

Functional Stormwater Management Report

Norwood Park Subdivision – Phase 4
Engage Project No. 20120

Engage Engineering Ltd.
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REVISION SUMMARY

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1	Issued for 1 st Draft Plan	January 14 th , 2022	Final

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1.0 Introduction

1.1 Purpose

Engage Engineering Limited (Engage) has been retained by DPH Developments Inc. (DPH) to prepare a Stormwater Management (SWM) Report to support a Draft Plan Application for Phase 4 of the Norwood Park residential subdivision in the Township of Asphodel-Norwood (Township). Phase 4 of the development will consist of 96 single family homes, and 52 townhomes, an extension of Albine Street right of way (ROW), and the construction of three internal ROW's. This report will quantify the impact that the proposed development will have on runoff rates and recommend stormwater management measures required to maintain post-development flows to pre-development levels while providing appropriate quality control.

The first three phases of the subdivision have been individually serviced by stormwater management (SWM) facilities. There was no additional allocation provided in any of the previous phases to service any future development, and an individual SWM facility is required to service the proposed development

Recommendations made in this report will be in accordance with the MECP and Township of Asphodel-Norwood requirements, in addition to current stormwater management best practices and the Credit Valley Conservation Low Impact Development Stormwater Management Planning and Design Guide (CVC LIDSWMPDG).

1.2 Site Description

The subject development is a 14.1 ha parcel of land in the Township of Asphodel-Norwood (Town). The property is bounded to the north by the hydro corridor and agricultural lands, the west by agricultural lands, to the south by Albine Street and agricultural lands, and to the east by the Norwood Park Phase 3 Subdivision. The location of the subject property is identified on the **Location Plan** attached as **Figure 1**.

2.0 Stormwater Management

The proposed development of the site will increase site imperviousness and increase post-development runoff rates. To mitigate these effects, a stormwater management strategy is being proposed to provide the required quantity and quality control.

2.1 Hydrologic Model

As part of this study, a hydrologic model for the site under both existing and proposed conditions was developed using Visual OTTHYMO (VO) software. The model was used to simulate peak flows from the site under both pre and post-development conditions for a variety of storm distributions and durations, as well as to verify stormwater management storage requirements and performance. The model and detailed output are included in **Appendix C**.



City of Peterborough rainfall data was utilized to develop the storm distributions in the model. The geotechnical report prepared by GHD (June 2021) was utilized to determine land use and soil types for the hydrologic model. According to the geotechnical report which is included in **Appendix G**, the underlying soils are generally characterized as sandy silt or silty sand. This type of soil is classified as Hydrologic Soils Group B for the purposes of this report. This soil group along with the crop and other improved land use suggest a CN value of 74. Bedrock was encountered within the 1.1 – 3.2 mbgs and no permanent groundwater table was encountered during the geotechnical investigation.

2.2 Existing Conditions

The existing site is a 14.1 hectare parcel of land and is located directly west of the Phase 3 lands. The topography and legal limits of the property are shown on the **Topographic Survey Plan** prepared by JD Barnes which is included as **Figure 3**. The topographic survey was utilized to determine existing elevations, locations of existing features on the site, and to establish a proposed grading and servicing design for the proposed development of the site.

The site cover consists of gently rolling vacant agricultural land. Based on the topographic survey, County of Peterborough GIS contours, and site reconnaissance by Engage, flows from the site sheet flow from north to south across the site and continue to sheet flow across the agricultural land to the south, into an existing box culvert under the CN rail line. Once passed through the culvert, the flows continue to sheet flow into the un-evaluated wetland south of the railway.

For the purposes of this report the site was divided into two (2) sub-catchment areas and two (2) external drainage areas. The existing catchment areas have been identified as shown on the **Pre-Development Drainage Area Plan** included as **Figure 4**.

- Existing catchment area **EX1** is 12.27ha and includes drainage for the central portion of the site. This area generally drains from north to south via sheet flow and ultimately contributes to the culvert under the CN rail line south of the site.
- Existing catchment area **EX2** is 1.83ha and includes drainage for the western portion of the site. This area drains via sheet flow from northeast to southwest and ultimately contributes to the existing box culvert under the CN rail line south of the site.
- External catchment area **EXT3** is 2.80ha of external area that includes drainage for areas northeast of the development. The external area includes a portion of Phase 3 rearyard lots, and existing crop area. This area drains from north to south contributing to EX1 and consists of grassed, crop, and impervious area. Flows ultimately contribute to the box culvert under the CN rail line south of the site.
- Existing catchment area **EXT4** is 1.17ha of external area that includes drainage for areas directly east of the development. The external area includes a portion of



Phase 3 rearyard lots, and Albine Street. This area drains from east to west contributing to EX1 and consists of grassed, impervious, and gravel areas. Flows ultimately contribute to the box culvert under the CN rail line south of the site.

The hydrologic parameters for the pre-development model are summarized in **Table 1** below. A complete list of the VO input data is included in **Appendix A**.

Table 1 - Pre-Development Hydrological Parameters

Catchment	Area (ha)	TIMP	XIMP	CN*	IA	TP (hr)	VO Command
EX1	12.27	-	-	72	5	0.50	NASHYD
EX2	1.83	-	-	73	5	0.33	NASHYD
EXT3	2.80	-	-	71	5	0.35	NASHYD
EXT4	1.17	24.8	17.1	83	5	-	STANDHYD

Details on the time to peak calculations are included in **Appendix B**.

2.3 Proposed Conditions

Under the proposed condition, the topography will change to include the development of 96 single family homes and 53 townhomes as seen on the **Draft Plan** included as **Figure 2**. There are six (6) proposed drainage catchment areas as well as two (2) external areas as identified on the **Post-Development Drainage Area Plan** included as **Figure 5**. The respective catchment areas can be identified based on the following properties:

- Proposed catchment area **PR1** consists of 11.55ha that includes the entire development area and includes all 96 single family homes, 53 townhomes, the three proposed ROW's, the Albine extension, and the proposed SWM facility. Drainage from this area will flow via overland flow and storm sewers and discharge into the proposed SWM facility. Flows will ultimately be discharged at a controlled rate via a flow spreader to the south and sheet flow to the south, ultimately contributing to the box culvert as in existing conditions.
- Proposed catchment area **PR2** consists of 0.75ha of crop area in the northwest corner of the site. This area will remain unchanged from existing conditions and continue to sheet flow to the southwest and ultimately contribute to the box culvert under the CN rail line south of the site.
- Proposed catchment area **PR3** consists of 1.52ha of crop and grassed are in the northern portion of the site. This area includes the parkland block and a section of crop area which travels via sheet flow towards a conveyance swale which directs flows towards the proposed storm sewer network. Flows contribute to the proposed SWM pond and will ultimately be discharged at a controlled rate via a



flow spreader to the south and sheet flow to the south, ultimately contributing to the box culvert as in existing conditions.

- Proposed catchment area **PR4** consists of 0.27ha of the rear yards in the southern portion of the site. Flows from this area will discharge uncontrolled to the south as in existing conditions and sheet flow towards the box culvert south of the site.
- External catchment area **PXT5** is 2.80ha of external area that includes drainage for areas northeast of the development. The external area includes a portion of Phase 3 rearyard lots, and existing crop area. This area drains towards a lowpoint in the northeast corner of the site where the major storm flows will be captured within the proposed storm sewer network and directed to the SWM pond. This catchment area consists of grassed, crop, and impervious area. Flows ultimately contribute to the box culvert under the railroad south of the site.
- External catchment area **PXT6** is 1.17ha of external area that includes drainage for areas directly east of the development. The external area includes a portion of Phase 3 rearyard lots, and Albine Street. This area drains from east to west contributing to PR1 and consists of grassed, impervious, and gravel areas. Flows will be directed to the SWM pond and will ultimately contribute to the box culvert under the railroad south of the site at a controlled rate.

The characteristics of the proposed drainage areas are summarized in **Table 2** below. A complete list of the VO input data is included in **Appendix A**.

Table 2 – Post - Development Hydrologic Parameters

Catchment	Area (ha)	TIMP	XIMP	CN*	IA	VO Command
PR1	11.55	59	39	83	-	STANDHYD
PR2	0.75	-	-	73	5	NASHYD
PR3	1.52	-	-	66	5	NASHYD
PR4	0.27	-	-	59	5	NASHYD
PXT5	2.80	-	-	71	5	NASHYD
PXT6	1.17	29	20	83	-	STANDHYD

Details on the percent impervious calculations and time to peak calculations are included in **Appendix B**.

2.4 Existing and Proposed Peak Flows

Various storm distributions were analyzed to determine the highest peak flows and ultimately the quantity control storage volumes. The hydrologic model was used to



simulate existing and proposed peak flows for the 100-year storm for the following storm distributions:

- 1, 4, 6 hour Chicago
- 1, 6, 12 Hour AES
- 6, 12, 24 Hour SCS
- Timmins Storm

A summary of the results is shown in **Table 3** and **Table 4** below.

Table 3 - Pre-Development Peak Flows

Storm Event	Peak Flows (m ³ /s)			
	EX1	EX2	EXT3	EXT4
1CHI 100 Yr	0.519	0.102	0.141	0.190
4CHI 100 Yr	0.664	0.132	0.183	0.234
6CHI 100 Yr	0.697	0.138	0.192	0.241
1AES 100 Yr	0.584	0.123	0.168	0.226
6AES 100 Yr	0.679	0.133	0.185	0.182
12AES 100 Yr	0.590	0.106	0.151	0.108
6SCS 100 Yr	0.876	0.180	0.250	0.319
12SCS 100 Yr	0.734	0.147	0.206	0.202
24SCS 100 Yr	0.653	0.119	0.169	0.119

Table 4 - Post-Development Peak Flows

Storm Event	Peak Flows (m ³ /s)					
	PR1	PR2	PR3	PR4	PXT5	PXT6
1CHI 100 Yr	2.600	0.042	0.055	0.008	0.139	0.201
4CHI 100 Yr	2.898	0.054	0.071	0.010	0.180	0.244
6CHI 100 Yr	2.946	0.056	0.075	0.011	0.189	0.251
1AES 100 Yr	2.760	0.050	0.063	0.009	0.164	0.234
6AES 100 Yr	1.947	0.054	0.073	0.010	0.181	0.185
12AES 100 Yr	1.172	0.044	0.063	0.009	0.150	0.110
6SCS 100 Yr	3.478	0.074	0.095	0.014	0.246	0.326
12SCS 100 Yr	2.136	0.060	0.079	0.011	0.202	0.205
24SCS 100 Yr	1.271	0.049	0.071	0.010	0.167	0.120

Distributions with the highest peak flows and the highest difference in peak flows were analyzed to determine which storm event would produce the largest amount of storage. The 6Hour SCS storm distribution produced the largest storage volumes and was selected for the analysis of the wet SWM pond. The 2 through 100-year storm events were modeled and the results are summarized in **Table 5** and **Table 6** below. A peak flow summary and detailed VO output is included in **Appendix C**.



The results indicated that the 6 Hour SCS distribution produced both the highest peak flows and largest difference in peak flows. This distribution was selected to perform the analysis as part of the detailed design. The 2 through 100-year storm events were modeled and the results are summarized with the detailed VO output in **Appendix C**.

Table 5 - Pre Development Peak Flows - 6 Hour SCS

Outlet	Catchment ID	Peak Flows (m ³ /s)					
		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
EX1	East	0.182	0.334	0.451	0.612	0.741	0.876
EX2	West	0.038	0.069	0.093	0.126	0.153	0.180
EXT3	North	0.052	0.095	0.129	0.175	0.212	0.250
EXT4	Phase 3/Albine	0.081	0.146	0.186	0.238	0.278	0.319
Totals							
Total South	EX1+EXT3+EXT4	0.260	0.461	0.617	0.830	1.001	1.178
Total West	EX2	0.038	0.069	0.093	0.126	0.153	0.180
Total Existing	EX1+ EX2+EXT3+EXT4	0.296	0.526	0.704	0.948	1.143	1.345

Table 6 - Post Development Peak Flows - 6 Hour SCS

Outlet	Catchment ID	Peak Flows (m ³ /s)					
		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
PR1	To Pond	1.094	1.635	2.165	2.676	3.076	3.478
PR2	Open Space	0.016	0.028	0.038	0.052	0.063	0.074
PR3	Parkland	0.019	0.035	0.048	0.065	0.08	0.095
PR4	Rearyards	0.003	0.005	0.007	0.009	0.011	0.014
PXT5	North	0.051	0.093	0.126	0.171	0.208	0.246
PXT6	Phase 3/Albine	0.086	0.152	0.191	0.244	0.285	0.326
Totals							
Total South	PR1+PR3+PR4+PX5+PXT6	1.220	1.860	2.460	3.060	3.530	4.010
Total West	PR2	0.016	0.028	0.038	0.052	0.063	0.074
Total Post	PR1+PR2+PR3+PR4+PX5+PXT6	1.230	1.880	2.490	3.100	3.580	4.070

The results indicate that in the absence of any quantity controls, the peak flows from catchments PR1+PR3+PR4+PX5+PXT6 to the south will increase under the proposed conditions, when compared with EX1+EXT3+EXT4 and that some form of quantity control is required. The peak flows to the west have not increased in proposed conditions, therefore no quantity control is required for catchment area PR2. The peak flows from catchment areas PR4 will be released from the site uncontrolled, due to grading constraints it was not possible to direct these flows into the pond. The release rate from the pond will be overcontrolled to account for these areas.



Catchment areas PR1, PR3, PX5, and PXT6 will drain to the south to the proposed stormwater management wet pond. Minor flows (up to 5-year storm event) will be conveyed in the storm sewer and major flows (up to and including 100-year event) will be conveyed via the proposed road and storm sewer. Further details on the stormwater conveyance are included in Section 3.3.

VO model calculations were completed for the SWM facility to determine the storage volumes required to limit post-development flows to pre-development levels. The model outputs are included in **Appendix C**.

3.0 Stormwater Management Controls

3.1 Quantity Control

A wet pond is proposed to provide control of post-development runoff to pre-development levels for drainage areas PR1, PR3, PX5, and PXT6 as the contributing drainage area is greater than 5 hectares. The pond will be located on the southern boarder of the site south of Albine Street. Details showing the proposed pond location and associated details are included on the **Preliminary Grading Plan** included as **Figure 7**.

Runoff from minor and major storm events for catchment PR1, PR3, PX5, and PXT6 will be conveyed to the pond via storm sewer and the road right of way. The pond has a multi-stage outlet; the first stage consists of a 150 mm orifice tube as part of a perforated hickenbottom riser pipe which will provide the desired draw down time for the pond. The second, third and fourth stage consist of DICB's complete with 300 mm, 350 mm, and 250 mm orifice plates respectively, that will release flows at a controlled rate up to the 100-year storm. The proposed pond will discharge to a proposed level spreader, as per Section 4.5.12 for the MOE SWM Planning & Design Manual (MOESWPDM), and ultimately discharge as sheet flow to the south. Flows will continue to sheet flow and infiltrate across the crop land to the south and ultimately the existing box culvert under the CP rail line. A 19.9 m wide emergency overflow weir has been incorporated into the pond at elevation 209.50 m. The overflow weir will allow for 0.30 m of freeboard for the pond. The weir will convey the 100-year peak flows for the flows directed to the pond, in case of emergency or should either of the orifices plug. The emergency overland flow will be captured in the proposed storm network and the proposed ROW's and conveyance swales and ultimately convey to the south as in existing conditions. Weir sizing calculations are included in **Appendix E**.

The proposed stormwater management facility was modeled to determine the functionality and to confirm that it has the capacity to accommodate the flows from the site. A proposed wet pond surface was developed in AutoCAD Civil 3D. This surface was analyzed, and it was determined that the constructed pond has a total capacity of 10,134m³ up to the invert of the overflow weir. This volume is comprised of 2,014m³ permanent pool, 1,656m³ extended detention and 8,120m³ of active storage. The surface was used to develop a stage storage relationship in 0.05m increments.

An abbreviated stage storage discharge (SSD) relationship for the pond is shown in **Table 7** below. The complete SSD table and calculations are included in **Appendix D**.



Table 7 - Stage Storage Discharge

Description	Stage (m)	Discharge (m ³ /s)	Active Storage Provided (m ³)	Minimum Active Storage Required (from VO) (m ³)	Total Storage Provided (m ³)
Bottom of Pond / Permanent Pool	206.80	-	-	-	0.00
Bottom of Extended Detention/Top of Permanent Pool	207.80	0.000	0.000	0.00	2014
25mm CHI	208.35	0.043	1656	1555	3670
2 - Year Ponding	208.55	0.199	2361	2352	4375
5 - Year Ponding	208.85	0.243	3526	3505	5540
10 - Year Ponding	209.00	0.525	4159	4067	6173
25 - Year Ponding	209.15	0.758	4825	4628	6839
50 - Year Ponding	209.30	0.803	5526	5303	7540
100 - Year Ponding	209.40	0.832	6031	6031	8045
Overflow Weir	209.50	0.860	6516	-	8530
Top of Pond	209.80	-	8120	-	10134

The provided stage storage discharge will limit all storm events to at or below pre-development conditions. **Table 8** below demonstrates that the proposed discharge rates for the SWM facility, including the uncontrolled areas to the west and south, are at or below pre-development release rates.



Table 8 - Allowable vs. Proposed Release Rates

Design Storm (years)	Allowable Discharge Rate (EX1+EX2+EXT3+EXT4) (m³/sec)	Proposed Discharge Rate (PR1+PR3+PXT5+PXT6) (Routed) + PR4 (Uncontrolled) + PR2(Uncontrolled) (m³/sec)
2	0.241	0.211
5	0.426	0.269
10	0.569	0.561
25	0.765	0.814
50	0.921	0.860
100	1.083	0.904

3.2 Quality Control

In accordance with ORCA requirements, quality control is provided in the proposed SWM facility to an “Enhanced” level. Per table 3.2 of the MOE SWM Planning & Design Manual, the quality storage volume requirements for a wet pond facility with 45.6% site imperviousness was interpolated to be 167 m³/ha. Of this volume, 40 m³/ha is extended detention while the remainder represents the permanent pool. For the entire 14.1ha drainage area, a total of 2,355 m³ of storage is required for enhanced quality control. The permanent pool volume required is 1,791 m³. The extended detention required is the greater volume generated by the 40 m³/ha or the 25mm storm event, which is 1,570 m³. The proposed SWM facility provides a permanent pool volume of 2,014 m³ and an extended detention volume of 1,656 m³. Therefore, the proposed SWM facility provides adequate quality control volume for the proposed site.

The proposed design includes a sediment forebay at the inlet location to improve pollutant removal and allow for proper maintenance of the SWM facility. The forebay was designed using equations 4.5 - 4.9 of the MOE SWM Planning & Design Manual (MOESWPDM). The forebay will be 36 m in length, with a 11.2 m minimum width, and have a depth of 1.0m. Calculations are included in **Appendix G**. Quality control requirements for the SWM pond are compared to what is being provided in **Table 9** below.



Table 9 - Quality Control Requirements

Description	Requirement	Provided
Quality Control Volume	1,791 m ³	2,014 m ³
Extended Detention	564 m ³	1,656 m ³
25mm Chicago Storm	1,570 m ³	1,656 m ³
Draw Down Time	24 hrs	24 hrs
Settling Length	16.9 m	21.4 m
Dispersion Length	12.6 m	21.4m
Forebay Width	2.2 m	11.2 m

The SWM facility will provide the site with adequate control measures as set out in the MOE SWMPDM; detailed calculations can be found in **Appendix F**.

In addition to the proposed wet pond, low impact development measures will be implemented for the site in order to promote groundwater recharge and provide quality and quantity control for the site. These proposed measures are presented in Section 3.4 and additional details for these features will be provided during the detailed design stage.

3.3 Stormwater Conveyance

Runoff from the site will be conveyed to the SWM facility in one of two methods: via surface drainage systems (including storm sewers and swales) and major overland flow routes.

Minor Storms

Minor storm events, up to and including the 5-year storm, will be conveyed in the storm sewer system and in swales. The storm sewer system will be designed at the detailed design stage in accordance with best practices with all sections of pipe operating below 80% capacity for the 5-year storm.

Major Storms

Major flows up to and including 100-year storms, will be conveyed via overland flow routes to the SWM pond. The overland flow routes are shown on the **Preliminary Grading Plan** included in **Figure 7**. The roadway will serve as the major overland flow route for the development as the proposed grading directs the majority of the runoff toward the SWM facility.

3.4 Water Balance

Water balance calculations were completed comparing the pre and post development infiltration volumes for the site using the methodology outlined in the MOE SWPDM.

Pre Development – this scenario considered the site in its current land use and cover, which is entirely grassed area.



Post Development – this scenario considered the site without any LID/infiltration techniques. Only the grassed areas were considered in calculating infiltration. This scenario is meant to convey the change in infiltration if the site were developed using a traditional SWM approach.

Post Development with Enhancements – this scenario included the grassed areas and the proposed infiltration techniques summarized below. This scenario is meant to demonstrate the anticipated improvements in infiltration that can be realized for this site with the implementation of infiltration techniques.

The proposed enhancements for this site include directing rooftop runoff areas to four infiltration trenches.

The calculations for each scenario are included in **Appendix H** and summarized in **Table 10** below.

Table 10 - Annual Infiltration Volumes

Water Balance		
	Annual Infiltration (m³)	% Change in Infiltration
Pre Development	19,359	-
Post Development	10,481	54% of Pre Development
Post with Enhancements	15,695	81% of Pre Development

The results indicate that in the absence of any infiltration techniques, the development of the site would result in a significant reduction in infiltration and disrupt the water balance and baseflows from the site.

The post development infiltration on the site will be improved with the proposed SWM enhancements. The infiltration volume provided in the post development scenario with enhancements is equal to 81% of the predevelopment infiltration volume, which is a significant improvement compared to a traditional SWM approach.

Four infiltration trenches are proposed which will allow rear yard and rooftop drainage that is essentially clean water to re-charge groundwater on the subject site. The locations of the proposed infiltration trenches are included on the **Preliminary Grading Plan** included as **Figure 7**.

3.5 Low Impact Development Measures

As described above, four infiltration trenches have been specified in addition to the wet pond to promote infiltration across the site. The geotechnical report prepared by GHD (June 2021) was utilized to determine the locations of the LID features. GHD installed three monitoring wells on the site, and no groundwater has been encountered to date. Seasonal monitoring will continue in order to identify any potential groundwater



fluctuations. Bed rock was encountered throughout the site and all LID features have been designed with a 1m separation from the bottom of the facility to the top of the bedrock. Infiltration testing determined an estimated infiltration rate of 50 – 75 mm/hr, correlating to an average design infiltration rate of 18 mm/hr. A max depth of 2 m was calculated based on the soil characteristics and detailed calculations are included in **Appendix I**.

These infiltration measures and further LID measures will be explored further during the detailed design stage.

4.0 Operation and Maintenance

Proper operation and maintenance has an important impact on the long-term performance of stormwater management facilities and features. A detailed Operation and Maintenance Manual will be prepared during the detailed design submission.

5.0 Erosion and Sediment Control

The development of the site will result in a large area of exposed native soils which has the potential to erode and contribute sediment to downstream receivers. To mitigate these effects, an erosion and sediment control strategy will be developed for the site at the detailed design phase. The strategy will incorporate best practices as outlined in the *Erosion and Sediment Control Guidelines for Urban Construction, GGHCA*.

In preparing the plan, consideration will be given to the multi-barrier approach of first reducing erosion where possible and then containing sediment on site. The ESC plan will incorporate several sedimentation control measures including perimeter silt fencing, interceptor swales, straw bale check dams and use of the proposed pond as a temporary sediment pond. The pond will be sized to provide the necessary sediment removal for the entire site; the additional measures including straw bale flow checks will provide a secondary level of control and are part of the treatment train approach for the ESC plan. During the detailed design stage an Erosion and Sediment Control Report and Plan will be developed in accordance with the appropriate guidelines.



6.0 Summary

The development of the proposed Phase 4 of the Norwood Park Subdivision which consists of 96 single family homes, and 52 townhomes, an extension of Albine Street, and the construction of three internal right-of-way's (ROW), will increase runoff rates and has the potential to increase sediment/contaminant loading downstream. To mitigate these effects, a stormwater management strategy is proposed that incorporates a wet pond to provide quantity and quality control. The SWM facility will control the post-development release rates to below the pre-development levels for all storm distributions and durations. Sufficient storage is provided in the pond to allow attenuation of the peak flows for up to the 100-year storms. The wet pond will provide an Enhanced level of quality control. The proposed SWM strategy will ensure that the proposed development does not have a negative impact on downstream receivers. In addition to the pond, low impact development measures will be implemented for the site in order to promote groundwater recharge and aide in quality and quantity control for the site.

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Figure 1 - Location Plan



PROPOSED SITE LOCATION

COUNTY ROAD 40

ALBINE STREET



ENGAGE
ENGINEERING

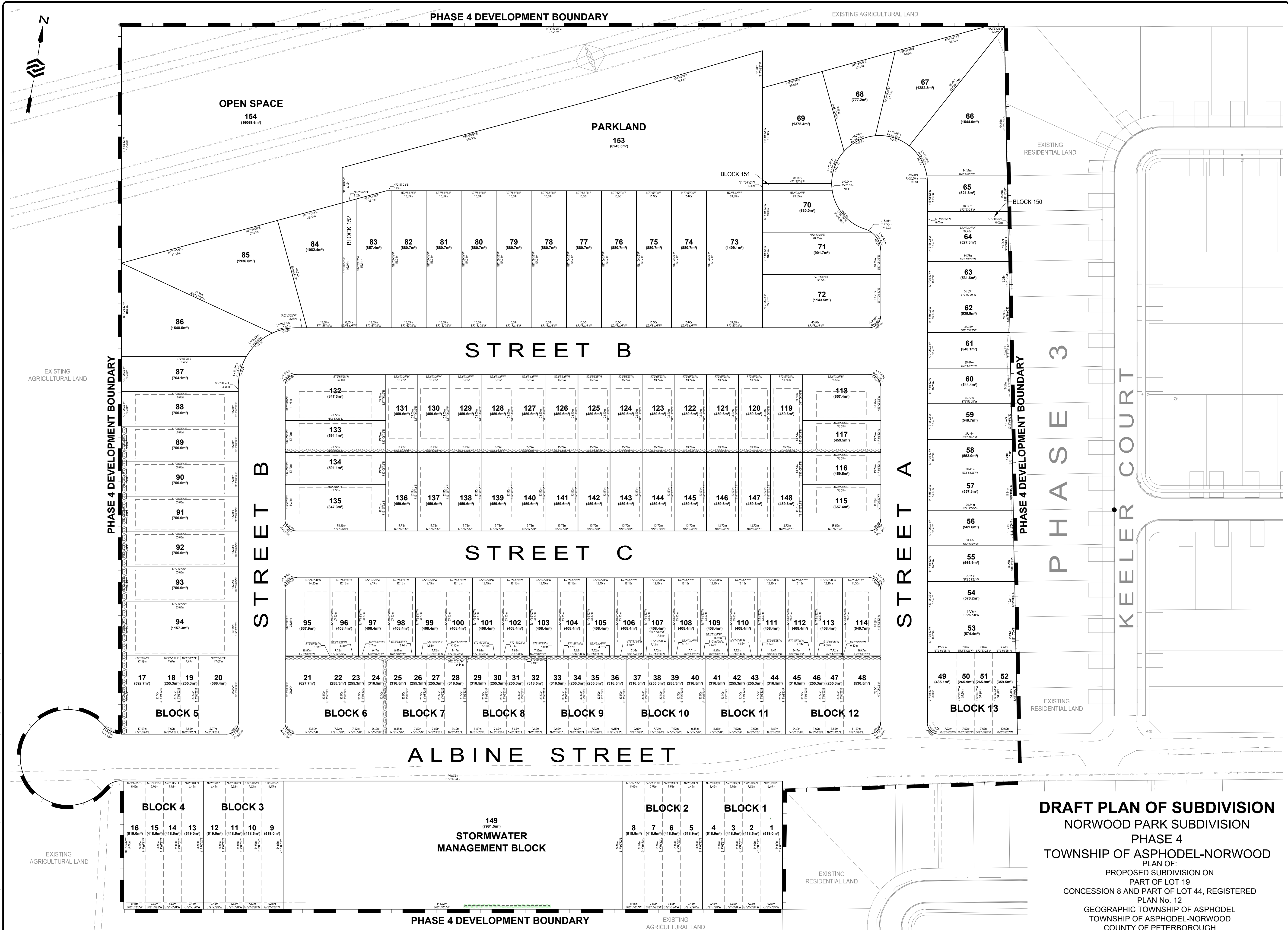
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NORWOOD PARK PHASE 4 - DUE DILIGENCE

FIGURE 1 - LOCATION PLAN

DRAWN: B.SANDERS	APPROVED: P.HURLEY	SCALE: N.T.S	DATE: 21-04-07	PROJECT No.: 20120
---------------------	-----------------------	-----------------	-------------------	-----------------------

Figure 2 - Draft Plan



BENCHMARK
CUT CROSS IN CONCRETE GUTTER ON KEELER COURT AT THE INTERSECTION OF KEELER COURT AND MARYANN LANE. CUT CROSS IS ON THE WEST SIDE OF THE ROAD APPROXIMATELY 100m NORTH OF THE INTERSECTION OF ALBINE STREET AND KEELER COURT.
ELEV: 213.160m

OWNER'S CERTIFICATE
I AUTHORIZE ENGAGE CONSULTING SERVICES INC. TO SUBMIT THIS DRAFT PLAN OF SUBDIVISION TO THE COUNTY OF PETERBOROUGH.

DATE: 2021-12-10
DPH DEVELOPMENTS INC.

