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

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0005):    78.57   3.045     2.50    34.44
      + ID2= 2 (  0031):     1.23   0.109     2.17    32.60
        ================================================
        ID = 3 (  0005):    79.80   3.103     2.50    34.41

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

--------------------
| ADD HYD  (  0005)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0005):    79.80   3.103     2.50    34.41
      + ID2= 2 (  0004):    19.62   1.199     2.33    32.66
        ================================================
        ID = 1 (  0005):    99.42   4.270     2.42    34.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=   0.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.34         0.28
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      64.29        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     274.53     ********
               over (min)        5.00        10.00
```

```
     Storage Coeff.  (min)=       1.31 (ii)    5.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.05          0.280 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08           2.00
     RUNOFF VOLUME    (mm)=      79.44        35.06          59.46
     TOTAL RAINFALL   (mm)=      80.44        80.44          80.44
     RUNOFF COEFFICIENT   =       0.99         0.44           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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            |
| NASHYD   (  0019)|   Area    (ha)=   5.34   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.49

     Unit Hyd Qpeak  (cms)=   0.416

     PEAK FLOW       (cms)=   0.254 (i)
     TIME TO PEAK    (hrs)=   2.583
     RUNOFF VOLUME    (mm)=  32.663
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0020)|   Area    (ha)=  45.28   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.73