SURVEYOR'S CERTIFICATE
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND ARE IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

DATE: 2021-12-10
SHAWN M. O'CONNOR
Ontario Land Surveyor

KEY MAP

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51-17 (A-L) OF THE PLANNING ACT:
a. AS SHOWN ON THIS DRAFT PLAN
b. AS SHOWN ON THIS DRAFT PLAN
c. AS SHOWN ON THIS DRAFT PLAN
d. RESIDENTIAL DWELLINGS
e. AS SHOWN ON THIS DRAFT PLAN
f. AS SHOWN ON THIS DRAFT PLAN
g. REFER TO FUNCTIONAL SERVICING REPORT BY ENGAGE ENGINEERING
h. REFER TO STORMWATER MANAGEMENT REPORT BY ENGAGE ENGINEERING
i. AS SHOWN ON THIS DRAFT PLAN
j. HYDRO, TELEPHONE, MUNICIPAL SEWAGE SERVICING, MUNICIPAL WATER SERVICING AND STORMWATER MANAGEMENT PONDS
k. NA
l. NA

LAND USE SUMMARY			
LAND USE	AREA (m ²)	AREA (%)	UNITS
TOWNHOMES BLOCKS 1-13	19,029.30m ²	13.80%	52
SINGLE-FAMILY LOTS 53-148	61,568.10m ²	43.90%	96
SWM BLOCK 149	7981.50m ²	5.70%	-
SERVICING BLOCKS 150-152	621.30m ²	0.40%	-
PARKLAND BLOCK 153	6,243.50m ²	4.50%	-
OPEN SPACE BLOCK 154	16,089.60m ²	11.50%	-
20.0m MUNICIPAL ROAD ALLOWANCE	28,578.30m ²	20.40%	-
TOTAL AREA	140,078.60m²	100.00%	148

No.	REVISION	BY	DATE
1.	ISSUED FOR DRAFT PLAN SUBMISSION	JD	2021-12-10

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NORWOOD PARK SUBDIVISION PHASE 4

TOWNSHIP OF ASPHODEL-NORWOOD

DRAFT PLAN

NORWOOD, ONTARIO	
DRAWN BY:	J. DUNN
DESIGNED BY:	J. DUNN
APPROVED BY:	P. HURLEY
DATE:	2021-08-30
SCALE:	1:750
PROJECT NUMBER:	20120
SHEET NAME:	DP1
SHEET:	1 of 1

DRAFT PLAN OF SUBDIVISION
NORWOOD PARK SUBDIVISION
PHASE 4
TOWNSHIP OF ASPHODEL-NORWOOD
PLAN OF:
PROPOSED SUBDIVISION ON
PART OF LOT 19
CONCESSION 8 AND PART OF LOT 44, REGISTERED
PLAN No. 12
GEOGRAPHIC TOWNSHIP OF ASPHODEL
TOWNSHIP OF ASPHODEL-NORWOOD
COUNTY OF PETERBOROUGH

Figure 3 - Topographic Survey Plan

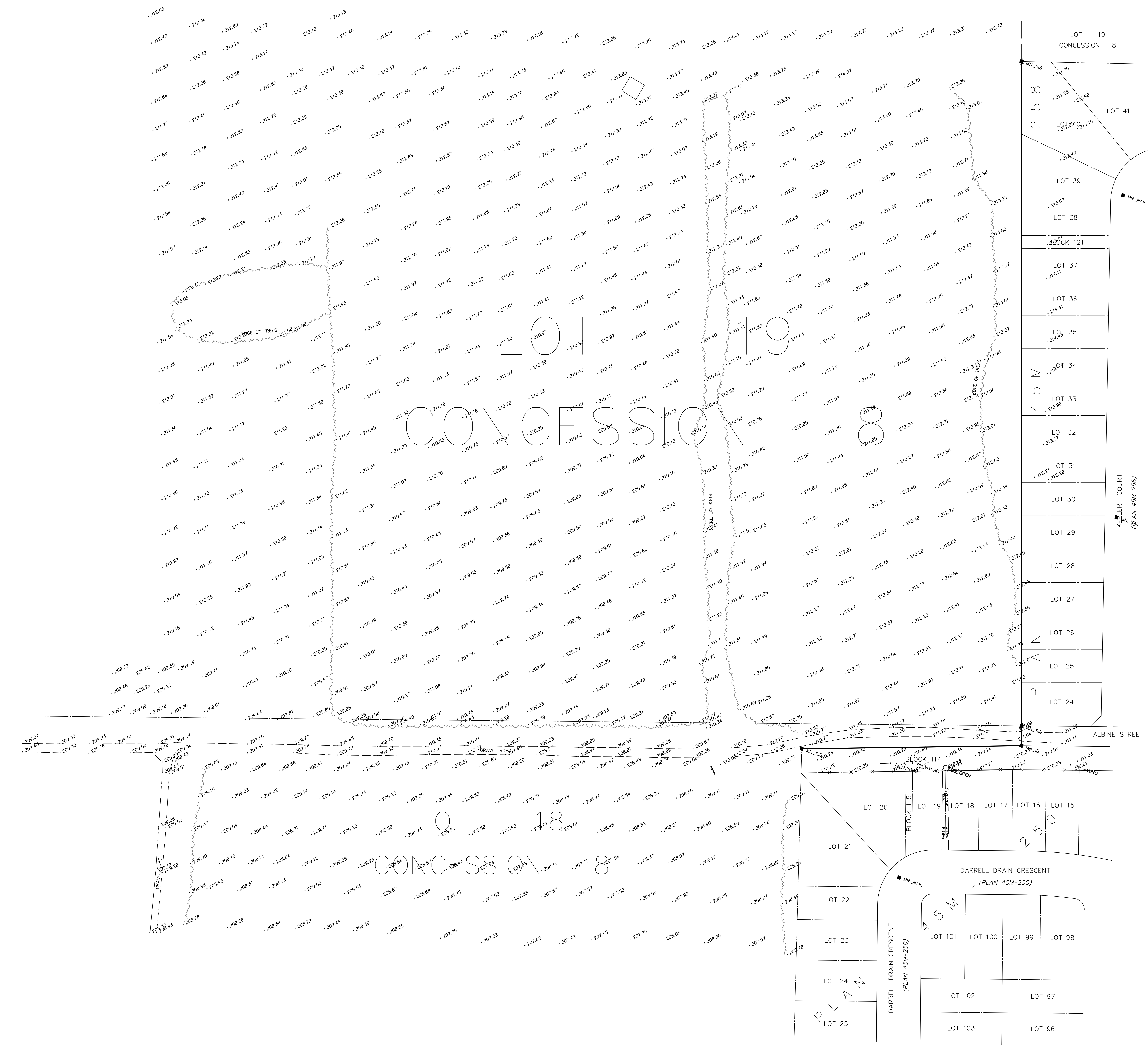
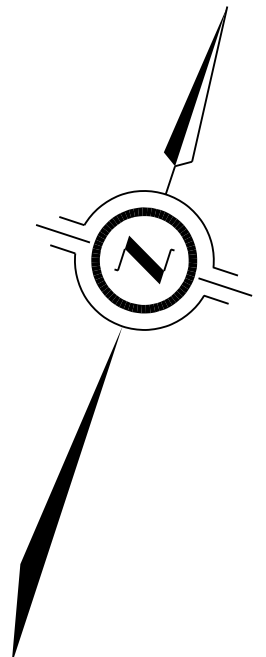
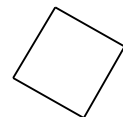


Figure 4 - Pre-Development Drainage Area
Plan

HYDRO CORRIDOR

EXT3
0.33 2.80

EX1
0.35 12.27

EX2
0.35 1.83

EXT4
0.35 1.17

NORWOOD PARK PHASE 3

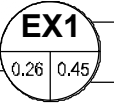
ALBINE STREET

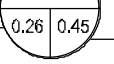
NORWOOD PARK PHASE 2

LEGEND

 OVERLAND FLOW ROUTE

 CATCHMENT BOUNDARY

 CATCHMENT NAME

RUNOFF COEFFICIENT  AREA (ha)

 **ENGAGE**
ENGINEERING

NORWOOD PARK PHASE 4

FIGURE 5 - PRE-DEVELOPMENT DRAINAGE AREA PLAN

DRAWN: B.SANDERS	APPROVED: B.PARSONS	SCALE: 1:2000	DATE: 21-12-10	PROJECT No.: 20120
---------------------	------------------------	------------------	-------------------	-----------------------

Figure 5 - Post-Development Drainage Area
Plan

HYDRO CORRIDOR



PXT5
0.33 2.80

PR2
0.35 0.75

PR3
0.25 1.52

PR1
0.56 11.55

NORWOOD PARK PHASE 3

PXT6
0.33 1.17

PR4
0.10 0.27

ALBINE STREET

NORWOOD PARK PHASE 2

LEGEND



OVERLAND FLOW ROUTE



CATCHMENT BOUNDARY

PR1 CATCHMENT NAME
RUNOFF COEFFICIENT 0.26 0.45 AREA (ha)



NORWOOD PARK PHASE 4

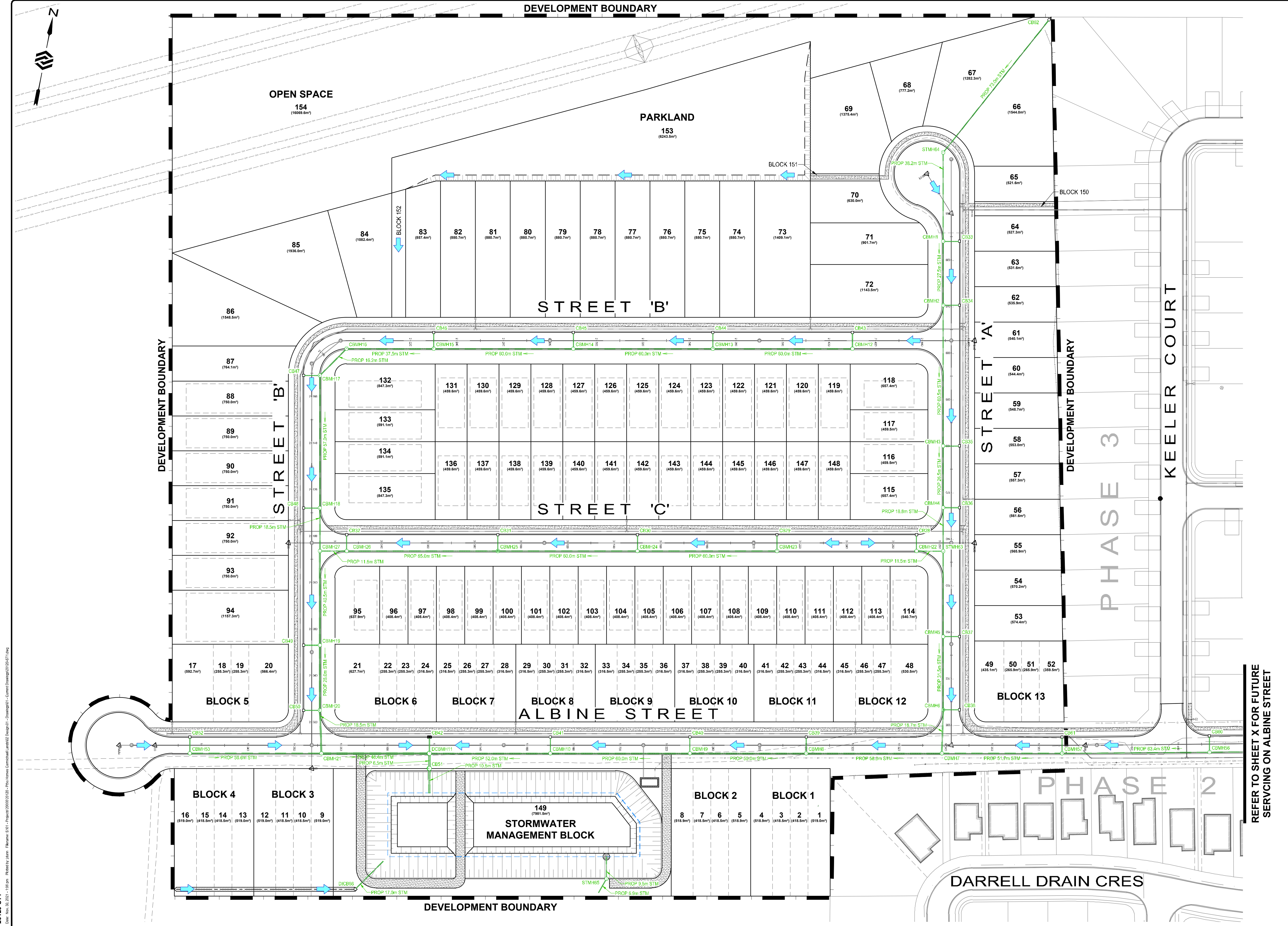
FIGURE 6 - POST-DEVELOPMENT DRAINAGE AREA PLAN

DRAWN: B.SANDERS APPROVED: B.PARSONS SCALE: 1:500 DATE: 21-10-01 PROJECT No.: 20120

Figure 6 - Overall Stormwater Plan

20120-ST1

Date: Nov 30, 2021 - 1:59 pm - Plotted by: J.D. - Project: 20120-ST1 - Phase: 4 - Stormwater Management Block - Drawing: 1 - Stormwater Management Block - Drawing: 1 - Stormwater Management Block - Drawing: 1



BENCHMARK
CUT CROSS IN CONCRETE GUTTER ON KEELER COURT AT THE INTERSECTION OF KEELER COURT AND MARYANN LANE. CUT CROSS IS ON THE WEST SIDE OF THE ROAD APPROXIMATELY 100m NORTH OF THE INTERSECTION OF ALBINE STREET AND KEELER COURT.

ELEV: 213.160m

NOTES:

- OVERLAND FLOW DIRECTION
- STORM SEWER
- CATCH BASIN
- DOUBLE CATCH BASIN
- CATCH BASIN MANHOLE
- DOUBLE CB MANHOLE
- STORM MANHOLE

1.	ISSUED FOR REVIEW	JD	2021-12-01
No.	REVISION	BY	DATE

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**NORWOOD PARK
SUBDIVISION PHASE 4**

TOWNSHIP OF ASPHODEL-NORWOOD

**FUNCTIONAL STORM
SEWER DESIGN**

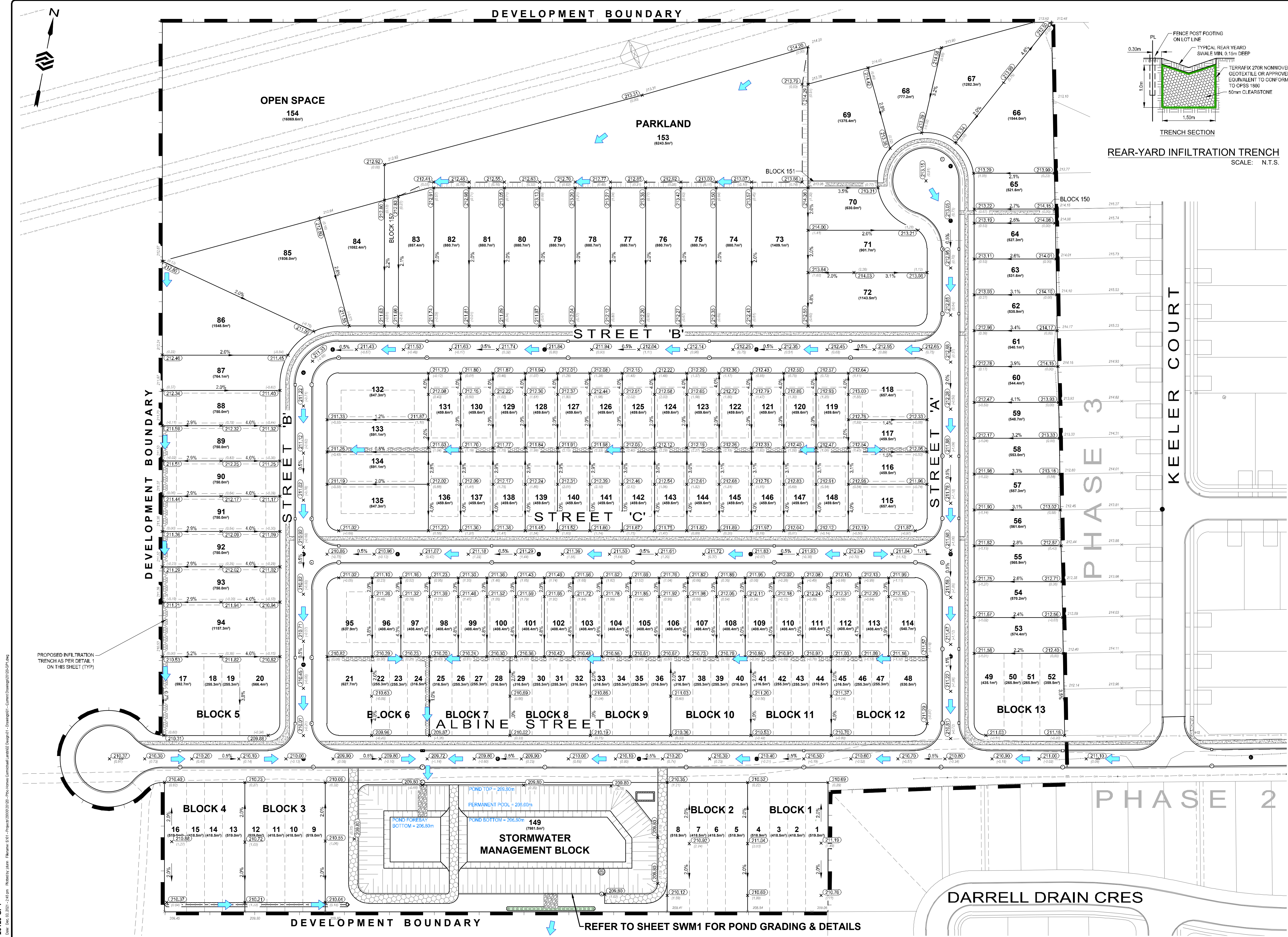
NORWOOD, ONTARIO

DRAWN BY: J. DUNN
DESIGNED BY: J. DUNN
APPROVED BY: J. ARMSTRONG
DATE: 2021-11-17
SCALE:

STAMP:

PROJECT NUMBER: 20120
SHEET NAME: ST1
SHEET: ### of ###

Figure 7 - Preliminary Grading Plan



BENCHMARK
CUT CROSS IN CONCRETE GUTTER ON KEELER COURT AT THE INTERSECTION OF KEELER COURT AND MARYANN LANE. CUT CROSS IS ON THE WEST SIDE OF THE ROAD APPROXIMATELY 100m NORTH OF THE INTERSECTION OF ALBINE STREET AND KEELER COURT.
ELEV: 213.160m

NOTES:

No.	REVISION	BY	DATE
1.	ISSUED FOR REVIEW	JD	2021-12-01

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NORWOOD PARK SUBDIVISION PHASE 4

TOWNSHIP OF ASPHODEL-NORWOOD

FUNCTIONAL GRADING PLAN

NORWOOD, ONTARIO

DRAWN BY: J. DUNN
DESIGNED BY: J. DUNN
APPROVED BY: J. ARMSTRONG
DATE: 2021-11-17
SCALE:

PROJECT NUMBER: 20120
SHEET NAME: GP1
SHEET: #### of ####

Appendix A: Hydrologic Parameters

Visual OTTHYMO Input Parameters

STANDHYD Command



Project Name: Norwood Park Phase 4

Project No: 20120

Designed By: BS

Date: 2021-11-21

Parameter	Description	EXT4	PR1	PXT6
AREA	Catchment Area (ha)	1.17	11.55	1.17
DT	Time Step Increment (min)	5		
TIMP	Total Impervious Area (%)	24.76	59	28.94
XIMP	Directly Connected Impervious Area (%)	17.1	39	20.09
DWF	Dry Weather Flow (m ³ /s)	0		
LOSS ¹	Modified CN*	83	83	83
SLPP	Average Slope Pervious Area (%)	5.1	3	5.1
LGP	Overland Flow Length Pervious Area (m)	26	22	26
MNP	Manning's Roughness Coefficient (Pervious)	0.25		
SCP	Storage Coefficient Pervious Area	0		
DPSI	Depression Storage Impervious Area (mm/hr)	1		
SLPI	Average Slope Impervious Area (%)	2	1	2
LGI	Impervious Overland Flow Length (m)	240.0	523.0	240.0
MNI	Manning's Roughness Coefficient (Impervious)	0.013		
SCI	Storage Coefficient Impervious Area	0		
RAIN	Optional Rainfall Intensity (mm/hr)	0		

Notes:

1. CN values based on Design Chart 1.09 in MTO Drainage Manual based on Soil Type B.
2. CN* derived using the Modify CN function in VO5. The modification was completed in accordance with the procedure described in the VO5 reference Manual.
3. Initial abstraction values derived from UNESCO Manual on Drainage in Urban Areas, 1987.

Visual OTTHYMO Input Parameters

NASHYD Command



Project Name: Norwood Park Phase 4
Project No: 20120

Designed By: BS
Date: 2021-11-21

Parameter	Description	EX1	EX2	EXT3	PR2	PR3	PR4	PXT5
Area	Watershed Area (m)	12.27	1.83	2.80	0.75	1.52	0.27	2.80
DT	Time Step Increment (min)	5						
DWF	Dry Weather Flow (Base Flow)	0						
CN ^{1,2}	Modified SCS Number	72	73	71	73	66	59	71
IA ³	Initial Abstraction	5						
TP ^{4,5}	Unit Hydrograph Time to Peak	0.50	0.33	0.35	0.33	0.47	0.43	0.36
N	Number of Linear Reservoir	3						
Rain	Optional Rainfall Intensity (mm/hr)	0 - None						

- Notes:**
- CN values based on Design Chart 1.09 in MTO Drainage Manual based on Soil Type B.
 - CN derived using the Modify CN function in VO5. The modification was completed in accordance with the procedure described in the VO5 reference Manual.
 - Initial abstraction values derived from UNESCO Manual on Drainage in Urban Areas, 1987.
 - Time of Concentration calculated using Airport Equation for C<0.4 and Bransby Williams for C>0.4.
 - Time to Peak estimated at 0.67Tc.

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BS

Date: 2021-12-06

Date: 2021-12-06

Notes: 1. Runoff coefficients for Land Uses taken from MTO Drainage Manual Design Chart 1.07. 2. Runoff coefficients have been adjusted for storms exceeding the 10-year return period as follows: 25 Year - 1.10; 50-Year: 1.20; 100-Year: 1.25	Time of Concentration 1. Tc calculated using Airport equation for C<0.4 and Bransby Willisams for C>0.4 2. Tp calculated as 0.67Tc.
--	---

Appendix B: Percent Impervious and Time to Peak Calculations

PERCENT IMPERVIOUS AREA CALCUATIONS

PROPOSED DRAINAGE AREA PR1

Project Name: Norwood Park Phase 4



Project No.: 20120

Surface Type	Number	Length (m)	Width (m)	Unit Area (m2)	Total Area (m2)
Homes (50' lots) ¹	44			770	15246
Homes (45' lots)	34			503	7695.9
Homes (40' lots) ¹	20			425	3825
Townhomes	54			444	10789.2
Road		1375	8		11000
Sidewalk (one side)		1375	1.5		2062.5
Driveways	152	8	6		7296
SWM Facility/SPS				6450	6450
Directly Connected Impervious					45586.55
Subtotal Impervious					64364.6
Pervious					51135.4
Drainage Area Total					115500

% Impervious 56%

% Directly Connected 39%

1 - Assummed 45% lot impervious coverage

2 - Directly connected impervious area includes: road, sidewalk, 0.5*homes, SWM facility

Appendix C: Visual OTTHYMO Results

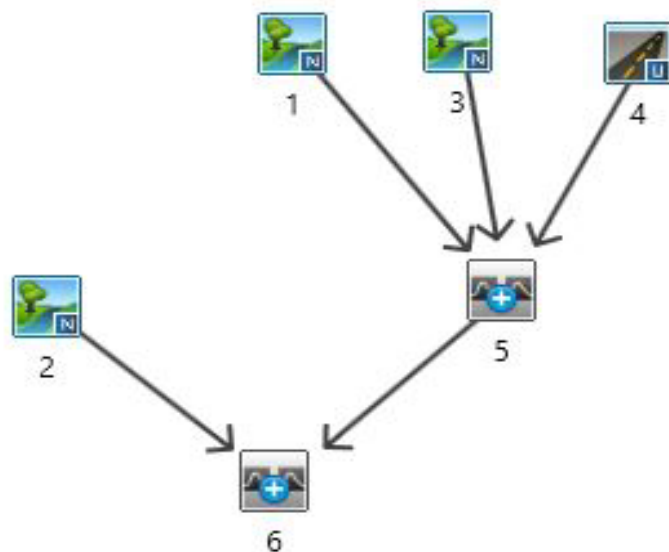
Visual OTTHYMO 3 - Hydrologic Model



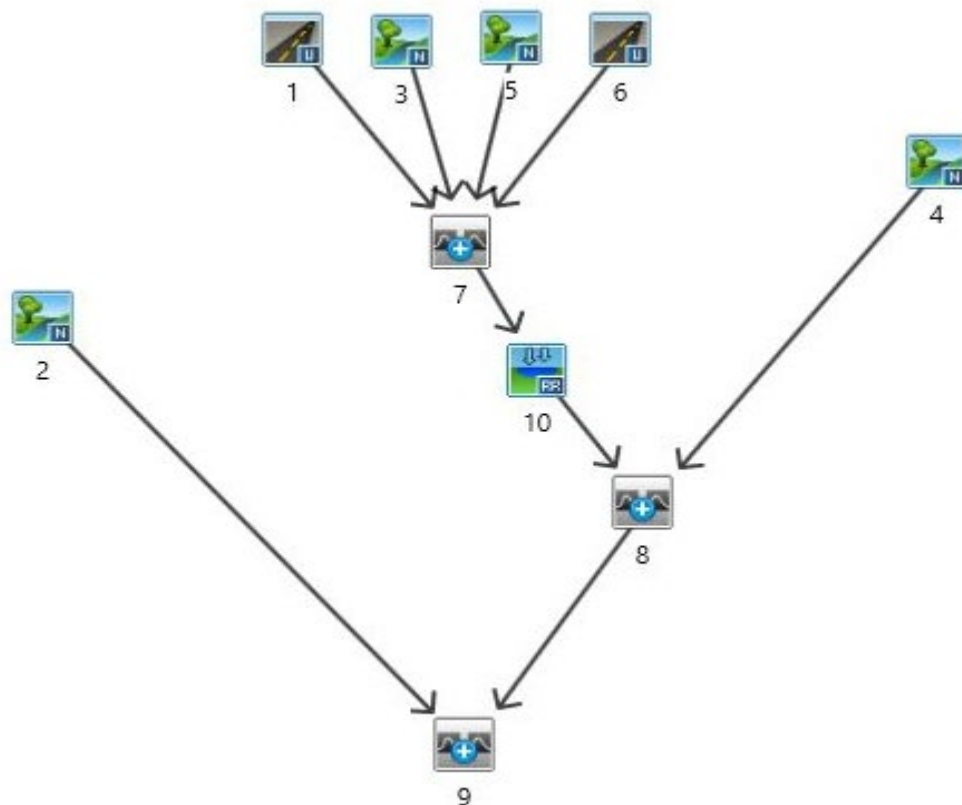
Project Name: Norwood Park Phase 4
Project No: 20120

Designed By: BS
Date: 2021-12-10

Pre-Development Model



Post-Development Model



Visual OTTHYMO

Peak Flow Summary



Visual OTTHYMO

Peak Flow Summary

Project Name:

Norwood Park Phase 4

Project No:

20120

Designed By:

BS

Date:

Nov-21

Catchment ID	Direction	Peak Flows (m ³ /s) (Ptbo - 6 Hour SCS)					
		2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
EX1	East	0.182	0.334	0.451	0.612	0.741	0.876
EX2	West	0.038	0.069	0.093	0.126	0.153	0.180
EXT3	North External	0.052	0.095	0.129	0.175	0.212	0.250
EXT4	Phase 3/Albine	0.081	0.146	0.186	0.238	0.278	0.319
Total South	EX1+EXT3+EXT4	0.260	0.461	0.617	0.830	1.001	1.178
Total Pre Development	EX1+EX2+EXT3+EXT4	0.296	0.526	0.704	0.948	1.143	1.345
PR1	Internal West	1.094	1.635	2.165	2.676	3.076	3.478
PR2	Open Space	0.016	0.028	0.038	0.052	0.063	0.074
PR3	Parklands	0.019	0.035	0.048	0.065	0.08	0.095
PR4	Rearyards	0.003	0.005	0.007	0.009	0.011	0.014
PXT5	North External	0.051	0.093	0.126	0.171	0.208	0.246
PXT6	Phase 3/Albine	0.086	0.152	0.191	0.244	0.285	0.326
Total To Pond	PR1+PR3+PXT5+PXT6	1.22	1.86	2.46	3.06	3.53	4.01
Total South	PR1+PR3+PR4+PXT5+PXT6	1.22	1.86	2.46	3.07	3.54	4.02
Total Post Development	PR1+PR2+PR3+ PR4+PR5+PXT6+PXT7	1.23	1.88	2.49	3.10	3.58	4.07
Allowable Discharge	Total South - PR4	0.241	0.426	0.569	0.765	0.921	1.083
Proposed (Routed)	(PR1 + PR3 + PXT5 +PXT6) (Routed)	0.199	0.243	0.525	0.758	0.803	0.832
Total Proposed (Routed)	(PR1 + PR3 + PXT5 +PXT6)(Routed) + PR4 + PR2	0.211	0.269	0.561	0.814	0.86	0.904

=====

V V I SSSS U U A L (v 6.2.2008)
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V V I SS U U A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

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

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TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	1.60	1.50	3.90	3.00	8.50	4.50	2.30
0.25	1.60	1.75	3.90	3.25	8.50	4.75	2.30
0.50	2.30	2.00	4.60	3.50	3.90	5.00	1.60
0.75	2.30	2.25	4.60	3.75	3.90	5.25	1.60
1.00	2.30	2.50	23.20	4.00	3.10	5.50	1.60
1.25	2.30	2.75	60.40	4.25	3.10	5.75	1.60

| CALIB |
| NASHYD (0001) | Area (ha)= 12.27 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)= 0.50

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.182 (i)
TIME TO PEAK (hrs)= 3.500
RUNOFF VOLUME (mm)= 8.594

TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.222

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

CALIB
NASHYD (0003) | Area (ha)= 2.80 Curve Number (CN)= 71.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.35

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.052 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 8.282
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.214

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

CALIB

STANDHYD (0004) | Area (ha)= 1.17
ID= 1 DT= 5.0 min | Total Imp(%)= 25.00 Dir. Conn.(%)= 17.10

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Max.Eff.Inten.(mm/hr)= 60.40 35.46
over (min) 5.00 15.00
Storage Coeff. (min)= 4.29 (ii) 10.56 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.23 0.09

TOTALS			
PEAK FLOW (cms)=	0.03	0.06	0.081 (iii)
TIME TO PEAK (hrs)=	3.00	3.08	3.00
RUNOFF VOLUME (mm)=	37.75	16.56	20.17
TOTAL RAINFALL (mm)=	38.75	38.75	38.75
RUNOFF COEFFICIENT =	0.97	0.43	0.52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)					
1 + 2 = 3					

	AREA	QPEAK	TPEAK	R.V.	
	(ha)	(cms)	(hrs)	(mm)	
ID1= 1 (0001):	12.27	0.182	3.50	8.59	
+ ID2= 2 (0003):	2.80	0.052	3.25	8.28	
=====					
ID = 3 (0005):	15.07	0.229	3.42	8.54	

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):		15.07	0.229	3.42	8.54
+ ID2= 2 (0004):		1.17	0.081	3.00	20.17
=====					
ID = 1 (0005):		16.24	0.260	3.33	9.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0002)	Area (ha)=	1.83	Curve Number (CN)= 73.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.33	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30

0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.038 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 8.917
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.230

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

ADD HYD (0006)					
1 + 2 = 3					
		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0002):		1.83	0.038	3.25	8.92
+ ID2= 2 (0005):		16.24	0.260	3.33	9.37
=====					
ID = 3 (0006):		18.07	0.296	3.33	9.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
000 T T H H Y Y M M 000
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***** D E T A I L E D O U T P U T *****

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Summary filename:
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4b61d3-d01c-4fd7-ae21-61a6424a231c\sce

DATE: 12-06-2021 TIME: 10:43:26

USER:

COMMENTS: _____

** SIMULATION : 2 - Ptbo_SCS_6hr_5yr **

READ STORM	Filename: C:\Users\bsanders\AppData\Local\Temp\729582a9-3243-4e00-bb23-71f61ddae83\bd8a0895
Ptotal= 52.44 mm	Comments: Ptbo_SCS_6hr_5yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.10	1.50	5.20	3.00	11.50	4.50	3.20
0.25	2.10	1.75	5.20	3.25	11.50	4.75	3.20
0.50	3.20	2.00	6.30	3.50	5.20	5.00	2.10
0.75	3.20	2.25	6.30	3.75	5.20	5.25	2.10
1.00	3.20	2.50	31.40	4.00	4.20	5.50	2.10
1.25	3.20	2.75	81.78	4.25	4.20	5.75	2.10

CALIB	Area (ha)= 12.27	Curve Number (CN)= 72.0
NASHYD (0001)	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.50	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.334 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 15.394
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.294

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

CALIB	Area (ha)= 2.80	Curve Number (CN)= 71.0
NASHYD (0003)	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.35	

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

-- TRANSFORMED HYETOGRAPH ----								
TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20		3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20		3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20		3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20		3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20		3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20		3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30		3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30		3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30		3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30		3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30		3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30		4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40		4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40		4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40		4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78		4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78		4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78		4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.095 (i)
 TIME TO PEAK (hrs)= 3.250
 RUNOFF VOLUME (mm)= 14.885
 TOTAL RAINFALL (mm)= 52.445
 RUNOFF COEFFICIENT = 0.284

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

CALIB	
STANDHYD (0004)	Area (ha)= 1.17
ID= 1 DT= 5.0 min	Total Imp(%)= 25.00 Dir. Conn.(%)= 17.10

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20		3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20		3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20		3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20		3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20		3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20		3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30		3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30		3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30		3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30		3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30		3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30		4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40		4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40		4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40		4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78		4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78		4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78		4.500	4.20	6.00	2.10

Max.Eff.Inten.(mm/hr)= 81.78 56.52
 over (min) 5.00 10.00
 Storage Coeff. (min)= 3.80 (ii) 9.00 (ii)
 Unit Hyd. Tpeak (min)= 5.00 10.00
 Unit Hyd. peak (cms)= 0.25 0.12

TOTALS
 PEAK FLOW (cms)= 0.04 0.10 0.146 (iii)
 TIME TO PEAK (hrs)= 3.00 3.00 3.00
 RUNOFF VOLUME (mm)= 51.44 26.59 30.84
 TOTAL RAINFALL (mm)= 52.45 52.45 52.45
 RUNOFF COEFFICIENT = 0.98 0.51 0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 83.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	12.27	0.334	3.42	15.39

```

+ ID2= 2 ( 0003):      2.80   0.095      3.25   14.89
=====
ID = 3 ( 0005):      15.07   0.419      3.42   15.30

```

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):   15.07   0.419   3.42   15.30
+ ID2= 2 ( 0004):   1.17   0.146   3.00   30.84
=====
ID = 1 ( 0005):   16.24   0.461   3.33   16.42

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| CALIB |
| NASHYD ( 0002)| Area (ha)= 1.83 Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.33

```

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

```

----- TRANSFORMED HYETOGRAPH -----
TIME    RAIN | TIME    RAIN | TIME    RAIN | TIME    RAIN
hrs      mm/hr | hrs      mm/hr | hrs      mm/hr | hrs      mm/hr
0.083    2.10 | 1.583    5.20 | 3.083    11.50 | 4.58     3.20
0.167    2.10 | 1.667    5.20 | 3.167    11.50 | 4.67     3.20
0.250    2.10 | 1.750    5.20 | 3.250    11.50 | 4.75     3.20
0.333    2.10 | 1.833    5.20 | 3.333    11.50 | 4.83     3.20
0.417    2.10 | 1.917    5.20 | 3.417    11.50 | 4.92     3.20
0.500    2.10 | 2.000    5.20 | 3.500    11.50 | 5.00     3.20
0.583    3.20 | 2.083    6.30 | 3.583    5.20 | 5.08     2.10
0.667    3.20 | 2.167    6.30 | 3.667    5.20 | 5.17     2.10
0.750    3.20 | 2.250    6.30 | 3.750    5.20 | 5.25     2.10
0.833    3.20 | 2.333    6.30 | 3.833    5.20 | 5.33     2.10
0.917    3.20 | 2.417    6.30 | 3.917    5.20 | 5.42     2.10
1.000    3.20 | 2.500    6.30 | 4.000    5.20 | 5.50     2.10
1.083    3.20 | 2.583    31.40 | 4.083    4.20 | 5.58     2.10
1.167    3.20 | 2.667    31.40 | 4.167    4.20 | 5.67     2.10
1.250    3.20 | 2.750    31.40 | 4.250    4.20 | 5.75     2.10
1.333    3.20 | 2.833    81.78 | 4.333    4.20 | 5.83     2.10
1.417    3.20 | 2.917    81.78 | 4.417    4.20 | 5.92     2.10
1.500    3.20 | 3.000    81.78 | 4.500    4.20 | 6.00     2.10

```

Unit Hyd Qpeak (cms)= 0.212

```

PEAK FLOW      (cms)= 0.069 (i)
TIME TO PEAK   (hrs)= 3.250
RUNOFF VOLUME  (mm)= 15.916
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.303

```

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

```

-----
| ADD HYD ( 0006)|
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002):   1.83   0.069   3.25   15.92
+ ID2= 2 ( 0005):  16.24   0.461   3.33   16.42
=====
ID = 3 ( 0006):   18.07   0.526   3.33   16.37

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

V  V  I  SSSSS  U  U  A  L          (v 6.2.2008)
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

```

```

000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
0  0  T  T  H  H  Y  Y  MM  MM  0  0
0  0  T  T  H  H  Y  Y  M  M  0  0
000  T  T  H  H  Y  Y  M  M  000

```

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

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Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\1d

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DATE: 12-06-2021 TIME: 10:43:26

USER:

COMMENTS:

** SIMULATION : 3 - Ptbo_SCS_6hr_10yr **

| READ STORM | Filename: C:\Users\bsanders\AppData
| | ata\Local\Temp\
| | 729582a9-3243-4e00-bb23-71f61ddae83\dcaa2f0c
| Ptotal= 61.60 mm | Comments: Ptbo_SCS_6hr_10yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.50	1.50	6.20	3.00	13.50	4.50	3.70
0.25	2.50	1.75	6.20	3.25	13.50	4.75	3.70
0.50	3.70	2.00	7.40	3.50	6.20	5.00	2.50
0.75	3.70	2.25	7.40	3.75	6.20	5.25	2.50
1.00	3.70	2.50	36.90	4.00	4.90	5.50	2.50
1.25	3.70	2.75	95.90	4.25	4.90	5.75	2.50

| CALIB |
| NASHYD (0001) | Area (ha)= 12.27 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)= 0.50

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70

0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.451 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 20.617
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.335

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

| CALIB |
| NASHYD (0003) | Area (ha)= 2.80 Curve Number (CN)= 71.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.35

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50

0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.129 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 19.975
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.324

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

CALIB	
STANDHYD (0004)	Area (ha)= 1.17
ID= 1 DT= 5.0 min	Total Imp(%)= 25.00 Dir. Conn.(%)= 17.10

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50

1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Max.Eff.Inten.(mm/hr)= 95.90 71.32
over (min) 5.00 10.00
Storage Coeff. (min)= 3.57 (ii) 8.31 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.26 0.13

TOTALS

PEAK FLOW (cms)= 0.05 0.13 0.186 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 60.60 33.82 38.40
TOTAL RAINFALL (mm)= 61.60 61.60 61.60
RUNOFF COEFFICIENT = 0.98 0.55 0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	12.27	0.451	3.42	20.62
+ ID2= 2 (0003):	2.80	0.129	3.25	19.97
=====				
ID = 3 (0005):	15.07	0.566	3.42	20.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0005):	15.07	0.566	3.42	20.50
+ ID2= 2 (0004):	1.17	0.186	3.00	38.40
=====				

ID = 1 (0005): 16.24 0.617 3.33 21.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (0002) Area (ha)= 1.83 Curve Number (CN)= 73.0
ID= 1 DT= 5.0 min Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.33

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.093 (i)

TIME TO PEAK (hrs)= 3.250

RUNOFF VOLUME (mm)= 21.274

TOTAL RAINFALL (mm)= 61.600

RUNOFF COEFFICIENT = 0.345

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

ADD HYD (0006)
1 + 2 = 3 AREA QPEAK TPEAK R.V.

(ha) (cms) (hrs) (mm)
ID1= 1 (0002): 1.83 0.093 3.25 21.27
+ ID2= 2 (0005): 16.24 0.617 3.33 21.79
ID = 3 (0006): 18.07 0.704 3.33 21.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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 6.2.1\VO2\voin.dat

Output filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\be
b362b8-e230-4631-b9fb-cf895481de4e\sce
Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\be
b362b8-e230-4631-b9fb-cf895481de4e\sce

DATE: 12-06-2021

TIME: 10:43:26

USER:

COMMENTS:

 ** SIMULATION : 4 - Ptbo_SCS_6hr_25yr **

1.417 4.40 | 2.917 113.70 | 4.417 5.80 | 5.92 2.90
 1.500 4.40 | 3.000 113.70 | 4.500 5.80 | 6.00 2.90

 | READ STORM | Filename: C:\Users\bsanders\AppData
 | | ata\Local\Temp\
 | | 729582a9-3243-4e00-bb23-71f61ddae83\b67f4ffa
 | Ptotal= 72.90 mm | Comments: Ptbo_SCS_6hr_25yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	2.90	1.50	7.30	3.00	16.00	4.50	4.40
0.25	2.90	1.75	7.30	3.25	16.00	4.75	4.40
0.50	4.40	2.00	8.80	3.50	7.30	5.00	2.90
0.75	4.40	2.25	8.80	3.75	7.30	5.25	2.90
1.00	4.40	2.50	43.70	4.00	5.80	5.50	2.90
1.25	4.40	2.75	113.70	4.25	5.80	5.75	2.90

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.612 (i)
 TIME TO PEAK (hrs)= 3.417
 RUNOFF VOLUME (mm)= 27.659
 TOTAL RAINFALL (mm)= 72.900
 RUNOFF COEFFICIENT = 0.379

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

 | CALIB |
 | NASHYD (0003) | Area (ha)= 2.80 Curve Number (CN)= 71.0
 | ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

 U.H. Tp(hrs)= 0.35

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

 | CALIB |
 | NASHYD (0001) | Area (ha)= 12.27 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)= 0.50

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

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90

----- TRANSFORMED HYETOGRAPH -----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.175 (i)
 TIME TO PEAK (hrs)= 3.250
 RUNOFF VOLUME (mm)= 26.854

TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.368

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

```
-----
| CALIB |
| STANDHYD ( 0004) | Area (ha)= 1.17
| ID= 1 DT= 5.0 min | Total Imp(%)= 25.00 Dir. Conn.(%)= 17.10
-----
```

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 2.90 1.583 7.30 3.083 16.00 4.58 4.40
0.167 2.90 1.667 7.30 3.167 16.00 4.67 4.40
0.250 2.90 1.750 7.30 3.250 16.00 4.75 4.40
0.333 2.90 1.833 7.30 3.333 16.00 4.83 4.40
0.417 2.90 1.917 7.30 3.417 16.00 4.92 4.40
0.500 2.90 2.000 7.30 3.500 16.00 5.00 4.40
0.583 4.40 2.083 8.80 3.583 7.30 5.08 2.90
0.667 4.40 2.167 8.80 3.667 7.30 5.17 2.90
0.750 4.40 2.250 8.80 3.750 7.30 5.25 2.90
0.833 4.40 2.333 8.80 3.833 7.30 5.33 2.90
0.917 4.40 2.417 8.80 3.917 7.30 5.42 2.90
1.000 4.40 2.500 8.80 4.000 7.30 5.50 2.90
1.083 4.40 2.583 43.70 4.083 5.80 5.58 2.90
1.167 4.40 2.667 43.70 4.167 5.80 5.67 2.90
1.250 4.40 2.750 43.70 4.250 5.80 5.75 2.90
1.333 4.40 2.833 113.70 4.333 5.80 5.83 2.90
1.417 4.40 2.917 113.70 4.417 5.80 5.92 2.90
1.500 4.40 3.000 113.70 4.500 5.80 6.00 2.90
```

Max. Eff. Inten. (mm/hr)= 113.70 90.51
over (min) 5.00 10.00
Storage Coeff. (min)= 3.33 (ii) 7.64 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.26 0.13

TOTALS
PEAK FLOW (cms)= 0.06 0.18 0.238 (iii)

TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	71.90	43.15	48.07
TOTAL RAINFALL (mm)=	72.90	72.90	72.90
RUNOFF COEFFICIENT =	0.99	0.59	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
-----
| ADD HYD ( 0005) |
| 1 + 2 = 3 |
-----
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	12.27	0.612	3.42	27.66
+ ID2= 2 (0003):	2.80	0.175	3.25	26.85
=====				
ID = 3 (0005):	15.07	0.768	3.33	27.51

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0005) |
| 3 + 2 = 1 |
-----
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0005):	15.07	0.768	3.33	27.51
+ ID2= 2 (0004):	1.17	0.238	3.00	48.07
=====				
ID = 1 (0005):	16.24	0.830	3.33	28.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| CALIB |
| NASHYD ( 0002) | Area (ha)= 1.83 Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
|-----| U.H. Tp(hrs)= 0.33
-----
```

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.126 (i)
 TIME TO PEAK (hrs)= 3.167
 RUNOFF VOLUME (mm)= 28.479
 TOTAL RAINFALL (mm)= 72.900
 RUNOFF COEFFICIENT = 0.391

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

ADD HYD (0006)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	1.83	0.126	3.17	28.48
+ ID2= 2 (0005):	16.24	0.830	3.33	28.99
=====				
ID = 3 (0006):	18.07	0.948	3.33	28.94

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSSS U U A A L (v 6.2.2008)
 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
 000 TTTT TTTT H H Y Y M M 000 TM
 0 0 T T H H Y Y MM MM 0 0
 0 0 T T H H Y M M 0 0
 000 T T H H Y M M 000

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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 6.2.1\VO2\voin.dat

Output filename:
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Summary filename:
 C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\8e19ac61-d1d6-4910-9989-504553c3d6cb\sce

DATE: 12-06-2021

TIME: 10:43:26

USER:

COMMENTS: _____

 ** SIMULATION : 5 - Ptbo_SCS_6hr_50yr **

READ STORM	Filename: C:\Users\bsanders\AppData\Local\Temp\729582a9-3243-4e00-bb23-71f61ddaee83\69c75c3f
Ptotal= 81.47 mm	Comments: Ptbo_SCS_6hr_50yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.30	1.50	8.10	3.00	17.90	4.50	4.90

0.25	3.30	1.75	8.10	3.25	17.90	4.75	4.90
0.50	4.90	2.00	9.80	3.50	8.10	5.00	3.30
0.75	4.90	2.25	9.80	3.75	8.10	5.25	3.30
1.00	4.90	2.50	48.90	4.00	6.50	5.50	3.30
1.25	4.90	2.75	127.00	4.25	6.50	5.75	3.30

CALIB			
NASHYD (0003)			
ID= 1 DT= 5.0 min			

Area	(ha)=	2.80	Curve Number (CN)= 71.0
Ia	(mm)=	5.00	# of Linear Res.(N)= 3.00
U.H. Tp(hrs)=	0.35		

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

CALIB			
NASHYD (0001)			
ID= 1 DT= 5.0 min			

Area	(ha)=	12.27	Curve Number (CN)= 72.0
Ia	(mm)=	5.00	# of Linear Res.(N)= 3.00
U.H. Tp(hrs)=	0.50		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.741 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 33.370
TOTAL RAINFALL (mm)= 81.475
RUNOFF COEFFICIENT = 0.410

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.212 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 32.444
TOTAL RAINFALL (mm)= 81.475
RUNOFF COEFFICIENT = 0.398

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

CALIB			
STANDHYD (0004)			
ID= 1 DT= 5.0 min			

Area	(ha)=	1.17	
Total Imp(%)=	25.00	Dir. Conn.(%)=	17.10

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.29	0.88
Dep. Storage	(mm)=	1.00	1.50

Average Slope (%)= 2.00 5.00
Length (m)= 240.00 26.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Max.Eff.Inten.(mm/hr)= 127.00 105.19
over (min) 5.00 10.00
Storage Coeff. (min)= 3.19 (ii) 7.25 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.27 0.14

TOTALS
PEAK FLOW (cms)= 0.07 0.21 0.278 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 80.47 50.47 55.60
TOTAL RAINFALL (mm)= 81.48 81.48 81.48
RUNOFF COEFFICIENT = 0.99 0.62 0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)				
1	2	3	AREA (ha)	QPEAK (cms)
ID1= 1 (0001):	12.27	0.741	3.42	33.37
+ ID2= 2 (0003):	2.80	0.212	3.25	32.44
ID = 3 (0005):	15.07	0.932	3.33	33.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0005)				
3	2	1	AREA (ha)	QPEAK (cms)
ID1= 3 (0005):	15.07	0.932	3.33	33.20
+ ID2= 2 (0004):	1.17	0.278	3.00	55.60
ID = 1 (0005):	16.24	1.001	3.33	34.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0002)	Area (ha)=	1.83	Curve Number (CN)= 73.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00

	U.H. Tp(hrs)=	0.33	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30

1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.153 (i)
 TIME TO PEAK (hrs)= 3.167
 RUNOFF VOLUME (mm)= 34.308
 TOTAL RAINFALL (mm)= 81.475
 RUNOFF COEFFICIENT = 0.421

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

ADD HYD (0006)	1	2	3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0002):				1.83	0.153	3.17	34.31
+ ID2= 2 (0005):				16.24	1.001	3.33	34.81
ID = 3 (0006):				18.07	1.143	3.33	34.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2008)
 V V I SS U U A A L
 V V I SS U U A A A L
 V V I SS U U A A L
 VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
 O O T T H H Y Y M M O O
 O O T T H H Y Y M M O O
 000 T T H H Y Y M M 000

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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 6.2.1\VO2\voin.dat

Output filename:
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 Summary filename:
 C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\1f
 df091f-b9d4-4290-9b04-1e9e00c3ec14\sce

DATE: 12-06-2021

TIME: 10:43:26

USER:

COMMENTS:

 ** SIMULATION : 6 - Ptbo_SCS_6hr_100yr **

READ STORM	Filename: C:\Users\bsanders\AppData\Local\Temp\729582a9-3243-4e00-bb23-71f61ddaee83\4ef46341
Ptotal= 89.93 mm	Comments: Ptbo_SCS_6hr_100yr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.00	3.60	1.50	9.00	3.00	19.80	4.50	5.40
0.25	3.60	1.75	9.00	3.25	19.80	4.75	5.40
0.50	5.40	2.00	10.80	3.50	9.00	5.00	3.60
0.75	5.40	2.25	10.80	3.75	9.00	5.25	3.60
1.00	5.40	2.50	53.90	4.00	7.20	5.50	3.60
1.25	5.40	2.75	140.20	4.25	7.20	5.75	3.60

CALIB	Area (ha)= 12.27	Curve Number (CN)= 72.0
NASHYD (0001)	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00
ID= 1 DT= 5.0 min	U.H. Tp(hrs)= 0.50	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.876 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 39.258
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.437

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

CALIB			
NASHYD (0003)	Area (ha)=	2.80	Curve Number (CN)= 71.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	0.35	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40

0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.250 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 38.218
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.425

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

CALIB			
STANDHYD (0004)	Area (ha)=	1.17	
ID= 1 DT= 5.0 min	Total Imp(%)=	25.00	Dir. Conn.(%)= 17.10

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40

0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Max.Eff.Inten.(mm/hr)= 140.20 119.92
over (min) 5.00 10.00
Storage Coeff. (min)= 3.07 (ii) 6.92 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.27 0.14

TOTALS
PEAK FLOW (cms)= 0.08 0.24 0.319 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 88.92 57.83 63.15
TOTAL RAINFALL (mm)= 89.93 89.93 89.93
RUNOFF COEFFICIENT = 0.99 0.64 0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)							
1 + 2 = 3							

ID1= 1 (0001):	12.27	0.876	3.42	39.26			
+ ID2= 2 (0003):	2.80	0.250	3.25	38.22			
=====							
ID = 3 (0005):	15.07	1.102	3.33	39.07			

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):	15.07	1.102	3.33	39.07
+ ID2= 2 (0004):	1.17	0.319	3.00	63.15
=====				
ID = 1 (0005):	16.24	1.178	3.33	40.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (0002)			
ID= 1 DT= 5.0 min			

Area (ha)=	1.83	Curve Number (CN)=	73.0
Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
U.H. Tp(hrs)=	0.33		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.180 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 40.310
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.448

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

```
-----
| ADD HYD ( 0006) |
| 1 + 2 = 3 |
-----
          AREA   QPEAK   TPEAK   R.V.
          (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002):   1.83   0.180   3.17   40.31
+ ID2= 2 ( 0005):  16.24   1.178   3.33   40.80
=====
ID = 3 ( 0006):   18.07   1.345   3.33   40.75
-----
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
=====
V  V  I  SSSSS  U  U  A  L          (v 6.2.2008)
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
```

```
000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
0 0  T  T  H  H  Y  Y  MM  MM  0 0
0 0  T  T  H  H  Y  M  M  0 0
000  T  T  H  H  Y  M  M  000
```

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

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Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\25
aa6d5a-9474-4134-88c0-cc8aaf701d8\sce

DATE: 12-06-2021

TIME: 10:43:26

USER:

COMMENTS: _____

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-----
*****
** SIMULATION : 7 - 25mm CHI **
*****
```

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|            |      ata\Local\Temp\
|            |      729582a9-3243-4e00-bb23-71f61ddaee83\d243f51a
| Ptotal= 24.91 mm |      Comments: 25mm CHI
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	1.76	1.00	11.75	2.00	3.88	3.00	2.07
0.17	2.00	1.17	57.66	2.17	3.35	3.17	1.93
0.33	2.32	1.33	15.20	2.33	2.96	3.33	1.81
0.50	2.81	1.50	8.31	2.50	2.66	3.50	1.71
0.67	3.61	1.67	5.91	2.67	2.42	3.67	1.62
0.83	5.28	1.83	4.66	2.83	2.23	3.83	1.54

```
-----
| CALIB |
| NASHYD ( 0001) | Area (ha)= 12.27 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)= 0.50
-----
```

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

```
----- TRANSFORMED HYETOGRAPH -----
TIME  RAIN  TIME  RAIN  TIME  RAIN  TIME  RAIN
hrs   mm/hr hrs   mm/hr hrs   mm/hr hrs   mm/hr
0.083 1.76 1.083 11.75 2.083 3.88 3.08 2.07
0.167 1.76 1.167 11.75 2.167 3.88 3.17 2.07
0.250 2.00 1.250 57.66 2.250 3.35 3.25 1.93
0.333 2.00 1.333 57.66 2.333 3.35 3.33 1.93
0.417 2.32 1.417 15.20 2.417 2.96 3.42 1.81
0.500 2.32 1.500 15.20 2.500 2.96 3.50 1.81
0.583 2.81 1.583 8.31 2.583 2.66 3.58 1.71
0.667 2.81 1.667 8.31 2.667 2.66 3.67 1.71
```

0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.937

PEAK FLOW (cms)= 0.061 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 3.338
TOTAL RAINFALL (mm)= 24.906
RUNOFF COEFFICIENT = 0.134

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

CALIB	
NASHYD (0003)	Area (ha)= 2.80 Curve Number (CN)= 71.0
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 0.35

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.306

PEAK FLOW (cms)= 0.016 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 3.204
TOTAL RAINFALL (mm)= 24.906
RUNOFF COEFFICIENT = 0.129

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

CALIB	
STANDHYD (0004)	Area (ha)= 1.17
ID= 1 DT= 5.0 min	Total Imp(%)= 25.00 Dir. Conn.(%)= 17.10

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.29	0.88
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Max.Eff.Inten.(mm/hr)= 57.66 17.44
over (min) 5.00 15.00
Storage Coeff. (min)= 4.37 (ii) 12.70 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.23 0.08

TOTALS			
PEAK FLOW (cms)=	0.03	0.02	0.041 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.91	7.85	10.59
TOTAL RAINFALL (mm)=	24.91	24.91	24.91
RUNOFF COEFFICIENT =	0.96	0.32	0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 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.

0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

ADD HYD (0005)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	12.27	0.061	2.00	3.34
+ ID2= 2 (0003):	2.80	0.016	1.75	3.20
=====				
ID = 3 (0005):	15.07	0.076	1.92	3.31

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):	15.07	0.076	1.92	3.31
+ ID2= 2 (0004):	1.17	0.041	1.33	10.59
=====				
ID = 1 (0005):	16.24	0.091	1.83	3.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (0002)				
ID= 1 DT= 5.0 min				
Area (ha)=	1.83	Curve Number (CN)=	73.0	
Ia (mm)=	5.00	# of Linear Res.(N)=	3.00	
U.H. Tp(hrs)=	0.33			

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71

Unit Hyd Qpeak (cms)= 0.212

PEAK FLOW (cms)= 0.012 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 3.479
TOTAL RAINFALL (mm)= 24.906
RUNOFF COEFFICIENT = 0.140

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

ADD HYD (0006)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	1.83	0.012	1.75	3.48
+ ID2= 2 (0005):	16.24	0.091	1.83	3.84
=====				
ID = 3 (0006):	18.07	0.102	1.83	3.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

=====

V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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

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DATE: 12-06-2021 TIME: 10:36:05

USER:

COMMENTS: _____

** SIMULATION : 1 - Ptbo_SCS_6hr_2yr **

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| |

| Pttotal= 38.75 mm | 9f044fcc-38f5-48ab-8ebb-10913a6c3c39\dd665a00
Comments: Ptbo_SCS_6hr_2yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	1.60	1.50	3.90	3.00	8.50	4.50	2.30
0.25	1.60	1.75	3.90	3.25	8.50	4.75	2.30
0.50	2.30	2.00	4.60	3.50	3.90	5.00	1.60
0.75	2.30	2.25	4.60	3.75	3.90	5.25	1.60
1.00	2.30	2.50	23.20	4.00	3.10	5.50	1.60
1.25	2.30	2.75	60.40	4.25	3.10	5.75	1.60

| CALIB |
| NASHYD (0002) | Area (ha)= 0.75 Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.33

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.016 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 8.917

TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.230

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

CALIB
NASHYD (0004) | Area (ha)= 0.27 Curve Number (CN)= 59.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.003 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 5.413
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.140

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

CALIB

NASHYD (0003) | Area (ha)= 1.52 Curve Number (CN)= 66.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.019 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 6.919
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.179

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

CALIB
NASHYD (0005) | Area (ha)= 2.80 Curve Number (CN)= 71.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.36

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.051 (i)
 TIME TO PEAK (hrs)= 3.250
 RUNOFF VOLUME (mm)= 8.283
 TOTAL RAINFALL (mm)= 38.750
 RUNOFF COEFFICIENT = 0.214

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

CALIB	Area (ha)= 1.17
STANDHYD (0006)	Total Imp(%)= 29.00 Dir. Conn.(%)= 20.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.34	0.83
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr

0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Max.Eff.Inten.(mm/hr)= 60.40 36.56
 over (min) 5.00 15.00
 Storage Coeff. (min)= 4.29 (ii) 10.48 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.23 0.09

TOTALS

PEAK FLOW (cms)=	0.04	0.05	0.086 (iii)
TIME TO PEAK (hrs)=	3.00	3.08	3.00
RUNOFF VOLUME (mm)=	37.75	16.75	20.95
TOTAL RAINFALL (mm)=	38.75	38.75	38.75
RUNOFF COEFFICIENT =	0.97	0.43	0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 83.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	Area (ha)= 11.55
STANDHYD (0001)	Total Imp(%)= 56.00 Dir. Conn.(%)= 39.00
ID= 1 DT= 5.0 min	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.47	5.08
Dep. Storage (mm)=	1.00	1.50

Average Slope (%)= 0.80 2.00
Length (m)= 260.00 22.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.60	1.583	3.90	3.083	8.50	4.58	2.30
0.167	1.60	1.667	3.90	3.167	8.50	4.67	2.30
0.250	1.60	1.750	3.90	3.250	8.50	4.75	2.30
0.333	1.60	1.833	3.90	3.333	8.50	4.83	2.30
0.417	1.60	1.917	3.90	3.417	8.50	4.92	2.30
0.500	1.60	2.000	3.90	3.500	8.50	5.00	2.30
0.583	2.30	2.083	4.60	3.583	3.90	5.08	1.60
0.667	2.30	2.167	4.60	3.667	3.90	5.17	1.60
0.750	2.30	2.250	4.60	3.750	3.90	5.25	1.60
0.833	2.30	2.333	4.60	3.833	3.90	5.33	1.60
0.917	2.30	2.417	4.60	3.917	3.90	5.42	1.60
1.000	2.30	2.500	4.60	4.000	3.90	5.50	1.60
1.083	2.30	2.583	23.20	4.083	3.10	5.58	1.60
1.167	2.30	2.667	23.20	4.167	3.10	5.67	1.60
1.250	2.30	2.750	23.20	4.250	3.10	5.75	1.60
1.333	2.30	2.833	60.40	4.333	3.10	5.83	1.60
1.417	2.30	2.917	60.40	4.417	3.10	5.92	1.60
1.500	2.30	3.000	60.40	4.500	3.10	6.00	1.60

Max.Eff.Inten.(mm/hr)= 60.40 50.37
over (min) 5.00 15.00
Storage Coeff. (min)= 5.93 (ii) 12.42 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.19 0.08

TOTALS

PEAK FLOW (cms)= 0.72 0.44 1.094 (iii)
TIME TO PEAK (hrs)= 3.00 3.08 3.00
RUNOFF VOLUME (mm)= 37.75 18.87 26.23
TOTAL RAINFALL (mm)= 38.75 38.75 38.75
RUNOFF COEFFICIENT = 0.97 0.49 0.68