     Unit Hyd Qpeak  (cms)=   2.369

     PEAK FLOW       (cms)=   1.633 (i)
     TIME TO PEAK    (hrs)=   2.917
     RUNOFF VOLUME    (mm)=  32.664
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406
```

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

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0021)|   Area    (ha)=  19.62   Curve Number   (CN)= 72.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.34

     Unit Hyd Qpeak  (cms)=   2.204

     PEAK FLOW       (cms)=   1.199 (i)
     TIME TO PEAK    (hrs)=   2.333
     RUNOFF VOLUME    (mm)=  32.657
     TOTAL RAINFALL   (mm)=  80.437
     RUNOFF COEFFICIENT   =   0.406

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

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   4.67
|ID= 1 DT= 5.0 min |   Total Imp(%)=  55.00   Dir. Conn.(%)=  55.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.57         2.10
     Dep. Storage     (mm)=       1.00         1.50
     Average Slope     (%)=       1.00         2.00
     Length            (m)=     176.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     274.53     ********
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.40 (ii)    6.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.75         0.32         1.923 (iii)
     TIME TO PEAK    (hrs)=       2.00         2.08          2.00
     RUNOFF VOLUME    (mm)=      79.44        35.06         59.47
     TOTAL RAINFALL   (mm)=      80.44        80.44         80.44
     RUNOFF COEFFICIENT   =       0.99         0.44          0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    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 (0023)	Area (ha)= 22.16				
ID= 1 DT= 5.0 min	Total Imp(%)= 55.00	Dir. Conn.(%)= 55.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	12.19	9.97	
Dep. Storage	(mm)=	1.00	1.50	
Average Slope	(%)=	1.00	2.00	
Length	(m)=	384.36	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	274.53	********	
over (min)		5.00	10.00	
Storage Coeff. (min)	=	3.83 (ii)	8.17 (ii)	
Unit Hyd. Tpeak (min)	=	5.00	10.00	
Unit Hyd. peak (cms)	=	0.25	0.13	
				TOTALS
PEAK FLOW	(cms)=	7.14	1.36	7.870 (iii)
TIME TO PEAK	(hrs)=	2.00	2.08	2.00
RUNOFF VOLUME	(mm)=	79.44	35.06	59.47
TOTAL RAINFALL	(mm)=	80.44	80.44	80.44
RUNOFF COEFFICIENT	=	0.99	0.44	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 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					
NASHYD (0028)	Area (ha)=	1.90	Curve Number (CN)=	72.0	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	0.10			

Unit Hyd Qpeak	(cms)=	0.726
PEAK FLOW	(cms)=	0.249 (i)
TIME TO PEAK	(hrs)=	2.000
RUNOFF VOLUME	(mm)=	31.816
TOTAL RAINFALL	(mm)=	80.437
RUNOFF COEFFICIENT	=	0.396

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

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0019):	5.34	0.254	2.58	32.66
	+ ID2= 2 (0020):	45.28	1.633	2.92	32.66
	ID = 3 (0024):	50.62	1.854	2.83	32.66

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	50.62	1.854	2.83	32.66
	+ ID2= 2 (0021):	19.62	1.199	2.33	32.66
	ID = 1 (0024):	70.24	2.727	2.58	32.66

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0024):	70.24	2.727	2.58	32.66
	+ ID2= 2 (0022):	4.67	1.923	2.00	59.47
	ID = 3 (0024):	74.91	2.902	2.58	34.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0024):	74.91	2.902	2.58	34.33
	+ ID2= 2 (0023):	22.16	7.870	2.00	59.47
	ID = 1 (0024):	97.07	10.279	2.00	40.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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

--------------------
| ADD HYD  (  0024)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0024):    97.07  10.279     2.00    40.07
     + ID2= 2 (  0028):     1.90   0.249     2.00    31.82
       ================================================
       ID = 3 (  0024):    98.97  10.528     2.00    39.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0011)|     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   |   0.7513      0.6198
                          0.0357     0.0893   |   1.0759      0.7433
                          0.2910     0.1598   |   2.2034      0.8728
                          0.3360     0.1840   |   2.9440      0.9399
                          0.4751     0.2844   |   3.7787      1.0085
                          0.5819     0.3904   |   4.6976      1.0786
                          0.6719     0.5021   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0024)     98.970     10.528      2.00      39.91
   OUTFLOW: ID= 1 (  0011)     98.970      3.624      2.67      39.91

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 34.42
                  TIME SHIFT OF PEAK FLOW         (min)= 40.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.9967

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

--------------------
| ADD HYD  (  0029)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0011):    98.97   3.624     2.67    39.91
     + ID2= 2 (  0030):     0.62   0.280     2.00    59.46
       ================================================
       ID = 3 (  0029):    99.59   3.644     2.67    40.03

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

Appendix C

Stormwater Quality Calculations

115791 - Tulip Estates Subdivision, Picton, ON
Sediment Forebay Sizing Calculations

Forebay Settling Length

Dist =	$[(r \times Q_p)/V_s]^{0.5}$		Equation 4.5, P.4.55 in 2003 MOE Manual
r =	1.5		r = length to width ratio of the forebay
Q_p =	0.477	m^3/s	Q_p = peak flow rate from the pond during design quality storm
V_s =	0.0003	m/s	V_s = settling velocity
Dist =	**49**	**m**	

Dispersion Length

Dist =	$(8 \times Q)/(d \times V_f)$		Equation 4.6, P.4.56 in 2003 MOE Manual
Q =	4.357	m^3/s	Q = inlet flowrate of 100 year storm (pipe capacity)
d =	2.0	m	d = depth of permanent pool in forebay
V_f =	0.5	m/s	V_f = max forebay velocity
Dist =	**35**	**m**	

Min. Forebay Bottom Width (depth > 1 m) = Dist/8 = 4.4 m

Velocity Check Through Forebay

Forebay dimensions: top width =	20	m	bottom width =	10	m
Water depth =	2.0	m	Flow =	4.357	m^3/s
Velocity =	**0.15**	**m/s**	(must be equal to or less than 0.15 m/s)		

Forebay length should be the greater of the settling length and the dispersion length. However, the maximum forebay area should be less than or equal to one fifth of the total pond surface area.

The sediment forebay length is 50 m

115791 - Tulip Estates Subdivision, Picton, ON
Stormwater Management Pond Sediment Clean-Out Frequency

Theory
Pond to be cleaned out upon 5% decrease in required TSS removal efficiency

Input Data		
Protection Level (1=Enhanced, 2=Normal, 3=Basic)	1	
Untreated Drainage Area	26.830	ha
Level of Imperviousness(35, 55, 70, 85)	55	%
Actual Starting Pond Storage Volume	4536	m^3

Calculations		
Total TSS Loading from drainage area	50.977	m^3/year
Actual Starting Pond Storage Volume	4536	m^3
Actual Unit Pond Storage Volume	169.1	m^3/ha
Required TSS Removal Efficiency	80	%
Actual Starting TSS Removal Efficiency	87.2	%
Target "Cleanout" TSS Removal Efficiency	75	%
Resultant Cleanout Frequency	54	Years
Sediment Cleanout Volume	2119	m^3

Year	Actual Pond Volume (m^3/ha)	TSS Removal Efficiency (%)	Resultant TSS Loading (m^3)	Remaining Pond Volume (m^3)
1	169.1	87.2	44.5	4492
2	167.4	87.1	44.4	4447
3	165.8	86.9	44.3	4403
4	164.1	86.8	44.3	4359
5	162.5	86.7	44.2	4314
6	160.8	86.5	44.1	4270
7	159.2	86.4	44.1	4226
8	157.5	86.3	44.0	4182
9	155.9	86.1	43.9	4138
10	154.2	86.0	43.9	4094
11	152.6	85.9	43.8	4051
12	151.0	85.7	43.7	4007
13	149.3	85.6	43.7	3963
14	147.7	85.5	43.6	3920
15	146.1	85.4	43.5	3876
16	144.5	85.2	43.5	3833
17	142.9	85.1	43.4	3789
18	141.2	85.0	43.3	3746
19	139.6	84.8	43.2	3703
20	138.0	84.7	43.2	3660
21	136.4	84.5	43.1	3617
22	134.8	84.3	43.0	3574
23	133.2	84.2	42.9	3531
24	131.6	84.0	42.8	3488
25	130.0	83.9	42.7	3445