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```

-----
| ADD HYD ( 0007) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0001): 11.55 1.094 3.00 26.23
+ ID2= 2 ( 0003): 1.52 0.019 3.42 6.92
=====
ID = 3 ( 0007): 13.07 1.102 3.00 23.99

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0007) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0007): 13.07 1.102 3.00 23.99
+ ID2= 2 ( 0005): 2.80 0.051 3.25 8.28
=====
ID = 1 ( 0007): 15.87 1.131 3.00 21.22

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| ADD HYD ( 0007) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0007): 15.87 1.131 3.00 21.22
+ ID2= 2 ( 0006): 1.17 0.086 3.00 20.95
=====
ID = 3 ( 0007): 17.04 1.217 3.00 21.20

```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```

-----
| RESERVOIR( 0010) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF

```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.2490	0.3900
0.0000	0.0000	0.5170	0.3944
0.0000	0.0000	0.5310	0.4159
0.0000	0.0000	0.7520	0.4400
0.0100	0.0270	0.7690	0.5050
0.0420	0.1490	0.8040	0.5300
0.0480	0.2000	0.8160	0.5700
0.1920	0.2180	0.8400	0.6200
0.2220	0.2930	0.8600	0.6500
0.2390	0.3200	0.0000	0.0000

AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
INFLOW : ID= 2 (0007) 17.040 1.217 3.00 21.20
OUTFLOW: ID= 1 (0010) 17.040 0.199 3.83 21.16

PEAK FLOW REDUCTION [Qout/Qin](%)= 16.34
TIME SHIFT OF PEAK FLOW (min)= 50.00
MAXIMUM STORAGE USED (ha.m.)= 0.2352

| ADD HYD (0008) |
1 + 2 = 3
ID1= 1 (0010): 17.04 0.199 3.83 21.16
+ ID2= 2 (0004): 0.27 0.003 3.42 5.41
=====

ID = 3 (0008): 17.31 0.201 3.75 20.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (0009) |
1 + 2 = 3
ID1= 1 (0002): 0.75 0.016 3.25 8.92
+ ID2= 2 (0008): 17.31 0.201 3.75 20.91
=====

ID = 3 (0009): 18.06 0.211 3.58 20.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y M M O O
O O T T H H Y Y M M O O
000 T T H H Y Y M M 000

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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 6.2.1\VO2\voin.dat

Output filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\6b
f76957-3ac2-444e-8a2e-44f1264a17df\sce

Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\6b
f76957-3ac2-444e-8a2e-44f1264a17df\sce

DATE: 12-06-2021

TIME: 10:36:05

USER:

COMMENTS: _____

** SIMULATION : 2 - Ptbo_SCS_6hr_5yr **

| READ STORM | | Filename: C:\Users\bsanders\AppData
| | | ata\Local\Temp\
| | | 9f044fcc-38f5-48ab-8ebb-10913a6c3c39\bd8a0895
| Ptotal= 52.44 mm | | Comments: Ptbo_SCS_6hr_5yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.10	1.50	5.20	3.00	11.50	4.50	3.20
0.25	2.10	1.75	5.20	3.25	11.50	4.75	3.20
0.50	3.20	2.00	6.30	3.50	5.20	5.00	2.10
0.75	3.20	2.25	6.30	3.75	5.20	5.25	2.10
1.00	3.20	2.50	31.40	4.00	4.20	5.50	2.10
1.25	3.20	2.75	81.78	4.25	4.20	5.75	2.10

CALIB
NASHYD (0002) | Area (ha)= 0.75 Curve Number (CN)= 73.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.33

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.028 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 15.916
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.303

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

CALIB
NASHYD (0004) | Area (ha)= 0.27 Curve Number (CN)= 59.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 10.047
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.192

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

CALIB
NASHYD (0003) | Area (ha)= 1.52 Curve Number (CN)= 66.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20

0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.035 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 12.624
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.241

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

CALIB			
NASHYD (0005)	Area (ha)= 2.80	Curve Number (CN)= 71.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.36		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10

1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.093 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 14.886
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.284

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

CALIB			
STANDHYD (0006)	Area (ha)= 1.17		
ID= 1 DT= 5.0 min	Total Imp(%)= 29.00	Dir. Conn.(%)= 20.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.34	0.83
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20
0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10

1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Max.Eff.Inten.(mm/hr)= 81.78 58.15
over (min) 5.00 10.00
Storage Coeff. (min)= 3.80 (ii) 8.95 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.25 0.12

TOTALS
PEAK FLOW (cms)= 0.05 0.10 0.152 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 51.44 26.86 31.77
TOTAL RAINFALL (mm)= 52.45 52.45 52.45
RUNOFF COEFFICIENT = 0.98 0.51 0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min
Area (ha)= 11.55
Total Imp(%)= 56.00 Dir. Conn.(%)= 39.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.47	5.08
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	0.80	2.00
Length (m)=	260.00	22.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.10	1.583	5.20	3.083	11.50	4.58	3.20
0.167	2.10	1.667	5.20	3.167	11.50	4.67	3.20
0.250	2.10	1.750	5.20	3.250	11.50	4.75	3.20
0.333	2.10	1.833	5.20	3.333	11.50	4.83	3.20
0.417	2.10	1.917	5.20	3.417	11.50	4.92	3.20

0.500	2.10	2.000	5.20	3.500	11.50	5.00	3.20
0.583	3.20	2.083	6.30	3.583	5.20	5.08	2.10
0.667	3.20	2.167	6.30	3.667	5.20	5.17	2.10
0.750	3.20	2.250	6.30	3.750	5.20	5.25	2.10
0.833	3.20	2.333	6.30	3.833	5.20	5.33	2.10
0.917	3.20	2.417	6.30	3.917	5.20	5.42	2.10
1.000	3.20	2.500	6.30	4.000	5.20	5.50	2.10
1.083	3.20	2.583	31.40	4.083	4.20	5.58	2.10
1.167	3.20	2.667	31.40	4.167	4.20	5.67	2.10
1.250	3.20	2.750	31.40	4.250	4.20	5.75	2.10
1.333	3.20	2.833	81.78	4.333	4.20	5.83	2.10
1.417	3.20	2.917	81.78	4.417	4.20	5.92	2.10
1.500	3.20	3.000	81.78	4.500	4.20	6.00	2.10

Max.Eff.Inten.(mm/hr)= 81.78 78.42
over (min) 5.00 15.00
Storage Coeff. (min)= 5.25 (ii) 10.69 (ii)
Unit Hyd. Tpeak (min)= 5.00 15.00
Unit Hyd. peak (cms)= 0.21 0.09

TOTALS
PEAK FLOW (cms)= 0.99 0.73 1.635 (iii)
TIME TO PEAK (hrs)= 3.00 3.08 3.00
RUNOFF VOLUME (mm)= 51.44 29.68 38.17
TOTAL RAINFALL (mm)= 52.45 52.45 52.45
RUNOFF COEFFICIENT = 0.98 0.57 0.73

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0007)
1 + 2 = 3
AREA QPEAK TPEAK R.V.
(ha) (cms) (hrs) (mm)
ID1= 1 (0001): 11.55 1.635 3.00 38.17
+ ID2= 2 (0003): 1.52 0.035 3.42 12.62
=====

ID = 3 (0007): 13.07 1.651 3.00 35.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)
3 + 2 = 1
AREA QPEAK TPEAK R.V.

```
-----
              (ha)   (cms)   (hrs)   (mm)
ID1= 3 ( 0007): 13.07  1.651  3.00   35.20
+ ID2= 2 ( 0005):  2.80  0.093  3.25   14.89
=====
ID = 1 ( 0007): 15.87  1.707  3.00   31.61
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0007) |
| 1 + 2 = 3 |
|-----|
              (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0007): 15.87  1.707  3.00   31.61
+ ID2= 2 ( 0006):  1.17  0.152  3.00   31.77
=====
ID = 3 ( 0007): 17.04  1.859  3.00   31.62
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| RESERVOIR( 0010) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |
|-----|
OVERFLOW IS OFF
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.2490 0.3900
0.0000 0.0000 | 0.5170 0.3944
0.0000 0.0000 | 0.5310 0.4159
0.0000 0.0000 | 0.7520 0.4400
0.0100 0.0270 | 0.7690 0.5050
0.0420 0.1490 | 0.8040 0.5300
0.0480 0.2000 | 0.8160 0.5700
0.1920 0.2180 | 0.8400 0.6200
0.2220 0.2930 | 0.8600 0.6500
0.2390 0.3200 | 0.0000 0.0000
              AREA   QPEAK   TPEAK   R.V.
              (ha)   (cms)   (hrs)   (mm)
INFLOW : ID= 2 ( 0007) 17.040  1.859  3.00   31.62
OUTFLOW: ID= 1 ( 0010) 17.040  0.243  3.92   31.58
```

```
PEAK FLOW REDUCTION [Qout/Qin](%)= 13.09
TIME SHIFT OF PEAK FLOW (min)= 55.00
MAXIMUM STORAGE USED (ha.m.)= 0.3505
```

```
-----
| ADD HYD ( 0008) |
| 1 + 2 = 3 |
|-----|
              AREA   QPEAK   TPEAK   R.V.
```

```
-----
              (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0010): 17.04  0.243  3.92   31.58
+ ID2= 2 ( 0004):  0.27  0.005  3.42   10.05
=====
ID = 3 ( 0008): 17.31  0.247  3.75   31.25
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0009) |
| 1 + 2 = 3 |
|-----|
              (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002):  0.75  0.028  3.25   15.92
+ ID2= 2 ( 0008): 17.31  0.247  3.75   31.25
=====
ID = 3 ( 0009): 18.06  0.269  3.42   30.61
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
=====
V V I SSSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A L
V V I SS U U A A L
VV I SSSSS UUUUU A A LLLLL
000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000
```

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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 6.2.1\VO2\voin.dat

Output filename:

C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\d0
ee8603-c291-4a35-a662-677b8538057c\sce

Summary filename:

C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\d0
ee8603-c291-4a35-a662-677b8538057c\sce

DATE: 12-06-2021

TIME: 10:36:05

USER:

COMMENTS: _____

** SIMULATION : 3 - Ptbo_SCS_6hr_10yr **

| READ STORM | Filename: C:\Users\bsanders\AppData
| | ata\Local\Temp\
| | 9f044fcc-38f5-48ab-8ebb-10913a6c3c39\f3539bba
| Ptotal= 61.60 mm | Comments: Ptbo_SCS_6hr_10yr

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.00	2.50	1.50	6.20		3.00	13.50	4.50	3.70
0.25	2.50	1.75	6.20		3.25	13.50	4.75	3.70
0.50	3.70	2.00	7.40		3.50	6.20	5.00	2.50
0.75	3.70	2.25	7.40		3.75	6.20	5.25	2.50
1.00	3.70	2.50	36.90		4.00	4.90	5.50	2.50
1.25	3.70	2.75	95.90		4.25	4.90	5.75	2.50

| CALIB |
| NASHYD (0002) | Area (ha)= 0.75 Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.33

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20		3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20		3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20		3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20		3.333	13.50	4.83	3.70

0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.038 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 21.273
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.345

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

| CALIB |
| NASHYD (0004) | Area (ha)= 0.27 Curve Number (CN)= 59.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.47

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

----- TRANSFORMED HYETOGRAPH -----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20		3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20		3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20		3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20		3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20		3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20		3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40		3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40		3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40		3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40		3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40		3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40		4.000	6.20	5.50	2.50

1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.007 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 13.738
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.223

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

CALIB							
NASHYD (0003)	Area (ha)=	1.52	Curve Number (CN)=	66.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.47					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.048 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 17.089
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.277

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

CALIB							
NASHYD (0005)	Area (ha)=	2.80	Curve Number (CN)=	71.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.36					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.50	1.583	6.20	3.083	13.50	4.58	3.70
0.167	2.50	1.667	6.20	3.167	13.50	4.67	3.70
0.250	2.50	1.750	6.20	3.250	13.50	4.75	3.70
0.333	2.50	1.833	6.20	3.333	13.50	4.83	3.70
0.417	2.50	1.917	6.20	3.417	13.50	4.92	3.70
0.500	2.50	2.000	6.20	3.500	13.50	5.00	3.70
0.583	3.70	2.083	7.40	3.583	6.20	5.08	2.50
0.667	3.70	2.167	7.40	3.667	6.20	5.17	2.50
0.750	3.70	2.250	7.40	3.750	6.20	5.25	2.50
0.833	3.70	2.333	7.40	3.833	6.20	5.33	2.50
0.917	3.70	2.417	7.40	3.917	6.20	5.42	2.50
1.000	3.70	2.500	7.40	4.000	6.20	5.50	2.50
1.083	3.70	2.583	36.90	4.083	4.90	5.58	2.50
1.167	3.70	2.667	36.90	4.167	4.90	5.67	2.50
1.250	3.70	2.750	36.90	4.250	4.90	5.75	2.50
1.333	3.70	2.833	95.90	4.333	4.90	5.83	2.50
1.417	3.70	2.917	95.90	4.417	4.90	5.92	2.50
1.500	3.70	3.000	95.90	4.500	4.90	6.00	2.50

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.126 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 19.975
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.324

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

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| CALIB |
| STANDHYD ( 0006) |
| ID= 1 DT= 5.0 min |
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	Area (ha)=	1.17
	Total Imp(%)=	29.00 Dir. Conn.(%)= 20.00
	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.34	0.83
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

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

```

-----
      TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
      hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
-----
0.083 2.50 | 1.583 6.20 | 3.083 13.50 | 4.58 3.70
0.167 2.50 | 1.667 6.20 | 3.167 13.50 | 4.67 3.70
0.250 2.50 | 1.750 6.20 | 3.250 13.50 | 4.75 3.70
0.333 2.50 | 1.833 6.20 | 3.333 13.50 | 4.83 3.70
0.417 2.50 | 1.917 6.20 | 3.417 13.50 | 4.92 3.70
0.500 2.50 | 2.000 6.20 | 3.500 13.50 | 5.00 3.70
0.583 3.70 | 2.083 7.40 | 3.583 6.20 | 5.08 2.50
0.667 3.70 | 2.167 7.40 | 3.667 6.20 | 5.17 2.50
0.750 3.70 | 2.250 7.40 | 3.750 6.20 | 5.25 2.50
0.833 3.70 | 2.333 7.40 | 3.833 6.20 | 5.33 2.50
0.917 3.70 | 2.417 7.40 | 3.917 6.20 | 5.42 2.50
1.000 3.70 | 2.500 7.40 | 4.000 6.20 | 5.50 2.50
1.083 3.70 | 2.583 36.90 | 4.083 4.90 | 5.58 2.50
1.167 3.70 | 2.667 36.90 | 4.167 4.90 | 5.67 2.50
1.250 3.70 | 2.750 36.90 | 4.250 4.90 | 5.75 2.50
1.333 3.70 | 2.833 95.90 | 4.333 4.90 | 5.83 2.50
1.417 3.70 | 2.917 95.90 | 4.417 4.90 | 5.92 2.50
1.500 3.70 | 3.000 95.90 | 4.500 4.90 | 6.00 2.50
-----

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Max.Eff.Inten.(mm/hr)=	95.90	73.30
over (min)	5.00	10.00
Storage Coeff. (min)=	3.57 (ii)	8.26 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.26	0.13

			TOTALS
PEAK FLOW (cms)=	0.06	0.13	0.191 (iii)
TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	60.60	34.13	39.42
TOTAL RAINFALL (mm)=	61.60	61.60	61.60
RUNOFF COEFFICIENT =	0.98	0.55	0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 83.0 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.

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-----
| CALIB |
| STANDHYD ( 0001) |
| ID= 1 DT= 5.0 min |
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	Area (ha)=	11.55
	Total Imp(%)=	56.00 Dir. Conn.(%)= 39.00
	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.47	5.08
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	0.80	2.00
Length (m)=	260.00	22.00
Mannings n =	0.013	0.250

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

```

-----
      TIME RAIN | TIME RAIN | TIME RAIN | TIME RAIN
      hrs mm/hr | hrs mm/hr | hrs mm/hr | hrs mm/hr
-----
0.083 2.50 | 1.583 6.20 | 3.083 13.50 | 4.58 3.70
0.167 2.50 | 1.667 6.20 | 3.167 13.50 | 4.67 3.70
0.250 2.50 | 1.750 6.20 | 3.250 13.50 | 4.75 3.70
0.333 2.50 | 1.833 6.20 | 3.333 13.50 | 4.83 3.70
0.417 2.50 | 1.917 6.20 | 3.417 13.50 | 4.92 3.70
0.500 2.50 | 2.000 6.20 | 3.500 13.50 | 5.00 3.70
0.583 3.70 | 2.083 7.40 | 3.583 6.20 | 5.08 2.50
0.667 3.70 | 2.167 7.40 | 3.667 6.20 | 5.17 2.50
0.750 3.70 | 2.250 7.40 | 3.750 6.20 | 5.25 2.50
0.833 3.70 | 2.333 7.40 | 3.833 6.20 | 5.33 2.50
0.917 3.70 | 2.417 7.40 | 3.917 6.20 | 5.42 2.50
1.000 3.70 | 2.500 7.40 | 4.000 6.20 | 5.50 2.50
1.083 3.70 | 2.583 36.90 | 4.083 4.90 | 5.58 2.50
1.167 3.70 | 2.667 36.90 | 4.167 4.90 | 5.67 2.50
1.250 3.70 | 2.750 36.90 | 4.250 4.90 | 5.75 2.50
1.333 3.70 | 2.833 95.90 | 4.333 4.90 | 5.83 2.50
1.417 3.70 | 2.917 95.90 | 4.417 4.90 | 5.92 2.50
1.500 3.70 | 3.000 95.90 | 4.500 4.90 | 6.00 2.50
-----

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Max.Eff.Inten.(mm/hr)=	95.90	97.79
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over (min)	5.00	10.00	
Storage Coeff. (min)=	4.93 (ii)	9.90 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.22	0.11	
TOTALS			
PEAK FLOW (cms)=	1.16	1.00	2.165 (iii)
TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	60.60	37.36	46.42
TOTAL RAINFALL (mm)=	61.60	61.60	61.60
RUNOFF COEFFICIENT =	0.98	0.61	0.75

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
- (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
- (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0007)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	11.55	2.165	3.00	46.42
+ ID2= 2 (0003):	1.52	0.048	3.42	17.09
=====				
ID = 3 (0007):	13.07	2.188	3.00	43.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)				
3 + 2 = 1				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (0007):	13.07	2.188	3.00	43.01
+ ID2= 2 (0005):	2.80	0.126	3.25	19.98
=====				
ID = 1 (0007):	15.87	2.266	3.00	38.95

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0007):	15.87	2.266	3.00	38.95

+ ID2= 2 (0006):	1.17	0.191	3.00	39.42
=====				
ID = 3 (0007):	17.04	2.458	3.00	38.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0010)		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	0.2490	0.3900
0.0000	0.0000	0.5170	0.3944
0.0000	0.0000	0.5310	0.4159
0.0000	0.0000	0.7520	0.4400
0.0100	0.0270	0.7690	0.5050
0.0420	0.1490	0.8040	0.5300
0.0480	0.2000	0.8160	0.5700
0.1920	0.2180	0.8400	0.6200
0.2220	0.2930	0.8600	0.6500
0.2390	0.3200	0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0007)	17.040	2.458	3.00	38.98
OUTFLOW: ID= 1 (0010)	17.040	0.525	3.58	38.94

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.35
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.4067

ADD HYD (0008)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0010):	17.04	0.525	3.58	38.94
+ ID2= 2 (0004):	0.27	0.007	3.42	13.74
=====				
ID = 3 (0008):	17.31	0.531	3.58	38.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0009)				
1 + 2 = 3				
	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0002):	0.75	0.038	3.25	21.27

+ ID2= 2 (0008): 17.31 0.531 3.58 38.54
=====

ID = 3 (0009): 18.06 0.561 3.42 37.83
=====

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL

000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000

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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 6.2.1\VO2\voin.dat

Output filename:

C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\35
251238-81e8-4119-b9eb-5edcae33e5a8\sce

Summary filename:

C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\35
251238-81e8-4119-b9eb-5edcae33e5a8\sce

DATE: 12-06-2021

TIME: 10:36:05

USER:

COMMENTS: _____

** SIMULATION : 4 -Ptbo_SCS_6hr_25yr **

READ STORM
Ptotal= 72.90 mm

Filename: C:\Users\bsanders\AppData
ata\Local\Temp\
9f044fcc-38f5-48ab-8ebb-10913a6c3c39\b67f4ffa
Comments: Ptbo_SCS_6hr_25yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	2.90	1.50	7.30	3.00	16.00	4.50	4.40
0.25	2.90	1.75	7.30	3.25	16.00	4.75	4.40
0.50	4.40	2.00	8.80	3.50	7.30	5.00	2.90
0.75	4.40	2.25	8.80	3.75	7.30	5.25	2.90
1.00	4.40	2.50	43.70	4.00	5.80	5.50	2.90
1.25	4.40	2.75	113.70	4.25	5.80	5.75	2.90

| CALIB
| NASHYD (0002) |
ID= 1 DT= 5.0 min

Area (ha)= 0.75 Curve Number (CN)= 73.0
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.33

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.052 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 28.478
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.391

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

CALIB
NASHYD (0004) | Area (ha)= 0.27 Curve Number (CN)= 59.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.009 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 18.858
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.259

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

CALIB
NASHYD (0003) | Area (ha)= 1.52 Curve Number (CN)= 66.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.47

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.065 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 23.195
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.318

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

CALIB
NASHYD (0005) | Area (ha)= 2.80 Curve Number (CN)= 71.0
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

----- U.H. Tp(hrs)= 0.36

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

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.171 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 26.855
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.368

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

| CALIB |
| STANDHYD (0006) | Area (ha)= 1.17
| ID= 1 DT= 5.0 min | Total Imp(%)= 29.00 Dir. Conn.(%)= 20.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.34	0.83
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	2.00	5.00
Length (m)=	240.00	26.00
Mannings n =	0.013	0.250

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Max.Eff.Inten.(mm/hr)= 113.70 92.93
over (min) 5.00 10.00
Storage Coeff. (min)= 3.33 (ii) 7.60 (ii)
Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.26 0.13

TOTALS

PEAK FLOW (cms)= 0.07 0.17 0.244 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 71.90 43.50 49.18
TOTAL RAINFALL (mm)= 72.90 72.90 72.90
RUNOFF COEFFICIENT = 0.99 0.60 0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |

| STANDHYD (0001) | Area (ha)= 11.55
 |ID= 1 DT= 5.0 min | Total Imp(%)= 56.00 Dir. Conn.(%)= 39.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.47	5.08
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	0.80	2.00
Length (m)=	260.00	22.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	2.90	1.583	7.30	3.083	16.00	4.58	4.40
0.167	2.90	1.667	7.30	3.167	16.00	4.67	4.40
0.250	2.90	1.750	7.30	3.250	16.00	4.75	4.40
0.333	2.90	1.833	7.30	3.333	16.00	4.83	4.40
0.417	2.90	1.917	7.30	3.417	16.00	4.92	4.40
0.500	2.90	2.000	7.30	3.500	16.00	5.00	4.40
0.583	4.40	2.083	8.80	3.583	7.30	5.08	2.90
0.667	4.40	2.167	8.80	3.667	7.30	5.17	2.90
0.750	4.40	2.250	8.80	3.750	7.30	5.25	2.90
0.833	4.40	2.333	8.80	3.833	7.30	5.33	2.90
0.917	4.40	2.417	8.80	3.917	7.30	5.42	2.90
1.000	4.40	2.500	8.80	4.000	7.30	5.50	2.90
1.083	4.40	2.583	43.70	4.083	5.80	5.58	2.90
1.167	4.40	2.667	43.70	4.167	5.80	5.67	2.90
1.250	4.40	2.750	43.70	4.250	5.80	5.75	2.90
1.333	4.40	2.833	113.70	4.333	5.80	5.83	2.90
1.417	4.40	2.917	113.70	4.417	5.80	5.92	2.90
1.500	4.40	3.000	113.70	4.500	5.80	6.00	2.90

Max.Eff.Inten.(mm/hr)=	113.70	122.65
over (min)	5.00	10.00
Storage Coeff. (min)=	4.60 (ii)	9.52 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.23	0.12

TOTALS
 PEAK FLOW (cms)= 1.39 1.29 2.676 (iii)
 TIME TO PEAK (hrs)= 3.00 3.00 3.00
 RUNOFF VOLUME (mm)= 71.90 47.17 56.81
 TOTAL RAINFALL (mm)= 72.90 72.90 72.90
 RUNOFF COEFFICIENT = 0.99 0.65 0.78

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

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

CN* = 83.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0007)				
1 + 2 = 3				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	11.55	2.676	3.00	56.81
+ ID2= 2 (0003):	1.52	0.065	3.42	23.19
=====				
ID = 3 (0007):	13.07	2.708	3.00	52.90

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)				
3 + 2 = 1				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (0007):	13.07	2.708	3.00	52.90
+ ID2= 2 (0005):	2.80	0.171	3.25	26.85
=====				
ID = 1 (0007):	15.87	2.817	3.00	48.31

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0007)				
1 + 2 = 3				
	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0007):	15.87	2.817	3.00	48.31
+ ID2= 2 (0006):	1.17	0.244	3.00	49.18
=====				
ID = 3 (0007):	17.04	3.061	3.00	48.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0010)				OVERFLOW IS OFF	
IN= 2---> OUT= 1					
DT= 5.0 min					

	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.2490	0.3900
	0.0000	0.0000		0.5170	0.3944
	0.0000	0.0000		0.5310	0.4159

0.0000	0.0000		0.7520	0.4400
0.0100	0.0270		0.7690	0.5050
0.0420	0.1490		0.8040	0.5300
0.0480	0.2000		0.8160	0.5700
0.1920	0.2180		0.8400	0.6200
0.2220	0.2930		0.8600	0.6500
0.2390	0.3200		0.0000	0.0000

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0007)	17.040	3.061	3.00	48.37
OUTFLOW: ID= 1 (0010)	17.040	0.758	3.50	48.33

PEAK FLOW REDUCTION [Qout/Qin](%)= 24.76
TIME SHIFT OF PEAK FLOW (min)= 30.00
MAXIMUM STORAGE USED (ha.m.)= 0.4628

```
-----
| ADD HYD ( 0008) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0010): 17.04 0.758 3.50 48.33
+ ID2= 2 ( 0004): 0.27 0.009 3.42 18.86
=====
ID = 3 ( 0008): 17.31 0.767 3.50 47.87
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0009) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0002): 0.75 0.052 3.17 28.48
+ ID2= 2 ( 0008): 17.31 0.767 3.50 47.87
=====
ID = 3 ( 0009): 18.06 0.814 3.25 47.06
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
=====
V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLLL
```

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000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000
```

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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 6.2.1\VO2\voin.dat

Output filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\71
eac04c-1d4a-49b3-880f-7dd54ae7fa90\sce

Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\71
eac04c-1d4a-49b3-880f-7dd54ae7fa90\sce

DATE: 12-06-2021

TIME: 10:36:05

USER:

COMMENTS: _____

```
-----
*****
** SIMULATION : 5 - Ptbo_SCS_6hr_50yr **
*****
```

READ STORM	Filename: C:\Users\bsanders\AppData\Local\Temp\9f044fcc-38f5-48ab-8ebb-10913a6c3c39\69c75c3f
Ptotal= 81.47 mm	Comments: Ptbo_SCS_6hr_50yr

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	3.30	1.50	8.10	3.00	17.90	4.50	4.90
0.25	3.30	1.75	8.10	3.25	17.90	4.75	4.90
0.50	4.90	2.00	9.80	3.50	8.10	5.00	3.30

0.75	4.90	2.25	9.80	3.75	8.10	5.25	3.30
1.00	4.90	2.50	48.90	4.00	6.50	5.50	3.30
1.25	4.90	2.75	127.00	4.25	6.50	5.75	3.30

NASHYD (0004)	Area (ha)=	0.27	Curve Number (CN)=	59.0
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	0.47		

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

CALIB							
NASHYD (0002)	Area (ha)=	0.75	Curve Number (CN)=	73.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.33					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW	(cms)=	0.063 (i)
TIME TO PEAK	(hrs)=	3.167
RUNOFF VOLUME	(mm)=	34.307
TOTAL RAINFALL	(mm)=	81.475
RUNOFF COEFFICIENT	=	0.421

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

CALIB	
-------	--

---- TRANSFORMED HYETOGRAPH ----

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW	(cms)=	0.011 (i)
TIME TO PEAK	(hrs)=	3.417
RUNOFF VOLUME	(mm)=	23.113
TOTAL RAINFALL	(mm)=	81.475
RUNOFF COEFFICIENT	=	0.284

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

CALIB							
NASHYD (0003)	Area (ha)=	1.52	Curve Number (CN)=	66.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.47					

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

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.080 (i)
 TIME TO PEAK (hrs)= 3.417
 RUNOFF VOLUME (mm)= 28.207
 TOTAL RAINFALL (mm)= 81.475
 RUNOFF COEFFICIENT = 0.346

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

CALIB			
NASHYD (0005)	Area (ha)= 2.80	Curve Number (CN)= 71.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.36		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90

0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.208 (i)
 TIME TO PEAK (hrs)= 3.250
 RUNOFF VOLUME (mm)= 32.445
 TOTAL RAINFALL (mm)= 81.475
 RUNOFF COEFFICIENT = 0.398

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

CALIB			
STANDHYD (0006)	Area (ha)= 1.17		
ID= 1 DT= 5.0 min	Total Imp(%)= 29.00	Dir. Conn.(%)= 20.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)= 0.34	0.83	
Dep. Storage	(mm)= 1.00	1.50	
Average Slope	(%)= 2.00	5.00	
Length	(m)= 240.00	26.00	
Mannings n	= 0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30

0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Max.Eff.Inten.(mm/hr)=	127.00	107.93
over (min)	5.00	10.00
Storage Coeff. (min)=	3.19 (ii)	7.20 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.27	0.14

TOTALS

PEAK FLOW (cms)=	0.08	0.20	0.285 (iii)
TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	80.47	50.85	56.77
TOTAL RAINFALL (mm)=	81.48	81.48	81.48
RUNOFF COEFFICIENT =	0.99	0.62	0.70

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

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0001)	Area (ha)= 11.55
ID= 1 DT= 5.0 min	Total Imp(%)= 56.00 Dir. Conn.(%)= 39.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	6.47	5.08
Dep. Storage (mm)=	1.00	1.50
Average Slope (%)=	0.80	2.00
Length (m)=	260.00	22.00
Mannings n =	0.013	0.250

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.30	1.583	8.10	3.083	17.90	4.58	4.90
0.167	3.30	1.667	8.10	3.167	17.90	4.67	4.90
0.250	3.30	1.750	8.10	3.250	17.90	4.75	4.90
0.333	3.30	1.833	8.10	3.333	17.90	4.83	4.90
0.417	3.30	1.917	8.10	3.417	17.90	4.92	4.90
0.500	3.30	2.000	8.10	3.500	17.90	5.00	4.90
0.583	4.90	2.083	9.80	3.583	8.10	5.08	3.30
0.667	4.90	2.167	9.80	3.667	8.10	5.17	3.30
0.750	4.90	2.250	9.80	3.750	8.10	5.25	3.30
0.833	4.90	2.333	9.80	3.833	8.10	5.33	3.30
0.917	4.90	2.417	9.80	3.917	8.10	5.42	3.30
1.000	4.90	2.500	9.80	4.000	8.10	5.50	3.30
1.083	4.90	2.583	48.90	4.083	6.50	5.58	3.30
1.167	4.90	2.667	48.90	4.167	6.50	5.67	3.30
1.250	4.90	2.750	48.90	4.250	6.50	5.75	3.30
1.333	4.90	2.833	127.00	4.333	6.50	5.83	3.30
1.417	4.90	2.917	127.00	4.417	6.50	5.92	3.30
1.500	4.90	3.000	127.00	4.500	6.50	6.00	3.30

Max.Eff.Inten.(mm/hr)=	127.00	141.49
over (min)	5.00	10.00
Storage Coeff. (min)=	4.40 (ii)	9.11 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.23	0.12

TOTALS

PEAK FLOW (cms)=	1.56	1.52	3.076 (iii)
TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	80.47	54.81	64.82
TOTAL RAINFALL (mm)=	81.48	81.48	81.48
RUNOFF COEFFICIENT =	0.99	0.67	0.80

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

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0007)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0001):	11.55	3.076	3.00	64.82
+ ID2= 2 (0003):	1.52	0.080	3.42	28.21

=====

ID = 3 (0007): 13.07 3.116 3.00 60.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| ADD HYD ( 0007) |
| 3 + 2 = 1 |
-----
ID1= 3 ( 0007): 13.07 3.116 3.00 60.56
+ ID2= 2 ( 0005): 2.80 0.208 3.25 32.45
=====
ID = 1 ( 0007): 15.87 3.250 3.00 55.60
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| ADD HYD ( 0007) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0007): 15.87 3.250 3.00 55.60
+ ID2= 2 ( 0006): 1.17 0.285 3.00 56.77
=====
ID = 3 ( 0007): 17.04 3.534 3.00 55.68
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| RESERVOIR( 0010) |
| IN= 2--> OUT= 1 |
| DT= 5.0 min |
-----
OVERFLOW IS OFF
OUTFLOW STORAGE | OUTFLOW STORAGE
(cms) (ha.m.) | (cms) (ha.m.)
0.0000 0.0000 | 0.2490 0.3900
0.0000 0.0000 | 0.5170 0.3944
0.0000 0.0000 | 0.5310 0.4159
0.0000 0.0000 | 0.7520 0.4400
0.0100 0.0270 | 0.7690 0.5050
0.0420 0.1490 | 0.8040 0.5300
0.0480 0.2000 | 0.8160 0.5700
0.1920 0.2180 | 0.8400 0.6200
0.2220 0.2930 | 0.8600 0.6500
0.2390 0.3200 | 0.0000 0.0000
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0007)	17.040	3.534	3.00	55.68
OUTFLOW: ID= 1 (0010)	17.040	0.803	3.58	55.64

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.72

TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.5303

```
| ADD HYD ( 0008) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0010): 17.04 0.803 3.58 55.64
+ ID2= 2 ( 0004): 0.27 0.011 3.42 23.11
=====
ID = 3 ( 0008): 17.31 0.814 3.58 55.13
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| ADD HYD ( 0009) |
| 1 + 2 = 3 |
-----
ID1= 1 ( 0002): 0.75 0.063 3.17 34.31
+ ID2= 2 ( 0008): 17.31 0.814 3.58 55.13
=====
ID = 3 ( 0009): 18.06 0.860 3.42 54.27
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V V I SSSS U U A L (v 6.2.2008)
V V I SS U U A A L
V V I SS U U A A A A L
V V I SS U U A A L
VV I SSSS UUUU A A LLLL
```

```
000 TTTT TTTT H H Y Y M M 000 TM
O O T T H H Y Y MM MM O O
O O T T H H Y M M O O
000 T T H H Y M M 000
```

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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 6.2.1\VO2\voin.dat

Output filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\0d
bef63c-e66b-40f6-a51e-67b13eca1dd6\sce
Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\0d
bef63c-e66b-40f6-a51e-67b13eca1dd6\sce

DATE: 12-06-2021 TIME: 10:36:05

USER:

COMMENTS: _____

** SIMULATION : 6 - Ptbo_SCS_6hr_100yr **

| READ STORM | Filename: C:\Users\bsanders\AppData\Local\Temp\
| | 9f044fcc-38f5-48ab-8ebb-10913a6c3c39\4ef46341
| Ptotal= 89.93 mm | Comments: Ptbo_SCS_6hr_100yr

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.00	3.60	1.50	9.00		3.00	19.80	4.50	5.40
0.25	3.60	1.75	9.00		3.25	19.80	4.75	5.40
0.50	5.40	2.00	10.80		3.50	9.00	5.00	3.60
0.75	5.40	2.25	10.80		3.75	9.00	5.25	3.60
1.00	5.40	2.50	53.90		4.00	7.20	5.50	3.60
1.25	5.40	2.75	140.20		4.25	7.20	5.75	3.60

| CALIB |
| NASHYD (0002) | Area (ha)= 0.75 Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.33

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00		3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00		3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00		3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00		3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00		3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00		3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80		3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80		3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80		3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80		3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80		3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80		4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90		4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90		4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90		4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20		4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20		4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20		4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.074 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 40.310
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.448

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

| CALIB |
| NASHYD (0004) | Area (ha)= 0.27 Curve Number (CN)= 59.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00

U.H. Tp(hrs)= 0.47

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

---- TRANSFORMED HYETOGRAPH ----

TIME	RAIN	TIME	RAIN	'	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr		hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00		3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00		3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00		3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00		3.333	19.80	4.83	5.40

0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.014 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 27.581
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.307

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

1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.095 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 33.422
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.372

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

CALIB			
NASHYD (0005)	Area (ha)= 2.80	Curve Number (CN)= 71.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.36		

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

CALIB			
NASHYD (0003)	Area (ha)= 1.52	Curve Number (CN)= 66.0	
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= 0.47		

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	3.60	1.583	9.00	3.083	19.80	4.58	5.40
0.167	3.60	1.667	9.00	3.167	19.80	4.67	5.40
0.250	3.60	1.750	9.00	3.250	19.80	4.75	5.40
0.333	3.60	1.833	9.00	3.333	19.80	4.83	5.40
0.417	3.60	1.917	9.00	3.417	19.80	4.92	5.40
0.500	3.60	2.000	9.00	3.500	19.80	5.00	5.40
0.583	5.40	2.083	10.80	3.583	9.00	5.08	3.60
0.667	5.40	2.167	10.80	3.667	9.00	5.17	3.60
0.750	5.40	2.250	10.80	3.750	9.00	5.25	3.60
0.833	5.40	2.333	10.80	3.833	9.00	5.33	3.60
0.917	5.40	2.417	10.80	3.917	9.00	5.42	3.60
1.000	5.40	2.500	10.80	4.000	9.00	5.50	3.60
1.083	5.40	2.583	53.90	4.083	7.20	5.58	3.60
1.167	5.40	2.667	53.90	4.167	7.20	5.67	3.60
1.250	5.40	2.750	53.90	4.250	7.20	5.75	3.60
1.333	5.40	2.833	140.20	4.333	7.20	5.83	3.60
1.417	5.40	2.917	140.20	4.417	7.20	5.92	3.60
1.500	5.40	3.000	140.20	4.500	7.20	6.00	3.60

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.246 (i)
TIME TO PEAK (hrs)= 3.250
RUNOFF VOLUME (mm)= 38.219
TOTAL RAINFALL (mm)= 89.925
RUNOFF COEFFICIENT = 0.425

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

CALIB
STANDHYD (0006)
ID= 1 DT= 5.0 min
Area (ha)= 1.17
Total Imp(%)= 29.00 Dir. Conn.(%)= 20.00

IMPERVIOUS PVIOUS (i)
Surface Area (ha)= 0.34 0.83
Dep. Storage (mm)= 1.00 1.50
Average Slope (%)= 2.00 5.00
Length (m)= 240.00 26.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 3.60 1.583 9.00 3.083 19.80 4.58 5.40
0.167 3.60 1.667 9.00 3.167 19.80 4.67 5.40
0.250 3.60 1.750 9.00 3.250 19.80 4.75 5.40
0.333 3.60 1.833 9.00 3.333 19.80 4.83 5.40
0.417 3.60 1.917 9.00 3.417 19.80 4.92 5.40
0.500 3.60 2.000 9.00 3.500 19.80 5.00 5.40
0.583 5.40 2.083 10.80 3.583 9.00 5.08 3.60
0.667 5.40 2.167 10.80 3.667 9.00 5.17 3.60
0.750 5.40 2.250 10.80 3.750 9.00 5.25 3.60
0.833 5.40 2.333 10.80 3.833 9.00 5.33 3.60
0.917 5.40 2.417 10.80 3.917 9.00 5.42 3.60
1.000 5.40 2.500 10.80 4.000 9.00 5.50 3.60
1.083 5.40 2.583 53.90 4.083 7.20 5.58 3.60
1.167 5.40 2.667 53.90 4.167 7.20 5.67 3.60
1.250 5.40 2.750 53.90 4.250 7.20 5.75 3.60
1.333 5.40 2.833 140.20 4.333 7.20 5.83 3.60
1.417 5.40 2.917 140.20 4.417 7.20 5.92 3.60
1.500 5.40 3.000 140.20 4.500 7.20 6.00 3.60

Max.Eff.Inten.(mm/hr)= 140.20 122.97
over (min) 5.00 10.00
Storage Coeff. (min)= 3.07 (ii) 6.88 (ii)

Unit Hyd. Tpeak (min)= 5.00 10.00
Unit Hyd. peak (cms)= 0.27 0.14
TOTALS
PEAK FLOW (cms)= 0.09 0.24 0.326 (iii)
TIME TO PEAK (hrs)= 3.00 3.00 3.00
RUNOFF VOLUME (mm)= 88.92 58.24 64.37
TOTAL RAINFALL (mm)= 89.93 89.93 89.93
RUNOFF COEFFICIENT = 0.99 0.65 0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min
Area (ha)= 11.55
Total Imp(%)= 56.00 Dir. Conn.(%)= 39.00

IMPERVIOUS PVIOUS (i)
Surface Area (ha)= 6.47 5.08
Dep. Storage (mm)= 1.00 1.50
Average Slope (%)= 0.80 2.00
Length (m)= 260.00 22.00
Mannings n = 0.013 0.250

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

---- TRANSFORMED HYETOGRAPH ----
TIME RAIN TIME RAIN TIME RAIN TIME RAIN
hrs mm/hr hrs mm/hr hrs mm/hr hrs mm/hr
0.083 3.60 1.583 9.00 3.083 19.80 4.58 5.40
0.167 3.60 1.667 9.00 3.167 19.80 4.67 5.40
0.250 3.60 1.750 9.00 3.250 19.80 4.75 5.40
0.333 3.60 1.833 9.00 3.333 19.80 4.83 5.40
0.417 3.60 1.917 9.00 3.417 19.80 4.92 5.40
0.500 3.60 2.000 9.00 3.500 19.80 5.00 5.40
0.583 5.40 2.083 10.80 3.583 9.00 5.08 3.60
0.667 5.40 2.167 10.80 3.667 9.00 5.17 3.60
0.750 5.40 2.250 10.80 3.750 9.00 5.25 3.60
0.833 5.40 2.333 10.80 3.833 9.00 5.33 3.60
0.917 5.40 2.417 10.80 3.917 9.00 5.42 3.60
1.000 5.40 2.500 10.80 4.000 9.00 5.50 3.60

Max.Eff.Inten.(mm/hr)=	140.20	160.30	
over (min)	5.00	10.00	
Storage Coeff. (min)=	4.23 (ii)	8.75 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.24	0.12	
			TOTALS
PEAK FLOW (cms)=	1.72	1.76	3.478 (iii)
TIME TO PEAK (hrs)=	3.00	3.00	3.00
RUNOFF VOLUME (mm)=	88.92	62.46	72.78
TOTAL RAINFALL (mm)=	89.93	89.93	89.93
RUNOFF COEFFICIENT =	0.99	0.69	0.81

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 83.0 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.

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.74
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.6031

ADD HYD (0008)	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0010):	17.04	0.832	3.58	62.97
+ ID2= 2 (0004):	0.27	0.014	3.42	27.58
ID = 3 (0008):	17.31	0.845	3.58	62.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0009) |
| 1 + 2 = 3 |
-----
          AREA      QPEAK      TPEAK      R.V.
          (ha)      (cms)      (hrs)      (mm)
ID1= 1 ( 0002):    0.75    0.074    3.17    40.31
+ ID2= 2 ( 0008):   17.31    0.845    3.58    62.42
=====
ID = 3 ( 0009):   18.06    0.904    3.33    61.50
=====
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

```
=====
V  V  I  SSSSS  U  U  A  L          (v 6.2.2008)
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

000  TTTT  TTTT  H  H  Y  Y  M  M  000  TM
O  O  T  T  H  H  Y  Y  MM  MM  O  O
O  O  T  T  H  H  Y  M  M  O  O
000  T  T  H  H  Y  M  M  000
```

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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 6.2.1\V02\voin.dat

Output filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\92
6396af-82c1-4cb8-99e7-c0d001424b2c\sce
Summary filename:
C:\Users\bsanders\AppData\Local\Civica\XH5\8997b08e-7671-45f2-a98a-df5ea147461e\92
6396af-82c1-4cb8-99e7-c0d001424b2c\sce

DATE: 12-06-2021

TIME: 10:36:04

USER:

COMMENTS: _____

```
-----
*****
** SIMULATION : 7 - 25mm CHI
*****
```

```
-----
| READ STORM |      Filename: C:\Users\bsanders\AppData
|            |      ata\Local\Temp\
|            |      9f044fcc-38f5-48ab-8ebb-10913a6c3c39\d243f51a
| Ptotal= 24.91 mm |      Comments: 25mm CHI
-----
```

TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.00	1.76	1.00	11.75	2.00	3.88	3.00	2.07
0.17	2.00	1.17	57.66	2.17	3.35	3.17	1.93
0.33	2.32	1.33	15.20	2.33	2.96	3.33	1.81
0.50	2.81	1.50	8.31	2.50	2.66	3.50	1.71
0.67	3.61	1.67	5.91	2.67	2.42	3.67	1.62
0.83	5.28	1.83	4.66	2.83	2.23	3.83	1.54

```
-----
| CALIB |
| NASHYD ( 0002) |      Area (ha)= 0.75      Curve Number (CN)= 73.0
| ID= 1 DT= 5.0 min |      Ia (mm)= 5.00      # of Linear Res.(N)= 3.00
|            |      U.H. Tp(hrs)= 0.33
-----
```

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

```
-----
--- TRANSFORMED HYETOGRAPH ---
TIME  RAIN | TIME  RAIN | TIME  RAIN | TIME  RAIN
hrs   mm/hr | hrs   mm/hr | hrs   mm/hr | hrs   mm/hr
0.083 1.76 | 1.083 11.75 | 2.083 3.88 | 3.08  2.07
0.167 1.76 | 1.167 11.75 | 2.167 3.88 | 3.17  2.07
0.250 2.00 | 1.250 57.66 | 2.250 3.35 | 3.25  1.93
0.333 2.00 | 1.333 57.66 | 2.333 3.35 | 3.33  1.93
0.417 2.32 | 1.417 15.20 | 2.417 2.96 | 3.42  1.81
-----
```

0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.087

PEAK FLOW (cms)= 0.005 (i)
TIME TO PEAK (hrs)= 1.750
RUNOFF VOLUME (mm)= 3.479
TOTAL RAINFALL (mm)= 24.906
RUNOFF COEFFICIENT = 0.140

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

CALIB							
NASHYD (0004)	Area (ha)=	0.27	Curve Number (CN)=	59.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.47					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.022

PEAK FLOW (cms)= 0.001 (i)
TIME TO PEAK (hrs)= 2.000
RUNOFF VOLUME (mm)= 2.013
TOTAL RAINFALL (mm)= 24.906

RUNOFF COEFFICIENT = 0.081

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

CALIB							
NASHYD (0003)	Area (ha)=	1.52	Curve Number (CN)=	66.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.47					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.124

PEAK FLOW (cms)= 0.006 (i)
TIME TO PEAK (hrs)= 1.917
RUNOFF VOLUME (mm)= 2.628
TOTAL RAINFALL (mm)= 24.906
RUNOFF COEFFICIENT = 0.106

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

CALIB							
NASHYD (0005)	Area (ha)=	2.80	Curve Number (CN)=	71.0			
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	# of Linear Res.(N)=	3.00			
	U.H. Tp(hrs)=	0.36					

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81
0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Unit Hyd Qpeak (cms)= 0.297

PEAK FLOW (cms)= 0.016 (i)
 TIME TO PEAK (hrs)= 1.750
 RUNOFF VOLUME (mm)= 3.204
 TOTAL RAINFALL (mm)= 24.906
 RUNOFF COEFFICIENT = 0.129

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

CALIB			
STANDHYD (0006)	Area (ha)=	1.17	
ID= 1 DT= 5.0 min	Total Imp(%)=	29.00	Dir. Conn.(%)= 20.00
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.34	0.83	
Dep. Storage (mm)=	1.00	1.50	
Average Slope (%)=	2.00	5.00	
Length (m)=	240.00	26.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07
0.167	1.76	1.167	11.75	2.167	3.88	3.17	2.07
0.250	2.00	1.250	57.66	2.250	3.35	3.25	1.93
0.333	2.00	1.333	57.66	2.333	3.35	3.33	1.93
0.417	2.32	1.417	15.20	2.417	2.96	3.42	1.81

0.500	2.32	1.500	15.20	2.500	2.96	3.50	1.81
0.583	2.81	1.583	8.31	2.583	2.66	3.58	1.71
0.667	2.81	1.667	8.31	2.667	2.66	3.67	1.71
0.750	3.61	1.750	5.91	2.750	2.42	3.75	1.62
0.833	3.61	1.833	5.90	2.833	2.42	3.83	1.62
0.917	5.27	1.917	4.66	2.917	2.23	3.92	1.54
1.000	5.28	2.000	4.66	3.000	2.23	4.00	1.54

Max.Eff.Inten.(mm/hr)= 57.66 18.09
 over (min)= 5.00 15.00
 Storage Coeff. (min)= 4.37 (ii) 12.58 (ii)
 Unit Hyd. Tpeak (min)= 5.00 15.00
 Unit Hyd. peak (cms)= 0.23 0.08

TOTALS

PEAK FLOW (cms)= 0.03 0.02 0.045 (iii)
 TIME TO PEAK (hrs)= 1.33 1.50 1.33
 RUNOFF VOLUME (mm)= 23.91 7.97 11.15
 TOTAL RAINFALL (mm)= 24.91 24.91 24.91
 RUNOFF COEFFICIENT = 0.96 0.32 0.45

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
 ***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
 YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
 CN* = 83.0 Ia = Dep. Storage (Above)
 (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
 THAN THE STORAGE COEFFICIENT.
 (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0001)	Area (ha)=	11.55	
ID= 1 DT= 5.0 min	Total Imp(%)=	56.00	Dir. Conn.(%)= 39.00
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	6.47	5.08	
Dep. Storage (mm)=	1.00	1.50	
Average Slope (%)=	0.80	2.00	
Length (m)=	260.00	22.00	
Mannings n =	0.013	0.250	

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

---- TRANSFORMED HYETOGRAPH ----							
TIME	RAIN	TIME	RAIN	TIME	RAIN	TIME	RAIN
hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.083	1.76	1.083	11.75	2.083	3.88	3.08	2.07


```
+ ID2= 2 ( 0004):      0.27   0.001    2.00    2.01
=====
ID = 3 ( 0008):      17.31   0.043    4.00   11.48
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
-----
| ADD HYD ( 0009)|
| 1 + 2 = 3 |
-----
      AREA   QPEAK   TPEAK   R.V.
      (ha)   (cms)   (hrs)   (mm)
ID1= 1 ( 0002):   0.75   0.005    1.75    3.48
+ ID2= 2 ( 0008):  17.31   0.043    4.00   11.48
=====
ID = 3 ( 0009):  18.06   0.044    3.50   11.15
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Appendix D: Stage Storage Discharge Calculations

Stormwater Management Facility Outlet Sizing



Project Name: Norwood Park - Phase 4

Designed By: BS

Project No: 20120

Date: 2021-12-03

Pond Outlet Configuration							
Description		Stage 1	Stage 2		Stage 3	Stage 4	
Control Type		Orifice Tube	Orifice Plate		Orifice Plate	Orifice Plate	
Orifice Diameter/Weir Height		0.15	0.30		0.35	0.25	
Invert Elevations		207.80	207.80		207.80	207.75	
Stage Storage Discharge							
Description	Elevation (m)	Storage (m³)	Controlled Discharge Rate (m³/s)				
			Orifice ¹	Orifice ²	Orifice ²	Orifice ²	Total
Bottom of Sotrage	207.80	0	0.000	0.000	0.000	0.000	0.000
	207.85	134	0.000	0.000	0.000	0.000	0.000
	207.90	271	0.010	0.000	0.000	0.000	0.010
	207.95	412	0.017	0.000	0.000	0.000	0.017
	208.00	556	0.022	0.000	0.000	0.000	0.022
	208.05	703	0.026	0.000	0.000	0.000	0.026
	208.10	853	0.030	0.000	0.000	0.000	0.030
	208.15	1007	0.033	0.000	0.000	0.000	0.033
	208.20	1164	0.036	0.000	0.000	0.000	0.036
	208.25	1325	0.038	0.000	0.000	0.000	0.038
25mm Ponding	208.30	1489	0.041	0.000	0.000	0.000	0.041
	208.35	1656	0.043	0.000	0.000	0.000	0.043
	208.40	1827	0.045	0.000	0.000	0.000	0.045
	208.45	2002	0.047	0.000	0.000	0.000	0.047
2 Year Ponding	208.50	2180	0.049	0.142	0.000	0.000	0.191
	208.55	2361	0.051	0.148	0.000	0.000	0.199
	208.60	2546	0.053	0.154	0.000	0.000	0.207
	208.65	2735	0.055	0.160	0.000	0.000	0.215
	208.70	2927	0.057	0.165	0.000	0.000	0.222
5 Year Ponding	208.75	3123	0.059	0.171	0.000	0.000	0.229
	208.80	3323	0.060	0.176	0.000	0.000	0.236
	208.85	3526	0.062	0.181	0.000	0.000	0.243
	208.90	3733	0.063	0.186	0.250	0.000	0.499
	208.95	3944	0.065	0.191	0.257	0.000	0.512
10 Year Ponding	209.00	4159	0.066	0.196	0.263	0.000	0.525
	209.05	4377	0.068	0.200	0.269	0.188	0.726
	209.10	4599	0.069	0.205	0.276	0.192	0.742
25 Year Ponding	209.15	4825	0.071	0.209	0.282	0.196	0.758
	209.20	5055	0.072	0.213	0.288	0.200	0.773
	209.25	5289	0.073	0.218	0.293	0.204	0.788
50 Year Ponding	209.30	5526	0.075	0.222	0.299	0.208	0.803
	209.35	5768	0.076	0.226	0.305	0.211	0.818
100 Year Ponding	209.40	6031	0.077	0.230	0.310	0.215	0.832
	209.45	6262	0.079	0.234	0.316	0.218	0.846
Emergency Weir	209.50	6516	0.080	0.238	0.321	0.222	0.860
	209.55	6773	0.081	0.241	0.326	0.225	0.874
	209.60	7034	0.082	0.245	0.331	0.228	0.887
	209.65	7299	0.083	0.249	0.336	0.232	0.900
	209.70	7569	0.085	0.253	0.341	0.235	0.913
	209.75	7842	0.086	0.256	0.346	0.238	0.926
	209.80	8120	0.087	0.260	0.351	0.241	0.939
	Notes:						
1. Orifice tube discharge calculated according to Q=0.8A(2gh) ^{1/2}							
2. Orifice plate discharge calculated according to Q=0.6A(2gh) ^{1/2}							
3. Emergency weir calculations included on separate sheet.							

Appendix E: Weir Sizing Calculations

Weir Sizing



Project Name: Norwood Park Phase 4

Project No: 20120

Designed By: BS

Date: 2021-12-10

Weir Parameters					
Type: ^{1,2}	Broad Crested Trapezoidal		Weir Invert:	209.65	m
Peak Flow:	3.996	m³/s	Weir Height:	0.3	m
Included Angle:	45	Degrees	Width:	19.9	m
Stage Discharge					
Elevation (m)			Weir Flow (m³/s)		
209.65			0.000		
209.67			0.096		
209.69			0.271		
209.71			0.498		
209.73			0.767		
209.75			1.072		
209.77			1.410		
209.79			1.778		
209.81			2.172		
209.83			2.593		
209.85			3.038		
209.87			3.506		
209.89			3.996		
Weir Overflow Results					
Pond Elevation at Peak Flow:		209.891	m		
Freeboard:		0.059	m		
Velocity:		0.836	m/s		

Notes:

1. Flows over rectangular broad crested weir calculated based on weir equations in MTO Drainage Manual Chapter 8, Section Flow Over Weirs and Notches.
2. Flows over trapezoidal broad crested weir calculated based on weir equations in Nottawasaga Valley Conservation Authority Section 9.9, Trapezoidal Broad Crested Weir (Emergency Spillways)

Appendix F: Water Quality Calculations

Water Quality Sizing Criteria



Project Name: Norwood Park Phase 4
Project No: 20120

Designed By: BS
Date: 2021-Dec

Site Data				
Protection Level:		Enhanced		
Facility Type:		Wet Pond		
Area	=	14.1	ha	
% Impervious Calculated	=	45.70	%	
Impervious Area	=	6.44	ha	
Required Extended Detention Volume (Ved)				
Ved	=	40	m ³ /ha	
	=	564	m ³	
Ved _{25mm}	=	2002	m ³	
Required Storage Volume (Vs)				
Vs	=	167	m ³ /ha	
	=	2355	m ³	
Required Permanent Pool Volume (Vpp)				
Vpp	=	127	m ³ /ha	
	=	1791	m ³	
Permanent Pool Volume Provided	=	2014	m ³	
Final Volumes				
Quantity Control Volume Required	=	5956.0	m ³	
Quantity Control Volume Provided	=	8120.0	m ³	
Total Pond Volume Required	=	7747	m ³	
Total Pond Volume Provided	=	10134	m ³	

Notes:

Table 3.2: Water Quality Storage Requirements based on Receiving Waters (MOE SWMPD Manual)

Protection Level	SWMP Type	Storage Volume (m ³ /ha) for Impervious Level				
		0%	35%	55%	70%	85%
Enhanced 80% long-term S.S. removal	Infiltration	16.25	25	30	35	40
	Wetlands	36.25	80	105	120	140
	Hybrid Wet Pond/Wetland	40	110	150	175	195
	Wet Pond	52.5	140	190	225	250
Normal 70% long-term S.S. removal	Infiltration	20	20	20	25	30
	Wetlands	42.5	60	70	80	90
	Hybrid Wet Pond/Wetland	48.75	75	90	105	120
	Wet Pond	55	90	110	130	150
Basic 60% long-term S.S. removal	Infiltration	20	20	20	20	20
	Wetlands	60	60	60	60	60
	Hybrid Wet Pond/Wetland	42.5	60	70	75	80
	Wet Pond	33.75	60	75	85	95
	Dry Pond (Continuous Flow)	0	90	150	200	240

Appendix G: Drawdown Time & Forebay Calculations

Drawdown Time Calculations

Design Sheet



Project Name: Norwood Park

Project No: 21020

Designed By: BS

Date: 2021-Dec

Design Criteria			Design Storms		
Quality Volume: ¹	125	m ³ /ha	Volume:	Chicago 25	
Disturbed Area:	14.1	ha	Conveyance:	100-Year	
Volume Required:	1763	m ³			
Storage Volume					
Req'd Quality Volume:	1763	m ³	Pond Bottom:	207.80	m
Req'd Volume (Chicago 25 mm):	1555	m ³	Top of Storage:	208.35	m
Volume Provided:	2014	m ³	Top of Pond:	209.80	m
Drawdown Time Calculation					
Head vs. Surface Area $y = 1329.7x + 2583.7$					
Outlet Configuration			Drawdown Time ²		
Outlet Type:	Orifice		$t = (0.66C_1h^{1.5} + 2C_2h^{0.5})/2.75A$		
Diameter:	150.00	mm	where		
Invert:	207.80	mm	$C_1 =$	1330	slope coefficient (from regression)
Peak Discharge: ³	0.043	m ³ /s	$C_2 =$	2584	intercept (from regression)
			$h =$	0.550	maximum water elevation (m)
			$A =$	0.018	cross sect. area orifice (m ²)
			$t =$	86224.6	seconds
			$=$	24	hours

Notes:

- From ESC Design Guidelines for Urban Construction, GGHCA
- From MOE SWMPDM Section 4.6.
- Orifice plate discharge calculated according to $Q=0.61A(2gh)^{1/2}$

Forebay Calculations



Project Name: Norwood Park Phase 4

Designed By: BS

Project No: 20120

Date: 2021-11-01

Settling Length¹ (D_s)

Length To Width Ratio:	$r =$	2.0:1	
Peak Outflow:	$Q =$	0.043	m^3/s
Desired Velocity In Forebay:	$V =$	0.0003	m/s
Required Settling Length:	$D_s =$	$(rQ/V)^{0.5}$	
	$=$	16.93	m

Dispersion Length² (D)

Peak Inflow:	$Q =$	0.787	m^3/s
Permanent Pool Depth:	$d =$	1.0	m
Desired Velocity in Forebay:	$V =$	0.5	m/s
Required Dispersion Length:	$D =$	$8Q/dV$	
	$=$	12.59	m

Forebay Dimensions

Min Forebay Length:	$L_{\min} =$	16.93	m
Min Forebay Width:	$W_{\min} =$	$D_s/8$	
		2.12	m

Notes:

1. From MOE SWMPDM Section 4.5.
2. From MOE SWMPDM Section 4.6.

Appendix H: Water Balance Calculations

Pre-Development
Water Balance Equations



Project Name: Norwood Park Phase 4
Project No: 20120
Location: Peterborough
Rainfall Data: Peterborough STP

Designed By: BS
Date: 2021-12-01

Catchment Designation	Site - Pre-Development			
	Crop Areas	Gravel Areas	Woodlot Areas	Totals
Area (m ²)	130200	3300	7500	141000
Pervious Area (m ²)	130200	0	7500	137700
Impervious Area (m ²)	0	3300	0	3300
Infiltration Factors				
Topography Infiltration Factor	0.2	0.2	0.2	
Soil Infiltration Factor				
Land Cover Infiltration Factor				
MOE Infiltration Factor	0.5	0.5	0	
Actual Infiltration Factor	0.5	0.5	0	
Run-off Coefficient	0.35	0.6	0.25	
Runoff from Impervious Surfaces *	0	0.8	0.8	
Inputs (per Unit Area)				
Precipitation (mm/yr)	855	855	855	855
Run-On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855
Outputs (per Unit Area)				
Precipitation Surplus (mm/yr)	290	290	684	311
Net Surplus (mm/yr)	290	290	684	311
Evapotranspiration (mm/yr) *	565	565	171	544
Infiltration (mm/yr)	145	145	0	137
LID Infiltration (mm/yr)	0	0	0	0
Total Infiltration (mm/yr)	145	145	0	137
Runoff Pervious Areas (mm/yr)	145	145	0	137
Runoff Impervious Areas (mm/yr)	0	0	684	36
Total Runoff (mm/yr)	145	145	684	174
Total Outputs (mm/yr)	855	855	855	855
Difference (Inputs- Outputs)	0	0	0	0
Inputs (Volumes)				
Precipitation (m ³ /yr)	111373	2823	6416	120611
Run-On (m ³ /yr)	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0
Total Inputs (m ³ /yr)	111373	2823	6416	120611
Outputs (Volumes)				
Precipitation Surplus (m ³ /yr)	37761	957	5132	43850
Net Surplus (m ³ /yr)	37761	957	5132	43850
Evapotranspiration (m ³ /yr) *	73612	1866	1283	76761
Infiltration (m ³ /yr)	18880	479	0	19359
Soakaway Infiltration (m ³ /yr)	0	0	0	0
Total Infiltration (m ³ /yr)	18880	479	0	19359
Runoff Pervious Areas (m ³ /yr)	18880	479	0	19359
Runoff Impervious Areas (m ³ /yr)	0	0	5132	5132
Total Runoff (m ³ /yr)	18880	479	5132	24491
Total Outputs (m ³ /yr)	111373	2823	6416	120611
Difference (Inputs- Outputs)	0	0	0	0

Notes:

Infiltration Factors

1.

Topography

Flat Land, average slope < 0.6 m/km0.3

Rolling Land, average slope 2.8 m to 3.8 m/km0.2

Hilly Land, average slope 28 m to 47 m/km0.1
2.

Soils

Tight impervious clay0.1

Medium combinations of clay and loam0.2

Open Sandy loam0.4
3.

Cover

Cultivated Land0.1

Woodland0.2

4. Evapotranspiration from impervious surfaces assumed to be 20% of precipitation.

Post-Development
Water Balance Calculations



Project Name: Norwood Park Phase 4
Project No: 20120
Location: Peterborough
Rainfall Data: Peterborough STP

Designed By: BS
Date: 2021-12-02

Catchment Designation	Site - Post-Development						
	Grassed Area	Crop Area	Impervious Area	Totals			
Area (m ²)	60230	16400	64400	141030			
Pervious Area (m ²)	60230	16400	0	76630			
Impervious Area (m ²)	0	0	64400	64400			
Infiltration Factors							
Topography Infiltration Factor	0.3	0.2	0.3				
Soil Infiltration Factor					0.2	0.2	
Land Cover Infiltration Factor							0.1
MOE Infiltration Factor	0.6	0.5	0				
Actual Infiltration Factor					0.6	0.5	
Run-off Coefficient							0.1
Runoff from Impervious Surfaces *	0	0	0.8				
Inputs (per Unit Area)							
Precipitation (mm/yr)				855	855	855	855
Run-On (mm/yr)	0	0	0	0			
Other Inputs (mm/yr)	0	0	0	0			
Total Inputs (mm/yr)	855	855	855	855			
Outputs (per Unit Area)							
Precipitation Surplus (mm/yr)	290	0	684	436			
Net Surplus (mm/yr)	290	0	684	436			
Evapotranspiration (mm/yr) *	565	565	171	385			
Infiltration (mm/yr)	174	0	0	74			
LID Infiltration (mm/yr)	0	0	0	0			
Total Infiltration (mm/yr)	174	0	0	74			
Runoff Pervious Areas (mm/yr)	116	290	0	83			
Runoff Impervious Areas (mm/yr)	0	0	684	312			
Total Runoff (mm/yr)	116	290	684	396			
Total Outputs (mm/yr)	855	855	855	855			
Difference (Inputs- Outputs)	0	0	0	0			
Inputs (Volumes)							
Precipitation (m ³ /yr)	51521	14029	55088	120637			
Run-On (m ³ /yr)	0	0	0	0			
Other Inputs (m ³ /yr)	0	0	0	0			
Total Inputs (m ³ /yr)	51521	14029	55088	120637			
Outputs (Volumes)							
Precipitation Surplus (m ³ /yr)	17468	0	44070	61538			
Net Surplus (m ³ /yr)	17468	0	44070	61538			
Evapotranspiration (m ³ /yr) *	34053	9272	11018	54343			
Infiltration (m ³ /yr)	10481	0	0	10481			
Soakaway Infiltration (m ³ /yr)	0	0	0	0			
Total Infiltration (m ³ /yr)	10481	0	0	10481			
Runoff Pervious Areas (m ³ /yr)	6987	4756	0	11743			
Runoff Impervious Areas (m ³ /yr)	0	0	44070	44070			
Total Runoff (m ³ /yr)	6987	4756	44070	55814			
Total Outputs (m ³ /yr)	51521	14029	55088	120637			
Difference (Inputs- Outputs)	0	0	0	0			

Pre-Development Total Infil.:
19359 m3/yr

- Notes:
- Infiltration Factors**
1.

Topography

Flat Land, average slope < 0.6 m/km
Rolling Land, average slope 2.8 m to 3.8 m/km
Hilly Land, average slope 28 m to 47 m/km

0.3
0.2
0.1
2.

Soils

Tight impervious clay
Medium combinations of clay and loam
Open Sandy loam

0.1
0.2
0.4
3.

Cover

Cultivated Land
Woodland

0.1
0.2
4. Evapotranspiration from impervious surfaces assumed to be 20% of precipitation.

Project Name:

Norwood Park Phase 4

Project No:

20120

Location:

Peterborough

Rainfall Data:

Peterborough STP

Designed By:

BS

Date:

2021-12-02

Catchment Designation	Site - Post-Development				
	Grassed Area	Crop Areas	Impervious Area	Impervious Area Directed to Infiltration Facility	Totals
Area (m ²)	60230	16400	52813	11587	141030
Pervious Area (m ²)	60230	16400	0	0	76630
Impervious Area (m ²)	0	0	52813	11587	64400
Infiltration Factors					
Topography Infiltration Factor	0.3	0.2	0	0.3	
Soil Infiltration Factor	0.2	0.2	0	0.2	
Land Cover Infiltration Factor	0.1	0.1	0	0.2	
MOE Infiltration Factor	0.6	0.5	0	0	
Actual Infiltration Factor	0.6	0.5	0	0	
Run-off Coefficient	0.1	0.35	0.9	0.9	
Runoff from Impervious Surfaces *	0	0	0.8	0.8	
Inputs (per Unit Area)					
Precipitation (mm/yr)	855	855	855	855	855
Run-On (mm/yr)	0	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0	0
Total Inputs (mm/yr)	855	855	855	855	855
Outputs (per Unit Area)					
Precipitation Surplus (mm/yr)	290	0	684	684	436
Net Surplus (mm/yr)	290	0	684	684	436
Evapotranspiration (mm/yr) *	565	565	171	171	320
Infiltration (mm/yr)	174	0	0	0	74
LID Infiltration (mm/yr)	0	0	0	450	37
Total Infiltration (mm/yr)	174	0	0	450	111
Runoff Pervious Areas (mm/yr)	116	290	0	0	50
Runoff Impervious Areas (mm/yr)	0	0	684	234	276
Total Runoff (mm/yr)	116	290	684	234	325
Total Outputs (mm/yr)	855	855	855	855	756
Difference (Inputs- Outputs)	0	0	0	0	0
Inputs (Volumes)					
Precipitation (m ³ /yr)	51521	14029	45176	9912	120637
Run-On (m ³ /yr)	0	0	0	0	0
Other Inputs (m ³ /yr)	0	0	0	0	0
Total Inputs (m ³ /yr)	51521	14029	45176	9912	120637
Outputs (Volumes)					
Precipitation Surplus (m ³ /yr)	17468	0	36141	7929	61538
Net Surplus (m ³ /yr)	17468	0	36141	7929	61538
Evapotranspiration (m ³ /yr) *	34053	9272	9035	1982	54343
Infiltration (m ³ /yr)	10481	0	0	0	10481
Soakaway Infiltration (m ³ /yr)	0	0	0	5214	5214
Total Infiltration (m ³ /yr)	10481	0	0	5214	15695
Runoff Pervious Areas (m ³ /yr)	6987	4756	0	0	11743
Runoff Impervious Areas (m ³ /yr)	0	0	36141	2715	38856
Total Runoff (m ³ /yr)	6987	4756	36141	2715	50600
Total Outputs (m ³ /yr)	51521	14029	45176	9912	120637
Difference (Inputs- Outputs)	0	0	0	0	0

Proposed Infiltration via Mitig
Pre-Development Total Infiltration:
137 mm/yr

Note:
539.8 mm
Precipitation available between Apr-Oct (non-winter months). Therefore available for infiltration into non-frozen soil

Pre-Development Total Infiltration:
19359 m3/yr

Notes:

Infiltration Factors

1.

Topography

Flat Land, average slope < 0.6 m/km 0.3

Rolling Land, average slope 2.8 m to 3.8 m/km 0.2

Hilly Land, average slope 28 m to 47 m/km 0.1
2.

Soils

Tight impervious clay 0.1

Medium combinations of clay and loam 0.2

Open Sandy loam 0.4
3.

Cover

Cultivated Land 0.1

Woodland 0.2
4. Evapotranspiration from impervious surfaces assumed to be 20% of precipitation.

Water Budget Summary



Project Name: Norwood Park Phase 4
Project No: 20120
Location: Peterborough
Rainfall Data: Peterborough STP

Designed By: BS
Date: 2021-12-02

Characteristic	Site				
	Pre-Development	Post-Development	Post-Development <i>with Mitigation</i>	Change (Pre to Post)	Change (Pre to Post) <i>with Mitigation</i>
Inputs (Volumes)					
Precipitation (m ³ /yr)	120611	120637	120637	0%	0%
Run-On (m ³ /yr)	0	0	0	0%	0%
Other inputs (m ³ /yr)	0	0	0	0%	0%
Total Inputs (m ³ /yr)	120611	120637	120637	26	26
Outputs (Volumes)					
Precipitation Surplus (m ³ /yr)	43850	61538	61538	140%	140%
Net Surplus (m ³ /yr)	43850	61538	61538	140%	140%
Evapotranspiration (m ³ /yr)	76761	54343	54343	71%	71%
Infiltration (m ³ /yr)	19359	10481	10481	54%	54%
LID Infiltration (m ³ /yr)	0	0	5214	-	5214 m3/yr
Total Infiltration (m³/yr)	19359	10481	15695	54%	81%
Runoff Pervious Areas (m ³ /yr)	19359	11743	11743	61%	61%
Runoff Impervious Areas (m ³ /yr)	5132	44070	38856	-	-
Total Runoff (m ³ /yr)	24491	55814	50600	228%	207%
Total Outputs (m ³ /yr)	120611	120637	120637	0%	0%

Appendix I: LID Facility Sizing

Soakaway/Infiltration Cell Sizing



Project Name: Norwood Park Phase 4
Project No: 20120

Designed By: BS
Date: 2021-12-10

Soil Information			
Geotechnical Report prepared by GHD. dated October 8, 2021 (Job No: 11231077)			
Borehole	Soil Characteristics	Hydraulic Conductivity (cm/sec)	Design Infiltration Rate (mm/hr)
MW1-21	0m to 1.4m - sand fill	10^{-3} to 10^{-4}	18
Reservoir Depth - $d_r \text{ max} = i \cdot t_s / V_r$			
i = native soil infiltration rate	18	mm/hr	
V_r = void space ratio (40% = 0.4)	0.4		
t_s = time to drain	48	hr	
$d_{r \text{ max}}$ = max. stone reservoir depth	2000	mm	

Appendix J: Geotechnical Report



Geotechnical Investigation Report

**Proposed Norwood Park Subdivision -
Phase 4, Albine Street, Norwood, Ontario**

DPH Developments Inc.

8 October 2021

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Figure 1	Site Location Map
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Appendix A	Stratigraphy Reports
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1. Introduction

GHD Limited (GHD) has been retained by DPH Developments Inc. (the Client), being represented by Engage Engineering Ltd. (EEL) to conduct a geotechnical investigation for the design and construction of phase 4 of the proposed Norwood Park subdivision along Albine Street and west of Keeler Court (phase 3), in Norwood, Ontario (the Site). The Site location map is presented as **Figure 1** in the attachment section of this report.

It is GHD's expectation that the proposed development will consist of typical 1- and 2-storey residences, with or without basements, with associated asphalt-paved roadways, and in-ground servicing. A preliminary conceptual plan provided by the Client illustrated the site location and proposed road network and lot layout. Further details of the proposed development, such as site grading plans and servicing plans, were not available at the time of preparation of this report.

The purpose of the geotechnical investigation was to assess the subsurface soil and groundwater conditions within the proposed development area, and to provide geotechnical engineering recommendations relevant to earthwork construction, reuse of existing soils as backfill material, service installation, infiltration rates for potential Low Impact Development (LID) features, storm water management (SWM) pond design, foundations, slabs, and pavement structure for roadway construction. The geotechnical investigation was completed in general accordance with our proposal PG-5227 dated July 6, 2021.

The factual data, interpretations and preliminary recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. This report should be read in conjunction with the Statement of Limitations appended to this report. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2. GHD's Scope of Work

GHD's scope of work was carried out from July to October 2021 and involved the following tasks:

- Pre-Planning activities:
 - Preparation of a Site-specific health and safety plan (HASP).
 - Completion of underground utility locate clearances (public and private).
- Field activities:
 - Advancement of four (4) boreholes identified as MW1-21, MW2-21, MW3-21 and BH4-21 as shown on **Figure 2** to depths ranging between 2.7 to 4.0 metres below ground surface (mbgs). Monitoring wells were installed in three (3) of the borehole locations (MW1-21, MW2-21, and MW3-21) to facilitate groundwater monitoring and testing.
 - Advancement of eleven (11) test pits identified as TP1-21 through TP11-21 on **Figure 2** to depths ranging between 1.0 to 3.7 mbgs.
 - Standard Penetration Test (SPT) and associated split spoon soil sampling in accordance with ASTM D1586.
 - Hydraulic testing (i.e. single well response slug testing) was completed at the three (3) monitoring wells and permeameter testing was completed at three test pit locations, to evaluate hydraulic conductivity for potential dewatering and infiltration rates for potential Low Impact Development (LID) design.
- Completion of geotechnical laboratory testing on the selected soil samples.
- Preparation of geotechnical investigations report (factual data, analysis and recommendations).

3. Methodology

3.1 Safety Planning

Upon project initiation, a Site-specific Health and Safety Plan (HASP) was prepared for implementation during the field investigation program. The HASP presents the visually observed Site conditions to identify potential physical hazards to field personnel. Required personal protective equipment was also listed in the HASP. It is mandatory for all GHD personnel involved in the field program, to read the HASP and have a copy of the HASP available at the Site during the investigative work. Health and Safety requirements in the HASP were implemented during the field investigation program.

In addition to the abovementioned safety measures, GHD's safety protocol related to COVID-19 issues was implemented and all preventive measures were reinforced. GHD and sub-contractor maintained the required social distancing throughout the field investigations.

3.2 Utility Clearance

GHD completed a pre-drilling Site visit to review the Site conditions and access restrictions. Based on the limits of approach, the test holes were positioned appropriately to avoid potential obstructions. The test holes were placed in the field based on the preliminary conceptual plan.

Prior to initiating the subsurface investigation activities, all applicable utility companies (gas, hydro, network cables, water, waste water, etc.) were contacted, to demarcate the location of their respective underground utilities to ensure that service lines would not be damaged during the investigative works.

GHD also retained a specialist private services locator (Utility Marx) to locate any underground private utilities that could potentially be present at the Site. The proposed boreholes and test pits were positioned at appropriate locations to avoid existing service lines.

3.3 Field Investigation

The test hole program associated with the geotechnical investigation was conducted on August 18th and August 27th, 2021. The subsurface investigation consisted of advancing a total of four (4) exploratory boreholes and eleven (11) test pits. Monitoring wells were installed in three (3) of borehole locations. The test hole locations are presented on **Figure 2**.

GHD's safety protocol related to COVID-19 issues was implemented and all preventive measures were applied for the bringing of samples into the lab. The sample bags were decontaminated before carrying out the sample review and laboratory testing.

3.3.1 Test Hole Advancement and Sample Collection

The boreholes were located as shown in **Figure 2**. The drilling work was carried out by a track mounted drilling rig, supplied, and operated by Landshark Drilling under the full-time supervision of a GHD experienced technical representative. The boreholes were advanced to depths ranging between approximately 2.7 to 4.0 mbgs.

The boreholes were advanced using continuous solid stem augers and soil samples were collected using a 50 millimetre (mm) outside diameter split spoon sampler in general accordance with the specifications of the Standard Penetration Test Method (ASTM D1586). The relative density or consistency of the subsurface soil layers were measured using the Standard Penetration Test (SPT) method, by counting the number of blows ('N') required to drive a conventional split barrel soil sampler 300 mm depth.

Monitoring wells were installed in three (3) borehole locations (MW1-21, MW2-21 and MW3-21). The monitoring wells consist of a 50 mm diameter polyvinyl chloride (PVC) slotted well screen and completed to the ground surface using a riser pipe. A silica sand pack was placed in the annular space between the PVC screen and riser pipe to approximately 0.3 m above the top of the screen. A bentonite seal was installed in the remaining borehole annulus above the sand pack.

The test pits were located as shown in **Figure 2**. The test pitting was carried out by a track mounted excavator, supplied, and operated by Drain Brothers Excavating Ltd under the full-time supervision of a GHD experienced technical representative. The test pits were advanced to bedrock at depths ranging between approximately 1.1 to 3.7 mbgs.

Groundwater level observations and measurements were made in the test holes as drilling and test pits proceeded and upon completion of the test holes. The observed conditions and measured groundwater levels are provided in the logs of the drilled boreholes and excavated test pits. The boreholes in which a monitoring well was not installed were backfilled upon completion and sealed in accordance with Ontario Regulation 903.

The GHD technical representative logged the soil samples and bedrock encountered in the test holes and examined the samples as they were obtained. The recovered samples were transferred to the GHD Peterborough laboratory, where they were reviewed by a senior geotechnical engineer. The detailed results of the examination are recorded on the test hole logs presented in Appendix A.

3.4 Test Hole Locations and Ground Surface Elevations

UTM coordinates and ground surface elevations for each test hole location was surveyed using a Leica RX1250X GPS system connected to the Real-Time Kinematic (RTK) network. The location of each test hole is referenced to UTM (Zone 17). The following table presents a summary of investigated depths, surface elevations, and UTM coordinates for the test hole locations:

Table 3.1 Summary of Test Holes

Borehole and Test Pit ID	Location – UTM Coordinates System		Test Hole Depth (mbgs)	Ground Elevation (m)
	Northing	Easting		
MW1-21	4919307	261628	3.1	211.9
MW2-21	4919275	261660	3.7	210.3
MW3-21	4919153	261503	4.0	211.7
BH4-21	4919103	261664	2.7	208.3
TP1-21	4919431	261740	1.7	212.3
TP2-21	4919371	261770	1.8	212.2
TP3-21	4919287	261795	3.2	212.9
TP4-21	4919218	261816	3.7	211.9
TP5-21	4919166	261690	1.6	209.7
TP6-21	4919126	261566	1.4	209.9
TP7-21	4919161	261501	2.0	212.0
TP8-21	4919211	261535	1.8	212.2
TP9-21	4949243	261669	1.6	210.1
TP10-21	4919299	261520	1.7	212.2
TP11-21	4919320	261644	1.1	212.2

It should be noted that the provided coordinates and elevations are approximate, and should not be used for construction purposes. The locations of the test holes are shown on the Test Hole Location Plan presented as **Figure 2**. Details of the subsurface conditions encountered are discussed in Section 5 of this report and are presented on the individual logs attached to this report in Appendix A.

3.5 Geotechnical Laboratory Testing

Geotechnical laboratory testing was completed in accordance with the latest editions of the ASTM standards. Geotechnical laboratory testing consisted of moisture content tests on recovered soil samples, as well as grain size distribution analysis (hydrometers) on five (5) selected soil samples.

The collected soil samples were classified / described in general accordance with the ASTM D2487 - Standard Practice for Classification of Soils for engineering purposes (Unified Soil Classification System-USCS).

The results of the moisture content and grain size distribution analysis are recorded at their corresponding depths on the individual test hole logs provided in Appendix A. The gradation curves are provided in Appendix B.

3.6 Hydraulic Conductivity and Infiltration Testing

In-situ constant head permeameter testing was conducted at test pits TP3-21 (2 tests), TP7-21 and TP11-21 at depths from about 0.3 to 1.4 mbgs. Infiltration testing was completed using an ETC Pask (constant head well) permeameter. The infiltration testing results are provided in Appendix C.

In-situ hydraulic response testing was completed in the monitoring wells installed in boreholes MW1-21, MW2-21 and MW3-21. The testing consisted of falling head testing and was completed by introducing a known quantity of potable water in the piezometers, and then measuring the water levels using a data logger programmed to record readings at three (3) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each test. The results of the hydraulic response testing are presented graphically in Appendix C.

4. Site Location and Description

The proposed development area is located along Albine Street to the west of Keeler Court with the bulk of the property on the north side of Albine Street, and a smaller portion on the south side of Albine Street, in Norwood, Ontario. The Site currently consists of vacant agricultural fields. The ground surface within the proposed development area generally comprised of recently harvested hay crops (cut grassed areas) delineated by older fence lines. Power transmission lines border the property at the northern extent. The Site topography is consists of rolling terrain with elevations generally dropping the south.

5. Regional Geology and Subsurface Conditions

5.1 Regional Geology

According to the Quaternary Geology of Ontario Map 2556 ("Quaternary Geology of Ontario-Southern Sheet", prepared by the Ministry of Northern Development and Mines (MNDM), published in 1997), the quaternary deposits in the area of the subject Site consist of till deposits comprised of predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content.

According to the Paleozoic Geology of Southern Ontario map, the bedrock in the area consists of limestone and shale of the Verulam Formation, Simcoe Group of the Middle Ordovician era. The bedrock in this area is expected to be encountered near the surface.

5.2 Subsurface Conditions

Subsurface conditions at the test hole locations were generally found to be consistent with the regional geology. Details of the subsurface conditions encountered in the four (4) boreholes and eleven (11) test pits advanced at Site during the GHD investigation are summarized in the following sections of the report. Detailed stratigraphy is shown on the detailed test hole logs presented in Appendix A. It should be noted that the subsurface conditions are only confirmed at the test hole locations and may vary between and beyond the test hole locations. The boundaries between the various strata, as shown on the test hole logs are based on non-continuous sampling and drilling resistance noted and observed at the time of drilling. These boundaries represent an inferred transition between the various strata, rather than precise planes of geological change.

5.2.1 Topsoil

A layer of topsoil was encountered at the surface in the boreholes and test pits. This topsoil layer ranged from 125 to 325 mm in thickness. This soil was observed to be in a damp, loose state, with a silty, highly organic content. As such, it is expected to be devoid of any structural engineering properties.

5.2.2 Sandy Silt / Silty Sand

The surficial layer of topsoil was underlain by native soils generally consisting of sandy silt or silty sand extending to depths ranging from 0.6 mbgs to 3.4 mbgs in the investigated test hole locations. These soils were generally brown in colour and were observed to contain increasing amounts of gravel, cobbles and boulders with depth. SPT N values obtained from within the sandy silt and silty sand layer varied from 4 blows/300mm to over 76 blows/150mm, indicating a loose to very dense in-situ state of relative density.

Samples of this material were visually described to be in a generally moist condition. Measured moisture contents ranged from 1 percent to 16 percent by weight.

5.2.3 Bedrock

Each test hole encountered practical refusal to further advancement due inferred/confirmed bedrock. Practical refusal occurred at depths ranging from 1.7 to 4.0 mbgs.

The depth at which practical refusal was encountered was interpreted by GHD as being the depth of competent bedrock for the purpose of logging the test holes. It is noted that bedrock typically exhibits a certain degree of weathering and fracturing in its upper zone. This weathering effect can increase significantly in shale/limestone bedrock. A number of the test pits penetrated partly into the bedrock, (i.e., through this upper zone of more fractured /

weathered bedrock) before encountering refusal on bedrock interpreted to be of more sound composition. This layer of weathered bedrock appears in the test holes with the exception of test pit TP2-21. Refer to Appendix A for additional details.

The estimated depths of the top of bedrock surface are provided on the test hole logs (Appendix A) and are summarized in Table 5.1.

Table 5.1 *Depth to Bedrock*

Borehole ID	Depth / Elevation to Inferred / Confirmed Weathered Bedrock (mbgs / m)	Depth / Elevation to Inferred / Confirmed Sound Bedrock (mbgs / m)
MW1-21	1.8 / 210.1	3.1 / 208.8
MW2-21	2.3 / 208.0	3.7 / 206.7
MW3-21	3.4 / 208.4	4.0 / 207.8
BH4-21	2.1 / 206.2	2.7 / 205.6
TP1-21	0.6 / 211.7	1.7 / 210.6
TP2-21	Not Observed	1.8 / 210.4
TP3-21	1.5 / 211.4	3.2 / 209.7
TP4-21	3.4 / 208.5	3.7 / 208.2
TP5-21	0.8 / 208.8	1.6 / 208.0
TP6-21	0.8 / 209.2	1.4 / 208.5
TP7-21	0.9 / 211.1	2.0 / 210.0
TP8-21	0.8 / 211.5	1.8 / 210.4
TP9-21	1.2 / 208.9	1.6 / 208.5
TP10-21	0.9 / 211.3	1.7 / 210.5
TP11-21	0.9 / 211.3	1.1 / 211.1

Note: Bedrock inferred within the boreholes; Bedrock confirmed in the test pits.

5.2.4 Groundwater

Groundwater seepage was not observed in any of the test holes during the drilling and excavation operations. Monitoring wells were installed by GHD in three (3) of the borehole locations (MW1-21, MW2-21 and MW3-21). All three monitoring wells were measured to be dry on August 27, 2021. Test hole information is available in Appendix A. It is noted that groundwater may be subject to seasonal fluctuations and could rise and decline in response to major weather events.

5.2.5 Geotechnical Laboratory Test Results

A total of five soil samples were collected from native soils at select depths and tested for grain size distribution analysis. The laboratory test results are summarized in the following table and detailed test results are presented in Appendix B.

Table 5.2 *Summary of Laboratory Results*

Location	Depth (mbgs)	Grain Size Distribution				Observed Soil Unit
		%Gravel	%Sand	%Silt	%Clay	
MW1-21	1.5 – 1.8	35	40	19	6	SM – Silty Sand, Gravelly
MW3-21	2.3 – 2.6	30	45	19	6	SM – Silty Sand, Gravelly
BH4-21	0.8 – 1.1	0	35	57	8	ML – Sandy Silt
TP1-21	0.8 – 0.9	52	30	15	3	Sample of Weathered Bedrock
TP4-21	0.6 – 0.9	0	7	90	3	ML – Silt
Soil description based on Unified Soil Classification System (ASTM D 2487)						

5.2.6 Hydraulic Conductivity and Infiltration Testing Results

In-situ constant head permeameter testing was conducted at test pits TP3-21 (2 tests), TP7-21 and TP11-21 at depths from about 0.3 to 1.4 mbgs. The values obtained correlate to field saturated hydraulic conductivity (K_{fs}) values that range between 10^{-3} cm/sec and 10^{-4} cm/sec for the native soils within the zone tested and correlates to estimated infiltration rates ranging from about 50 to 75 mm/hour based upon Supplementary Guidelines to the Ontario Building Code 2012. The infiltration testing results are provided in Appendix C.

In-situ hydraulic response testing was completed in the monitoring wells installed in boreholes MW1-21, MW2-21 and MW3-21. The testing consisted of falling head testing since the monitoring wells were dry at the outset and was completed by introducing a known quantity of potable water in the monitoring wells and then measuring the water levels using a data logger programmed to record readings at three (3) second intervals. The data was analyzed using AQTESOLV and the Bouwer-Rice solution for each test. The testing indicated hydraulic conductivity values ranging from 10^{-4} cm/sec to 10^{-5} cm/sec within the screened interval of the tested native soils and weathered bedrock units. The results of the hydraulic response testing are presented graphically in Appendix C.

6. Discussion and Recommendations

A preliminary conceptual plan provided by the Client illustrated the proposed site location, road network and lot layout. Proposed invert grades for utility piping (storm, sanitary, water) were not available to GHD as of writing this report. It is expected that the residential buildings will be up to 2-storeys in height, possibly with basements where feasible (based on final grading, bedrock depths, etc).

Based upon the above comments and on the test hole information, and assuming them to be representative of the subsoil conditions across the Site, the following comments and recommendations are offered.

6.1 Site Preparation, Grading and Backfill

The test holes generally encountered a surficial layer of topsoil over compact to very dense native sandy silt and silty sand native soils, containing increasing amounts of gravel, cobbles and boulders with depth, underlain by bedrock.

Any topsoil, vegetation, disturbed earth, fill, organic and organic-bearing material should be removed from the footprint of the proposed building area and from within pavement areas prior to site grading activities. Care will be required during excavation to separate materials containing significant amounts of topsoil/organics or rootlets from the clean excavated material.

Prior to Site grading activity, the subgrade soils exposed after the removal of topsoil and disturbed native soils within the proposed buildings and unsuitable materials within proposed pavement areas should be visually inspected, compacted if required, and proof rolled using large axially loaded equipment. Any loose, organic, or unacceptable areas should be subexcavated and removed as directed by the Engineer and replaced with suitable fill materials compacted to a minimum of 98 percent Standard Proctor Maximum Dry Density (SPMDD). Clean earth fill used to raise grades in the proposed buildings and pavement areas should be placed in thin layers (200 mm thick or less) and compacted by a heavy appropriate roller to 100 percent SPMDD.

The native soils encountered at the Site are generally suitable for reuse as backfill to raise site grades (where required), or as backfill against foundation walls or as trench backfill during installation of buried services, provided they are free of organic material, and are within the optimum moisture content. Control of moisture content during placement and compaction will be essential for maintaining adequate compaction.

Installation of engineered fill, where required, must be continuously monitored on a full-time basis by qualified geotechnical personnel.

6.2 Service Installation

The proposed utility invert depths were not available to GHD at the time of writing this report. The material encountered during this investigation at the anticipated service invert elevations (2 to 3 mbgs) typically consists of native silty sand or weathered bedrock and bedrock. As such, a normal compacted Class “B” bedding is recommended for all underground services, where moisture conditions inside the trench will allow for placement and compaction of bedding material. Class “B” bedding is Granular “A”, or 19 mm crusher run limestone, as per Ontario Provincial Standard Specifications (OPSS). The minimum recommended bedding thickness for the underground services is 150 mm. If any bedding subgrade consists of unsuitable or otherwise incompetent soils, either subexcavate to competent soils, and/or thicken the bedding material to 300 mm. All bedding, surround, and cover materials should be compacted to at least 98 percent of its SPMDD.

It is recommended that covering of the underground services be accomplished using Granular “A”, sand, or other suitable material as allowed by the Municipality’s standards, to a minimum of 300 mm above the pipe. Compaction of this material should attain a minimum of 100 percent SPMDD. It is expected that some of the excavated soils may be suitable for reuse as trench backfill, conditional upon suitable moisture content (within 2 % of optimum), final review and approval by an experienced geotechnical engineer at the time of construction, and regular monitoring and inspection of such reuse throughout construction. Compaction of any native soil in service trenches is recommended to be a minimum of 98 % of its SPMDD.

In order to minimize possibility of differential settlement due to variable subgrade material, where bedding subgrade transitions from soil to bedrock, the bedding thickness can be increased up to 300 mm on the bedrock, and taper at 10H:1V back to the minimum 150 mm thickness as the pipe alignment advances away from the soil subgrade and further into the bedrock subgrade. Alternatively (for watermain) the Client may consider the use of restrained joints at locations where this transition occurs.

6.3 Road Construction

Based on the results of this investigation, we would recommend the following procedures be implemented to prepare the proposed asphalt paved access way and parking areas for its construction:

1. Remove all topsoil, organics, organic-bearing materials and other deleterious materials from the planned pavement areas to a minimum depth to allow for the new pavement structure at which point an assessment of the exposed soils by a member of GHD will deem whether further removal and/or placement of suitable geotextile material or other treatment is required.

2. Inspect and proof roll the subgrade for the purpose of detecting possible zones of overly wet or soft subgrade. Any deleterious areas thus delineated should be replaced with approved granular material compacted to a minimum of 98 percent of its SPMDD. Approved excavated soils can be reused as road subgrade backfill provided the soil is workable and at a moisture content that will permit adequate compaction. A final review and approval to reuse any soils must be made during construction.
3. Contour the subgrade surface to prevent ponding of water during the construction and to promote rapid drainage of the sub-base and base course materials.
4. To maximize drainage potential, 150 mm diameter perforated pipe subdrains should be installed below any curb lines. The pipe should be encased in filter fabric and surrounded by clear stone aggregate. It is recommended that the subdrains discharge to a suitable, frost-free outlet.
5. Construct transitions between varying depths of granular base materials at a rate of 1:10 minimum.

The subgrade materials in the proposed pavement areas will consist of native silty sand till or fill soils. The frost susceptibility of these soils is assessed as being generally moderate to high. In this regard, the following minimum flexible pavement structures are recommended for the construction of the new access and parking areas.

Table 6.1 Minimum Pavement Structure for Local Residential Roads

Profile	Material	Thickness (mm)	In Conformance with OPSS Form
Asphalt Surface	H.L.3	40	1150
Asphalt Base	H.L.8	50	
Granular Base	Granular "A"	150	1010
Granular Subbase	Granular "B"	300	

The following steps are recommended for optimum construction of paved areas:

1. The Granular "A" and "B" courses should be compacted to a minimum 100 percent of their respective SPMDD's.
2. All asphaltic concrete courses should be placed, spread and compacted conforming to OPSS 310 or equivalent. All asphaltic concrete should be compacted to a minimum 92.0 percent of their respective laboratory Maximum Relative Densities (MRD's).
3. Adequate drainage should be provided to ensure satisfactory pavement performance.

It is recommended that all fill material be placed in uniform lifts not exceeding 200 mm in thickness before compaction. It is suggested that all granular material used as fill should have an in-situ moisture content within 2 percent of their optimum moisture content. All granular materials should be compacted to 100 percent SPMDD. Granular materials should consist of Granular "A" and "B" conforming to the requirements of OPSS 1010 or equivalent.

The performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible. It is noted that the above recommended pavement structures are for the end use of the project. The most severe loading conditions on pavement areas and the subgrade may occur during construction. As such, during construction of the project, the recommended granular depths may not be sufficient to support loadings encountered. Consequently, special provisions such as restricted lanes, half-loads during paving, etc. may be required, especially if construction is carried out during unfavourable weather.

6.4 Foundations

In general, it is recommended that structural loading for one- to two-storey buildings be supported on spread and continuous strip footings for column and load bearing walls, respectively. The footings should be founded on the compact native soils, bedrock, or on engineered fill placed directly on the compact native soils or bedrock. The following table summarizes the depths at which suitably competent soils and bedrock were first encountered in each test hole:

Table 6.2 *Depth to Competent Bearing Soil and Bedrock*

Borehole ID	Depth / Elevation to competent native soils (mbgs / m)	Depth / Elevation to Practical Refusal (Inferred / Confirmed Sound Bedrock , mbgs / m)
MW1-21	0.8 / 211.1	4.0 / 207.8
MW2-21	0.8 / 209.5	2.7 / 205.6
MW3-21	0.3 / 212.1	1.7 / 210.6
BH4-21	1.2 / 207.1	1.8 / 210.4
TP1-21	0.4 / 211.9	3.2 / 209.7
TP2-21	0.6 / 211.6	3.7 / 208.2
TP3-21	1.2 / 211.6	1.6 / 208.0
TP4-21	1.5 / 210.3	1.4 / 208.5
TP5-21	0.8 / 208.8	2.0 / 210.0
TP6-21	0.5 / 209.5	1.8 / 210.4
TP7-21	0.3 / 211.7	1.6 / 208.5
TP8-21	0.3 / 211.8	1.7 / 210.5
TP9-21	0.8 / 209.3	1.1 / 211.1
TP10-21	0.6 / 211.6	4.0 / 207.8
TP11-21	0.8 / 211.4	2.7 / 205.6

For design purposes, and based on one- to two-storey residential houses, it is generally recommended that footings constructed on the compact native soils, bedrock or engineered fill be proportioned using the following bearing capacities:

Table 6.3 *Preliminary Bearing Pressure for Foundation Design*

Parameter	Bearing Pressure				
	Sound Bedrock	Compact Undisturbed Native Soils	Engineering Fill		
			Rock-based Fill ⁽²⁾	Granular Fill ⁽³⁾	Earth Borrow Fill ⁽³⁾
Factored Bearing Capacity at ULS ⁽¹⁾	1 MPa	180 kPa	255 kPa	205 kPa	155 kPa
Bearing Capacity at SLS		120 kPa	150 kPa	120 kPa	90 kPa

Notes:

(1) Resistance factor $\Phi = 0.5$ applied to the ULS bearing pressure for design purposes.

(2) At least 1m of Rock-based fill. Quality of material is to be approved prior to use as engineered fill.

(3) At least 0.3m of Granular or Earth Borrow fill. Quality of material is to be approved prior to use as engineered fill.

Any engineered fill upon which footings are placed must be a minimum thickness corresponding to the notes that accompany the above table. Rock-based fill must be completely encapsulated with suitable filter fabric to minimize any migration of fine-grained particles from surrounding soils into the voids within the rock fill. Footings (and foundation walls) placed on engineered fill must be suitably reinforced; as a minimum, and where not already specified in the design drawings, this reinforcing should use 2 continuous runs of 15M rebar throughout the footings, and 2 runs of 15M rebar throughout near the top and bottom of the foundation walls.

The following is recommended for the construction of any engineered fill for the foundations:

1. Remove any and all existing vegetation, topsoil, fill, organics, and organic-bearing soils to the competent, undisturbed native soil from within the area of the proposed engineered fill.
2. The area of the engineered fill should extend horizontally 1m beyond the outside edge of the building foundations and then extend downward at a 1:1 slope to the competent native soil.
3. The base of the engineered fill area must be approved by a member of GHD prior to placement of any fill, to ensure that all unsuitable materials have been removed, that the materials encountered are similar to those observed, and that the subgrade is suitable for the engineered fill.
4. All engineered fill material is to be approved by GHD at the time of construction.
5. Place approved engineered fill, in maximum 200 mm lifts, compacted to 100 percent of its SPMDD. Any fill material placed under sufficiently wet conditions should consist of an approved, rock-based fill, with the inclusion of appropriate geotextile fabric around the rock-based fill should the rock fill contain enough voids to warrant.
6. Full time testing and inspection of the engineered fill will be required, to ensure compliance with material and compaction specifications.

Under no circumstances should the foundations be placed above organic materials, loose, frozen subgrade, construction debris, or within ponded water. Prior to forming, all foundation excavations must be inspected and approved by a member of GHD's geotechnical group. This will ensure that the foundation bearing material has been prepared properly at the foundation subgrade level and that the soils exposed are similar to those encountered during this investigation.

Should basement or otherwise subgrade areas be incorporated into any of the buildings' designs, it is recommended that for drainage purposes, perimeter drains be installed about the structure. The subdrains would serve to drain seepage water that infiltrates the backfill. The drains should consist of a perforated pipe, at least 150 mm in diameter, surrounded by clear, crushed stone and suitable filter protection. The drain should discharge to a positive sump or other permanent frost free outlet. It is also strongly recommended that the building's foundation walls be sealed and waterproofed.

For foundations constructed in accordance with the foregoing manner, total and differential settlements are estimated to be less than 25 mm.

6.5 Depth of Frost Penetration

It is recommended that all exterior foundations or footings in unheated areas have a minimum soil cover of at least 1.4 m in according to OPSD 3090.101 (2010), or equivalent insulation. Footings for heated structures, such as perimeter foundation for the proposed building structure, must be provided with a minimum of 1.2 m of earth cover or equivalent insulation.

During winter construction exposed surfaces to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.

6.6 Seismic Site Classification

The latest Ontario Building Code (OBC) requires the assignment of a Seismic Site Class for calculations of earthquake design forces and the structural design based on a two percent probability of exceedance in 50 years. According to the latest OBC, the Seismic Site Class is a function of soil profile, and is based on the average properties of the subsoil strata to a depth of 30 m below the ground surface. The OBC provides the following three methods to obtain the average properties for the top 30 m of the subsoil strata:

- Average shear wave velocity.
- Average Standard Penetration Test (SPT) values (uncorrected for overburden).
- Average undrained shear strength.

For design purposes, based on the criteria listed in Table 4.1.8.4.A. of the OBC and the results obtained from standard penetration resistance of the underlying subsurface conditions, estimated undrained shear strength and our knowledge of the regional geology, a Seismic Site Class 'C' can be used for the design of the proposed buildings.

6.7 Slab-On-Grade Construction

Floors may generally be constructed as normal slabs-on-grade, on granular or 19 mm clear stone over native, inorganic subsoils. The floor slab should be formed over a base course consisting of at least 150 mm of Granular "A" backfill as per OPSS or (19 mm clear stone beneath basement areas) compacted to a minimum of 100 percent of its SPMDD. All grade increases or infilling below the granular "A" or clearstone should be constructed in accordance with the engineered fill steps provided in Section 6.5 of this report. If the groundwater table is intersected by any basement excavations, the floor slabs should incorporate under slab drains, and a vapour barrier should be installed beneath the slab to prevent migration of moisture vapour. All fill placed as engineered fill must be inspected, approved and compaction verified by personnel from GHD.

6.8 Basement and Retaining Walls

It is recommended that free draining backfill to basement and retaining walls be provided. Walls located above the groundwater table may be designed for lateral earth pressures using the following equation:

$p = k (w h + q)$, where:

- p = the lateral earth pressure in kPa acting on the subsurface wall at depth h ;
- k_a = the coefficient of active earth pressure;
(= 0.3 for walls restrained from the bottom only);
(= 0.5 for walls restrained at the top and bottom*);
- k_p = the coefficient of passive earth pressure, (= 3.0);
- w = the granular or native soil bulk density in kN/m^3 ;
(= 21.0 kN/m^3 for well compacted, OPSS-approved Granular "B" or native soils);
- h = the depth (in metres) below the exterior grade at which the earth pressure is being calculated; and
- q = the equivalent value of any surcharge (in kN/m^3) acting on the ground surface adjacent to the walls.

(*) This value is recommended for rigid walls retaining compacted backfill.

The recommended value for the coefficient for sliding friction between the soil and the concrete is 0.4. Also, any additional surcharge loading that will influence the wall must be taken into account in its design.

6.9 Storm Water Management Pond

It is GHD's understanding that a SWM pond is proposed in the southwest corner of the site and is to be located within the area of test holes TP7-21 and MW3-21 as shown on the Test Hole Location Plan. The proposed base elevation of the SWM pond is not known at the time of writing this report, however it is expected that the bottom of the SWP will consist of gravelly silty sand native soils or bedrock. The hydraulic conductivity of the sandy gravel is expected to be on the order of about 10^{-3} to 10^{-4} cm/sec and the hydraulic conductivity of the bedrock is expected to range from 10^{-1} to 10^{-7} cm/sec depending on the presence of fractures and voids within the bedrock. (Note that even greater hydraulic conductivities may exist within the bedrock where larger fractures, voids, or other groundwater conduits exist and are intersected by excavations).

Based on the soils observed, and the assumed base elevations, it appears that construction of the SWM pond in this area is feasible. In general, excavation of the soils and/or bedrock for the SWM pond are expected to be straightforward, provided that appropriate measures are taken during construction to minimize any overland or near-surficial flow of water into the area. Groundwater and surficial water inflow into the open SWM pond excavation may be encountered depending on the time of the year in which construction is conducted, however this is expected to be controlled by pumping from within the excavation, along with further measures if required including up-gradient cutoff trenching with appropriate drainage outletting.

It is recommended that the SWM pond subgrade surfaces be proof rolled, and a representative of GHD approve the subgrade prior to construction of the berms. Construction of the berms may utilize excavated soils, such as the sandy silt or gravelly silty sand native soils. Such operations should place soils in lifts no thicker than 150 mm prior to compaction, and compacted to at least 95 percent SPMDD. The native, undisturbed soils or the fractured / weathered bedrock are not expected to have a sufficiently low permeability where they could substitute for a liner, as such the bottom of the SWM pond must be lined with a more suitable (i.e less hydraulically conductive) material.

Liner material should have a hydraulic conductivity of no greater than 10^{-6} cm/sec. The thickness of the liner typically depends on the hydraulic conductivity of the material used. Liners constructed using materials with the maximum allowable hydraulic conductivity (10^{-6} cm/sec) should be a minimum of 450 mm thick, and may be required to be as thick as 600 mm if containing high amounts of gravel and/or cobbles. Liners constructed with less permeable materials, such as clay soils containing hydraulic conductivity of 10^{-8} cm/sec or lower are typically required to be a minimum of 300 mm in thickness. The liner should be placed in lifts no thicker than 150 mm prior to compaction, and compacted to 100 percent SPMDD. It is recommended that compaction of any liner material be carried out under dry weather conditions and at an in-situ moisture content within 2 percent of the material's optimum moisture content. The surface of each liner lift should be scarified prior to placement of the overlying lift. Failure to achieve this will result in a poor performance and a liner with a higher relative hydraulic conductivity. It is noted that materials encountered during this investigation are typically expected to possess hydraulic conductivities greater than 10^{-6} cm/sec (with elevated sand and gravel content), and are therefore generally expected to be unsuitable for use as the SWM pond liner. Further geotechnical assessment of the exposed SWM pond subgrade and any soils being considered for reuse as a liner material should be made during construction.

For the purpose of the proposed SWP, the soils observed should be stable from slip circle failure if sloped at 3 horizontal to 1 vertical (3H:1V) or flatter in the long term both above and below the water table. Between the stable water level and the expected high water level, it is recommended that the slopes be lessened to 4H:1V (or flatter) to guard against erosion by wavelet action. The native material will require vegetative root mass (or otherwise suitable erosion protection) to minimize erosional forces on exposed slopes.

Slopes and berms of the SWP should be constructed so as to reduce or eliminate the effects of surficial erosion. Features to do so may include slope vegetation, installation of erosion or gabion mats, rip rap, and/or other acceptable stabilizing features.

6.10 Excavation and Temporary Shoring

The Occupational Health and Safety Act (OHSA) regulations require that if workmen must enter an excavation deeper than 1.2 m, the excavation must be suitably sloped and/or braced in accordance with the OHSA requirements. OHSA specifies maximum slope of the excavations for four broad soil types as summarized in the following table:

Soil Type	Base of Slope	Maximum Slope Inclination
1	Within 1.2 metres of bottom	1 horizontal to 1 vertical
2	Within 1.2 metres of bottom of trench	1 horizontal to 1 vertical
3	From bottom of excavation	1 horizontal to 1 vertical
4	From bottom of excavation	3 horizontal to 1 vertical

The earth fill and native soils underlying the Site are considered Type 3 soils above groundwater level, and Type 4 if affected by surface water or groundwater seepage. If the above recommended excavation side slopes cannot be maintained due to lack of space or any other reason, the excavation side slopes must be supported by an engineered shoring system. The shoring system should be designed in accordance with Canadian Engineering Foundation Manual (4th Edition) and the OHSA Regulations for Construction Projects.

Depending on the depth of foundations and underground services, construction excavation operations will likely encounter and extend into bedrock. It is recommended that a unit price allowance for bedrock removal be included in the construction contract due to the variable bedrock elevations that are expected during the proposed construction, should any bedrock require excavating. Excavation of any highly fractured / weathered bedrock may be possible using a large hydraulic backhoe. The use of hydraulic breaking techniques and/or blasting (combined with precondition surveys of surrounding properties and vibration monitoring during construction) may be required.

6.11 Temporary Dewatering Requirements

Groundwater seepage was not observed in any of the test holes during the drilling and excavation operations. The monitoring wells installed in boreholes MW1-21, MW2-21 and MW3-21 were measured to be dry on August 27, 2021. In the long-term, seasonal fluctuations of groundwater may occur. Perched groundwater could accumulate within the fill or at the interface between the bedrock and overburden soils after heavy precipitation and/or during spring thaw; however, is expected to be seasonal and temporary based upon the conditions observed during our geotechnical investigation. A permanent groundwater table was not encountered during this drilling program.

Based on the conditions observed during the drilling, and the anticipated excavation depths for the proposed development, groundwater seepage is not expected but could occur at some locations depending on the time of the year. Any groundwater or surficial water infiltration into open excavations is expected to be controlled by pumping from a sump to an acceptable outlet. Should any excavations extend into the bedrock, groundwater-bearing zones may be encountered within any bedding planes and/or fractures and/or other such conduits within the bedrock. Based on hydraulic response testing conducted on the installed monitoring wells, any seepage encountered within the native soils and weathered bedrock may be expected to have a hydraulic conductivity value ranging from 10^{-4} cm/sec to 10^{-5} cm/sec. It should be noted that hydraulic conductivities can vary over a vertical and horizontal extent, and may be outside the stated range if pockets or zones of sand, gravelly soils or more fractured bedrock is intersected.

If short-term pumping of groundwater at volumes greater than 50,000 L/day and less than 400,000 L/day is required during the construction stage, a permit through the Environmental Activity and Sector Registry (EASR) must be obtained. The EASR streamlines the process and water pumping may begin once the EASR registration is completed, the fee paid and supporting document prepared. If water taking in excess of 400,000 litres/day is required, a Permit to Take Water (PTTW) must be obtained in advance. PTTW applications may take up to 90 working days for the Ministry of the Environment, Conservation and Parks (MECP) to review and approve. The actual rate of groundwater taking performed during construction will be a function of the final design, time of year, and the contractor's schedule, equipment, and techniques.

It is recommended that prior to commencing the construction, consideration be given to the excavation of a series of trial excavations to determine more accurately the soil behaviour and whether or not any significant dewatering works will be required.

6.12 Infiltration Rates for LID Design

In-situ constant head permeameter testing was conducted at test pits TP3-21 (2 tests), TP7-21 and TP11-21 at depths from about 0.3 to 1.4 mbgs. The values obtained correlate to field saturated hydraulic conductivity (K_{fs}) values that range between 10^{-3} cm/sec and 10^{-4} cm/sec for the native soils within the zone tested and correlates to estimated infiltration rates ranging from about 50 to 75 mm/hour based upon Supplementary Guidelines to the Ontario Building Code 2012. The infiltration testing results are provided in Appendix C.

It is noted that slight variations in the soil stratigraphy may cause variations in the permeability of the soil in both vertical and horizontal orientations.

A safety correction factor from Appendix C of the Low Impact Storm Water Management Planning and Design Guide must be applied to the measured infiltration rates once the base elevation for the LID feature is determined.

LIDs can be applied to any soil type; however, it is recommended that more permeable zones are targeted and that sub-grade infiltration locations be kept away from private lands. LIDs require maintenance and long-term care. If possible, naturally occurring infiltration strategies such as roof water discharged via downspouts to sodded lawns with adequate topsoil depths and minimum flow path distances are recommended. As indicated above, the LID features will be designed by others.

6.13 General Recommendations

6.13.1 Wells

The monitoring wells installed as part of this investigation were recorded and reported to the MECP, are still present and active as of writing this report, and are the property of the site's Owner. Any decommissioning of wells on-site must be performed by an appropriately-licensed and experienced well contractor, in compliance with O.Reg. 903.

6.13.2 Test Pit During Tendering

It is strongly recommended that test pits be excavated at representative locations of this Site during the construction tendering phase, with mandatory attendance of interested contractors. This will allow them to make their own assessments of any groundwater, soil and bedrock conditions at the Site and how these will affect their proposed construction methods, techniques and schedules.

6.13.3 Subsoil Sensitivity

The native subsoils are susceptible to strength loss or deformation if saturated or disturbed by construction traffic. Therefore, where the subgrade consists of approved soil, care must be taken to protect the exposed subgrade from excess moisture and from construction traffic.

6.13.4 Winter Construction

The subsoils encountered across the site are frost-susceptible and freezing conditions could cause problems to the structures. As preventive measures, the following recommendations are presented:

1. During winter construction, exposed surfaces intended to support foundations must be protected against freezing by means of loose straw and tarpaulins, heating, etc.

2. Care must be exercised so that any sidewalks and/or asphalt pavements do not interfere with the opening of doors during the winter when the soils are subject to frost heave. This problem may be minimized by any one of several means, such as keeping the doors well above outside grade, installing structural slabs at the doors, and by using well-graded backfill and positive drainage, etc.
3. Because of the frost heave potential of the soils during winter, it is recommended that the trenches for exterior underground services be excavated with shallow transition slopes in order to minimize the abrupt change in density between the granular backfill, which is relatively non-frost susceptible, and the more frost-susceptible native soils.

6.13.5 Construction Monitoring

The foundation installations and Engineered Fill placement must be closely monitored and inspected by qualified personnel to ensure consistency with the design bearing. The on-site review of the condition of the foundation soil as the foundations are constructed is an integral part of the geotechnical design function and is required by Section 4.2.2.2 of the Ontario Building Code 2012.

Qualified Geotechnical personnel should inspect and test all stages of the proposed development. Specifically, they should ensure that the materials and conditions comply with this geotechnical assessment report. In addition, qualified geotechnical personnel should provide material testing services prior to and during backfilling and grade raising operation. Should soil conditions be encountered that vary from those described in this report, our office should be informed immediately such that the proper measures are undertaken.

7. Limitations of the Investigation

This report is intended solely for DPH Developments Inc. and their designers and is prohibited for use by others without GHD's prior written consent. This report is considered GHD's professional work product and shall remain the sole property of GHD. Any unauthorized reuse, redistribution of or reliance on the report shall be at the Client and recipient's sole risk, without liability to GHD. No portion of this report may be used as a separate entity; it is to be read in its entirety and shall include all supporting drawings and appendices.

The recommendations made in this report are in accordance with our present understanding of the project, the current site use, ground surface elevation and conditions, and are based on the work scope approved by the Client and described in the report. The services were performed in a manner consistent with that level of care and skill ordinarily exercised by members of geotechnical engineering professions currently practicing under similar conditions in the same locality. No other representations, and no warranties or representations of any kind, either expressed or implied, are made. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

All details of design and construction are rarely known at the time of completion of a geotechnical study. The recommendations and comments made in the study report are based on our subsurface investigation and resulting understanding of the project, as defined at the time of the study. We should be retained to review our recommendations when the drawings and specifications are complete. Without this review, GHD will not be liable for any misunderstanding of our recommendations or their application and adaptation into the final design.

By issuing this report, GHD is the geotechnical engineer of record. It is recommended that GHD be retained during construction of all foundations and during earthwork operations to confirm the conditions of the subsoil are actually similar to those observed during our study. The intent of this requirement is to verify that conditions encountered during construction are consistent with the findings in the report and that inherent knowledge developed as part of our study is correctly carried forward to the construction phases.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments included in this report are based on the results obtained at the test locations only. The subsurface conditions confirmed at the

test locations may vary at other locations. The subsurface conditions can also be significantly modified by the construction activities on site (e.g., excavation, dewatering and drainage, blasting, pile driving, etc.). These conditions can also be modified by exposure of soils or bedrock to humidity, dry periods or frost. Soil and groundwater conditions between and beyond the test locations may differ both horizontally and vertically from those encountered at the test locations and conditions may become apparent during construction which could not be detected or anticipated at the time of our investigation. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations. If changed conditions are identified during construction, no matter how minor, the recommendations in this report shall be considered invalid until sufficient review and written assessment of said conditions by GHD is completed.

All of Which is Respectfully Submitted,

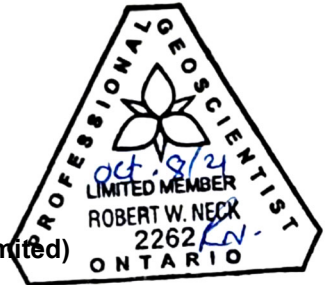
GHD



Leandro Ramos, P.Eng.



Robert Neck, P. Geo. (Limited)

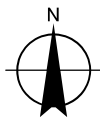


Figures



Paper Size ANSI A
0 70 140 210 280
Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N



DPH DEVELOPMENTS
158 ALBINE STREET, NORWOOD, ON
PT LOTS 18 & 19, CON 8, GEO. TOWNSHIP OF ASPODEL
TOWNSHIP OF ASPODEL-NORWOOD
COUNTY OF PETERBOROUGH

**GEOTECHNICAL INVESTIGATION
SITE LOCATION PLAN**

Project No. 11231077
Revision No.
Date Sep 2021

FIGURE 1



Paper Size ANSI A
0 10 20 30 40
Metres

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 18N



DPH DEVELOPMENTS
158 ALBINE STREET, NORWOOD, ON
PT LOTS 18 & 19, CON 8, GEO. TOWNSHIP OF ASPHODEL
TOWNSHIP OF ASPHODEL-NORWOOD
COUNTY OF PETERBOROUGH

**GEOTECHNICAL INVESTIGATION
TEST HOLE PLAN**

Project No. 11231077
Revision No.
Date Sep 2021

FIGURE 2

Appendices

Appendix A

Stratigraphy Logs

BOREHOLE No.: MW1-21

ELEVATION: 211.90 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

CHECKED BY: L Ramos

DATE (START): 18 August 2021

DATE (FINISH): 18 August 2021

LEGEND

	SS	- SPLIT SPOON
	ST	- SHELBY TUBE
	AU	- AUGER PROBE
		- WATER LEVEL

NORTHING: 4919307

EASTING: 261628

[illegible]

BOREHOLE No.: MW2-21

ELEVATION: 210.34 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

CHECKED BY: L Ramos

DATE (START): 18 August 2021

DATE (FINISH): 18 August 2021

LEGEND

 SS - SPLIT SPOON
 ST - SHELBY TUBE
 AU - AUGER PROBE
 - WATER LEVEL

NORTHING: 4919275

EASTING: 261657

[illegible]

BOREHOLE No.: MW3-21

ELEVATION: 211.74 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern CHECKED BY: L Ramos

DATE (START): 18 August 2021 DATE (FINISH): 18 August 2021

LEGEND

	SS	- SPLIT SPOON
	ST	- SHELBY TUBE
	AU	- AUGER PROBE
		- WATER LEVEL

NORTHING: 4919153

EASTING: 261503

[illegible]

BOREHOLE No.: BH4-21

ELEVATION: 208.30 m

BOREHOLE REPORT

Page: 1 of 1

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern CHECKED BY: L Ramos

DATE (START): 18 August 2021 DATE (FINISH): 18 August 2021

LEGEND

- | | | |
|---|----|---------------|
|  | SS | - SPLIT SPOON |
|  | ST | - SHELBY TUBE |
|  | AU | - AUGER PROBE |
|  | | - WATER LEVEL |

NORTHING: 4919102

EASTING: 261664

[illegible]



TEST PIT No.: TP1-21

ELEVATION: 212.33 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)

GS - GRAB SAMPLE (geotechnical)

Cu - SHEAR TEST

CHEM - CHEMICAL ANALYSIS

OVC - ORGANIC VAPOR CONCENTRATION

INF - INFILTRATION

▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.33	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (250 mm)	GS1			
1		212.08		NATIVE:				
	0.5	211.95		SM - SILTY SAND, reddish brown, moist	GS2			
2		211.72		ML - SANDY SILT, light brown, moist				
				WEATHERED BEDROCK				
3	1.0			gravel: 52%, sand 30%, silt: 15%, clay: 3%	GS3			
4								
5	1.5				GS4			
6		210.60		END OF TEST PIT				
	2.0			NOTES:				
7				- No noticeable groundwater seepage or accumulation at completion of test pit				
				- Test pit terminated at 1.7 m bgs due to solid bedrock refusal				
8	2.5			- bgs denotes 'below ground surface'				
9								
10	3.0							
11								
	3.5							
12								
13	4.0							



TEST PIT No.: TP2-21

ELEVATION: 212.21 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.21	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (250 mm)				
1	0.5	211.96		NATIVE: ML - SANDY SILT, light brown, moist	GS1			
2		211.60		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS2			
3	1.0			Cobbles and boulders				
4					GS3			
5	1.5							
6	2.0	210.38		END OF TEST PIT NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.8 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
7								
8	2.5							
9								
10	3.0							
11								
12	3.5							
13	4.0							



TEST PIT No.: TP3-21

ELEVATION: 212.87 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.87	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (250 mm)	GS1			
1		212.62		NATIVE:				
		212.47		SM - SILTY SAND, reddish brown, moist	GS2			
				ML - SANDY SILT, light brown, moist				
2	0.5							
3	1.0							
4		211.65		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS3			
5	1.5	211.35		WEATHERED BEDROCK				
6	2.0							
7								
8	2.5							
9								
10	3.0							
		209.67			GS4			
11	3.5			END OF TEST PIT				
				NOTES:				
				- No noticeable groundwater seepage or accumulation at completion of test pit				
				- Test pit terminated at 3.2 m bgs due to solid bedrock refusal				
				- bgs denotes 'below ground surface'				
12								
13	4.0							



TEST PIT No.: TP4-21

ELEVATION: 211.87 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 211.87	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (300 mm)				
1		211.56			GS1			
	0.5	211.41		NATIVE: SM - SILTY SAND, reddish brown, moist	GS2			
2				ML - SANDY SILT, light brown, moist				
				gravel: 0%, sand 7%, silt: 90%, clay: 3%	GS3			
3	1.0							
4								
5	1.5	210.34		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist				
				cobbles and boulders				
6	2.0							
7								
8	2.5							
9								
10	3.0							
11	3.5	208.51		WEATHERED BEDROCK	GS4			
12		208.21		END OF TEST PIT				
				NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 3.7 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
13	4.0							



TEST PIT No.: TP5-21

ELEVATION: 209.65 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 209.65	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
1		209.33		TOPSOIL (325 mm)				
	0.5			NATIVE: SM - SILTY SAND, reddish brown, moist	GS1			
2		209.10		ML - SANDY SILT, light brown, moist	GS2			
	1.0	208.84		WEATHERED BEDROCK	GS3			
3								
4								
	1.5				GS4			
5		208.03		END OF TEST PIT NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.6 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
6								
	2.0							
7								
	2.5							
8								
	3.0							
9								
	3.5							
10								
	4.0							
11								
12								
13								



TEST PIT No.: TP6-21

ELEVATION: 209.94 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 209.94	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (200 mm)				
1		209.73		NATIVE: ML - SANDY SILT, light brown, moist	GS1			
	0.5	209.53		SM-SILTY SAND, gravelly, trace clay, cobbles, brown, moist				
2					GS2			
	1.0	209.18		WEATHERED BEDROCK				
3								
4					GS3			
	1.5	208.51		END OF TEST PIT				
5				NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.4 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
6								
	2.0							
7								
	2.5							
8								
	3.0							
9								
	3.5							
10								
	4.0							
11								
12								
13								



TEST PIT No.: TP7-21

ELEVATION: 212.00 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.00	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
1	0.5	211.87		TOPSOIL (125 mm)				
2				NATIVE: SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS1			
3	1.0	211.09		WEATHERED BEDROCK				
4								
5	1.5				GS2			
6								
7	2.0	210.02		END OF TEST PIT NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 2.0 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
8	2.5							
9								
10	3.0							
11								
12	3.5							
13	4.0							



TEST PIT No.: TP8-21

ELEVATION: 212.15 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.15	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (175 mm)				
		211.98						
1		211.85		NATIVE: SM - SILTY SAND, reddish brown, moist	GS1			
	0.5			SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS2			
2		211.54		WEATHERED BEDROCK				
3								
4								
5	1.5				GS3			
6		210.38		END OF TEST PIT				
	2.0			NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.8 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
7								
8	2.5							
9								
10	3.0							
11								
12	3.5							
13	4.0							



TEST PIT No.: TP9-21

ELEVATION: 210.08 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 210.08	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
				TOPSOIL (300 mm)				
1		209.77		NATIVE: SM - SILTY SAND, reddish brown, moist	GS1			
2	0.5	209.57		ML - SANDY SILT, light brown, moist cobbles and boulders	GS2			
3	1.0	209.27		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS3			
4		208.86		WEATHERED BEDROCK	GS4			
5	1.5	208.45		END OF TEST PIT NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.6 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
6	2.0							
7								
8	2.5							
9								
10	3.0							
11								
12	3.5							
13	4.0							



TEST PIT No.: TP10-21

ELEVATION: 212.18 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.18	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
1		211.85		TOPSOIL (250 mm)				
	0.5							
2		211.63		NATIVE: ML - SANDY SILT, light brown, moist	GS1			
3		211.27		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS2			
	1.0							
4				WEATHERED BEDROCK				
5					GS3			
	1.5							
6		210.51		END OF TEST PIT				
				NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.7 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
7								
	2.0							
8								
	2.5							
9								
10								
	3.0							
11								
	3.5							
12								
13								
	4.0							



TEST PIT No.: TP11-21

ELEVATION: 212.21 m

TEST PIT REPORT

CLIENT: DPH Developments Inc

PROJECT: Geotechnical Investigation, Norwood Park Phase 4

LOCATION: Albine Street, Norwood

DESCRIBED BY: J McEachern

DATE: 27 August 2021

CHECKED BY: L Ramos

DATE: 27 August 2021

LEGEND

GSE - GRAB SAMPLE (environmental)
 GS - GRAB SAMPLE (geotechnical)
 Cu - SHEAR TEST
 CHEM - CHEMICAL ANALYSIS
 OVC - ORGANIC VAPOR CONCENTRATION
 INF - INFILTRATION
 ▼ - WATER LEVEL

Depth		Elevation (m) BGS 212.21	Symbol	STRATIGRAPHY	Sample Type & Number	OVC ppm	Tests Type	INF
Feet	Metres							
1	0.5	211.90		TOPSOIL (250 mm)				
2				NATIVE: ML - SANDY SILT, light brown, moist	GS1			
3	1.0	211.45		SM - SILTY SAND, gravelly, trace clay, cobbles, brown, moist	GS2			
4		211.29		WEATHERED BEDROCK	GS3			
5	1.5	211.14		END OF TEST PIT NOTES: - No noticeable groundwater seepage or accumulation at completion of test pit - Test pit terminated at 1.1 m bgs due to solid bedrock refusal - bgs denotes 'below ground surface'				
6	2.0							
7								
8	2.5							
9								
10	3.0							
11								
12	3.5							
13	4.0							

Appendix B

Geotechnical Laboratory Test Results



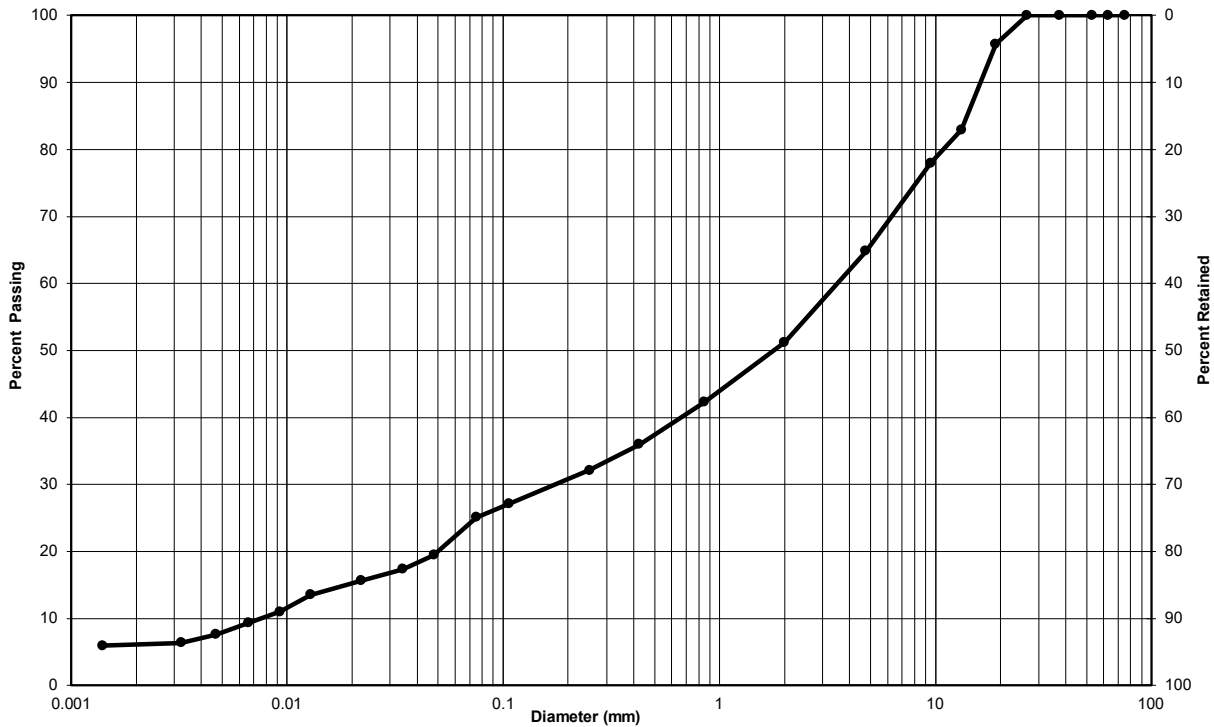
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: DPH Developments **Lab No.:** SS-21-70

Project/Site: Norwood Subdivision **Project No.:** 11231077

Borehole no.: MW1-21 **Sample no.:** SS3

Depth: 1.5 to 1.8m **Enclosure:**



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravelly, silty sand	35	40	25
Silt-size particles (%):	19		
Clay-size particles (%) (<0.002mm):	6		

Remarks:

Performed by: Jade Gorman **Date:** August 27, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021



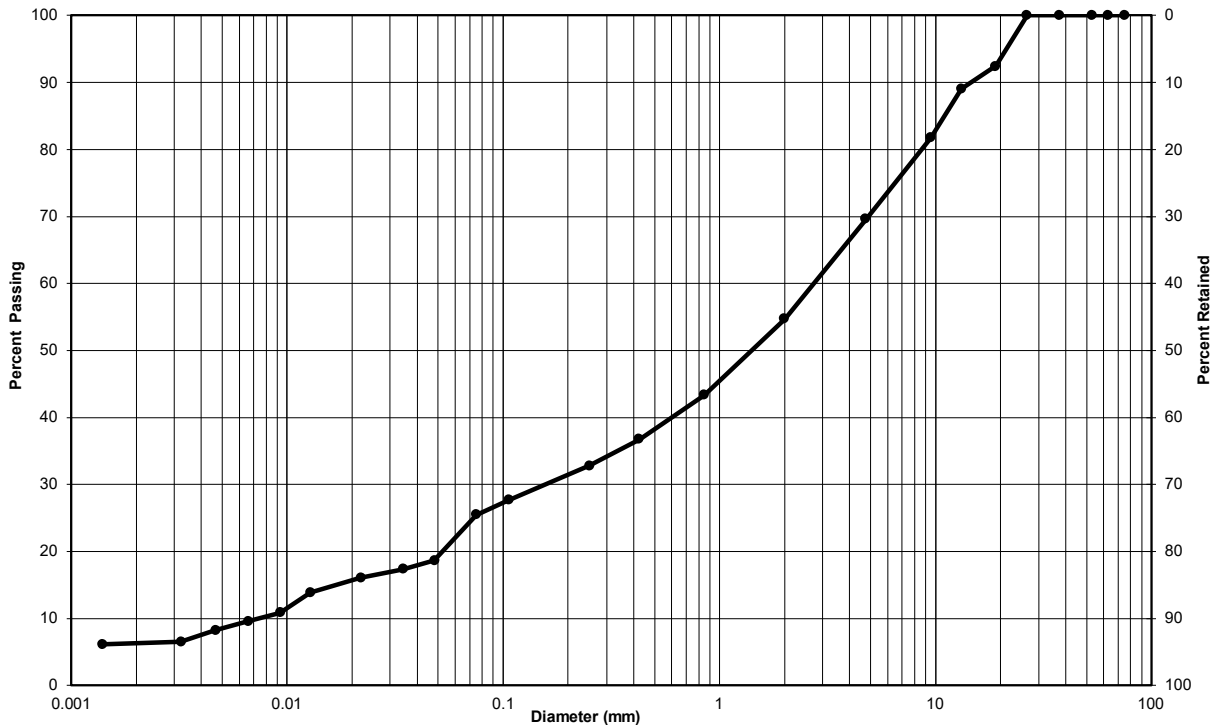
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: DPH Developments **Lab No.:** SS-21-70

Project/Site: Norwood Subdivision **Project No.:** 11231077

Borehole no.: MW3-21 **Sample no.:** SS4

Depth: 2.3 to 2.6m **Enclosure:**



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Gravelly, silty sand	30	44	25
Silt-size particles (%):	19		
Clay-size particles (%) (<0.002mm):	6		

Remarks:

Performed by: Jade Gorman **Date:** August 27, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021



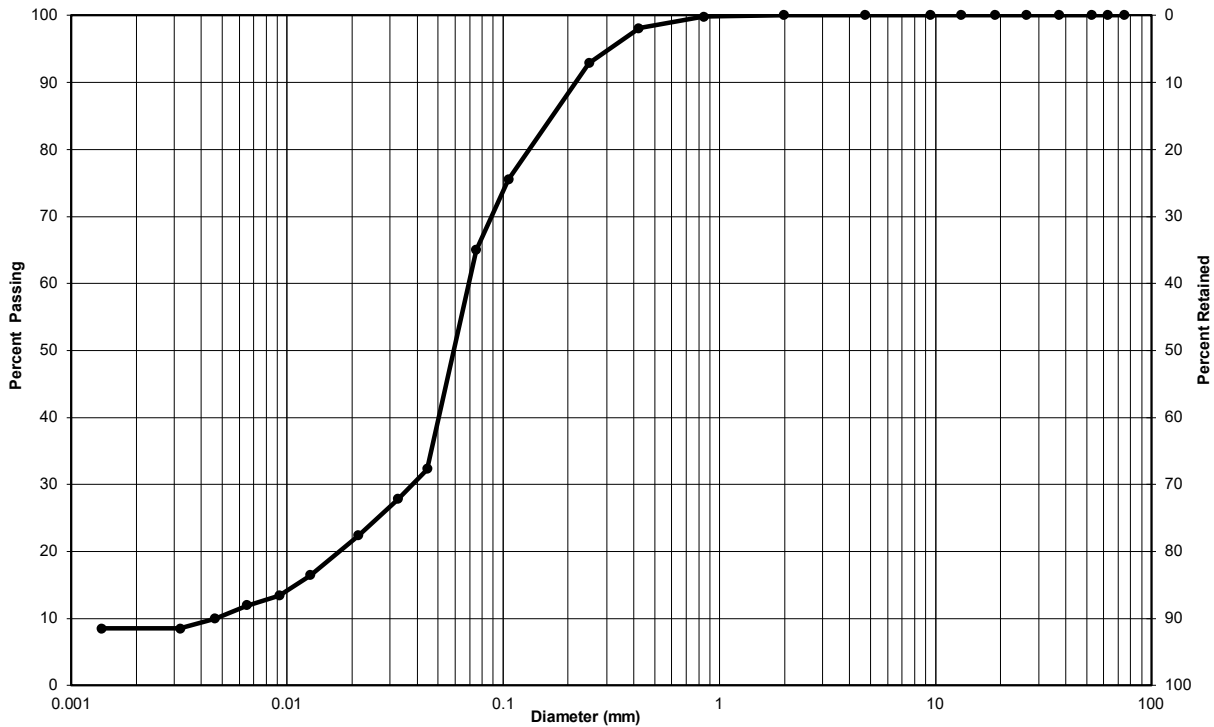
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: DPH Developments **Lab No.:** SS-21-70

Project/Site: Norwood Subdivision **Project No.:** 11231077

Borehole no.: BH4-21 **Sample no.:** SS2A

Depth: 0.8 to 1.1m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Sandy silt	0	35	65
Silt-size particles (%):	57		
Clay-size particles (%) (<0.002mm):	8		

Remarks: _____

Performed by: Jade Gorman **Date:** August 27, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 7, 2021



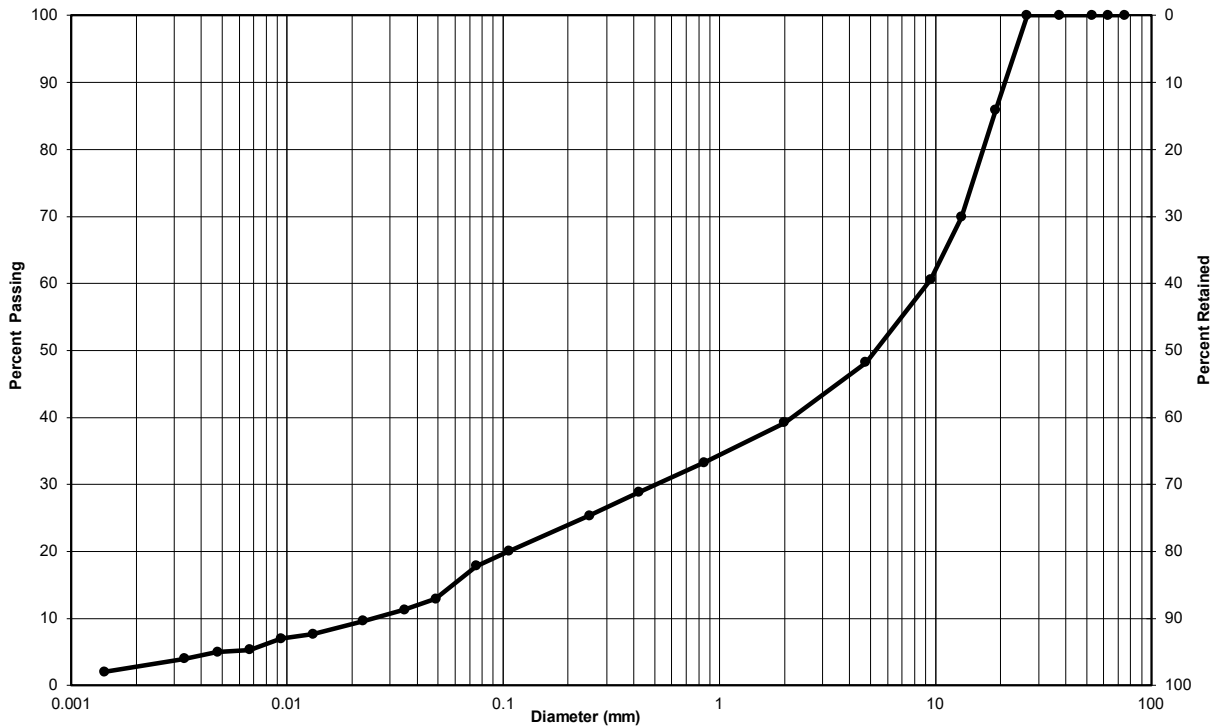
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: DPH Developments **Lab No.:** SS-21-74

Project/Site: Norwood Park Subdivision - Phase 4 **Project No.:** 11231077

Borehole no.: TP1-21 **Sample no.:** GS3

Depth: 0.8 to 0.9m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silty gravel with sand (GM)	52	30	18
Silt-size particles (%):	15		
Clay-size particles (%) (<0.002mm):	3		

Remarks: _____

Performed by: Jade Gorman **Date:** September 3, 2021

Verified by: Joe Sullivan  **Date:** September 13, 2021



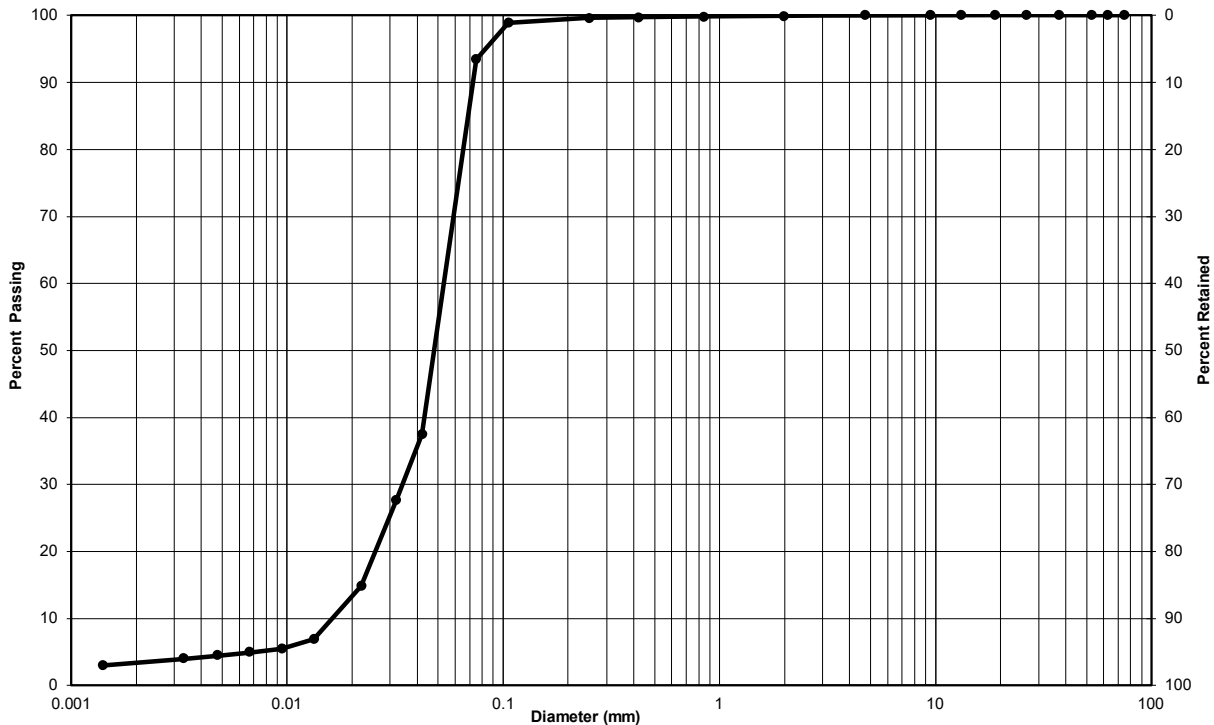
**Particle-Size Analysis of Soils (Geotechnical)
(USCS) (ASTM D422)**

Client: DPH Developments **Lab No.:** SS-21-74

Project/Site: Norwood Park Subdivision - Phase 4 **Project No.:** 11231077

Borehole no.: TP4-21 **Sample no.:** GS3

Depth: 0.6 to 0.9m **Enclosure:** _____



Clay & Silt	Sand			Gravel	
	Fine	Medium	Coarse	Fine	Coarse
Unified Soil Classification System					

Soil Description	Gravel (%)	Sand (%)	Clay & Silt (%)
Silt (ML)	0	7	93
Silt-size particles (%):	90		
Clay-size particles (%) (<0.002mm):	3		

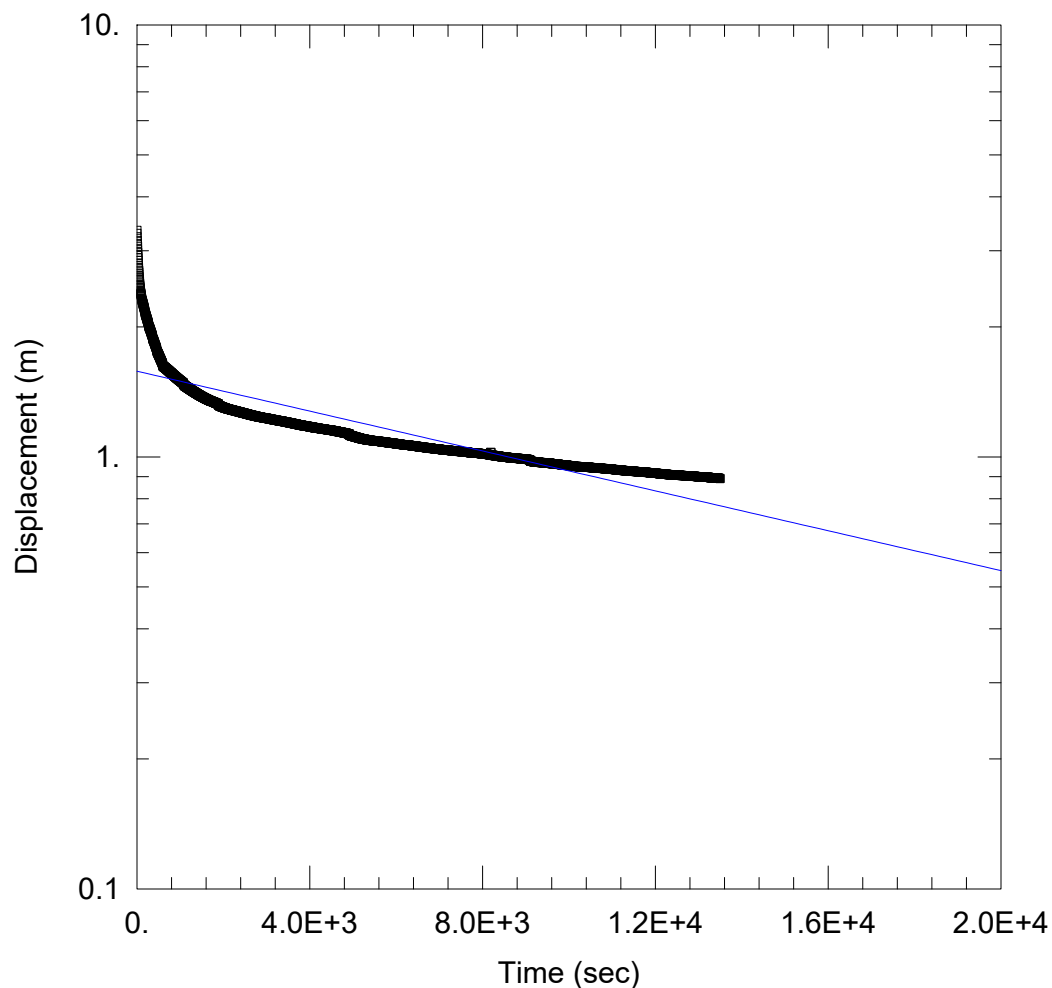
Remarks: _____

Performed by: Jade Gorman **Date:** September 3, 2021

Verified by: Joe Sullivan *Joe Sullivan* **Date:** September 13, 2021

Appendix C

Hydraulic Conductivity and Infiltration Testing Results



MW1-21 - FALLING HEAD TEST

Data Set: G:\...\11231077 - Falling Head Test MW1-21.aqt

Date: 10/05/21

Time: 09:28:34

PROJECT INFORMATION

Company: GHD

Client: DPH Developments Inc.

Project: 11231077

Location: Norwood Park Subdivision Ph.4

Test Well: MW1-21

Test Date: August 27, 2021

AQUIFER DATA

Saturated Thickness: 0.1 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW1-21)

Initial Displacement: 3.345 m

Static Water Column Height: 0.1 m

Total Well Penetration Depth: 1.6 m

Screen Length: 1.5 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

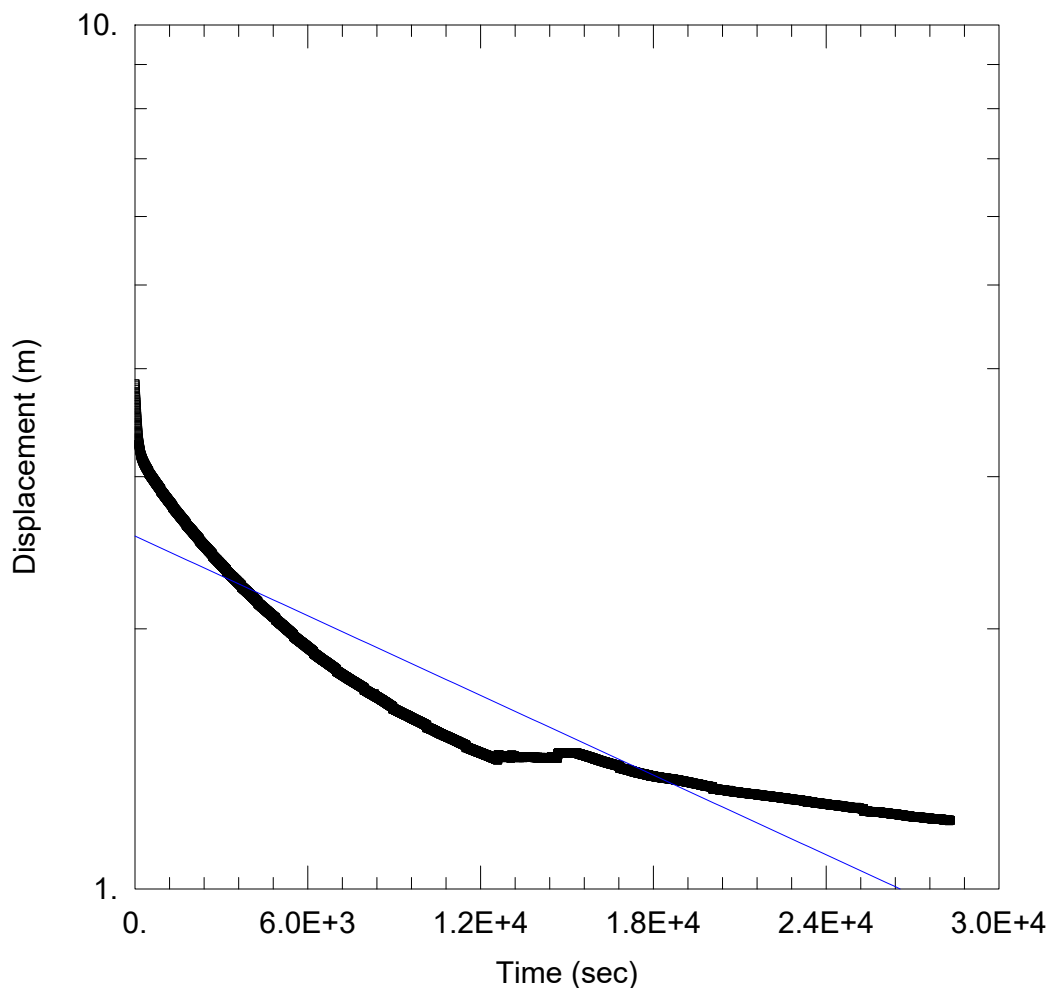
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 3.661E-5$ cm/sec

$y_0 = 1.579$ m



MW2-21 - FALLING HEAD TEST

Data Set: G:\...\11231077 - Falling Head Test MW2-21.aqt

Date: 10/05/21

Time: 09:31:47

PROJECT INFORMATION

Company: GHD

Client: DPH Developments Inc.

Project: 11231077

Location: Norwood Park Subdivision Ph.4

Test Well: MW2-21

Test Date: August 27, 2021

AQUIFER DATA

Saturated Thickness: 0.1 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW2-21)

Initial Displacement: 3.842 m

Static Water Column Height: 0.1 m

Total Well Penetration Depth: 1.6 m

Screen Length: 1.5 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

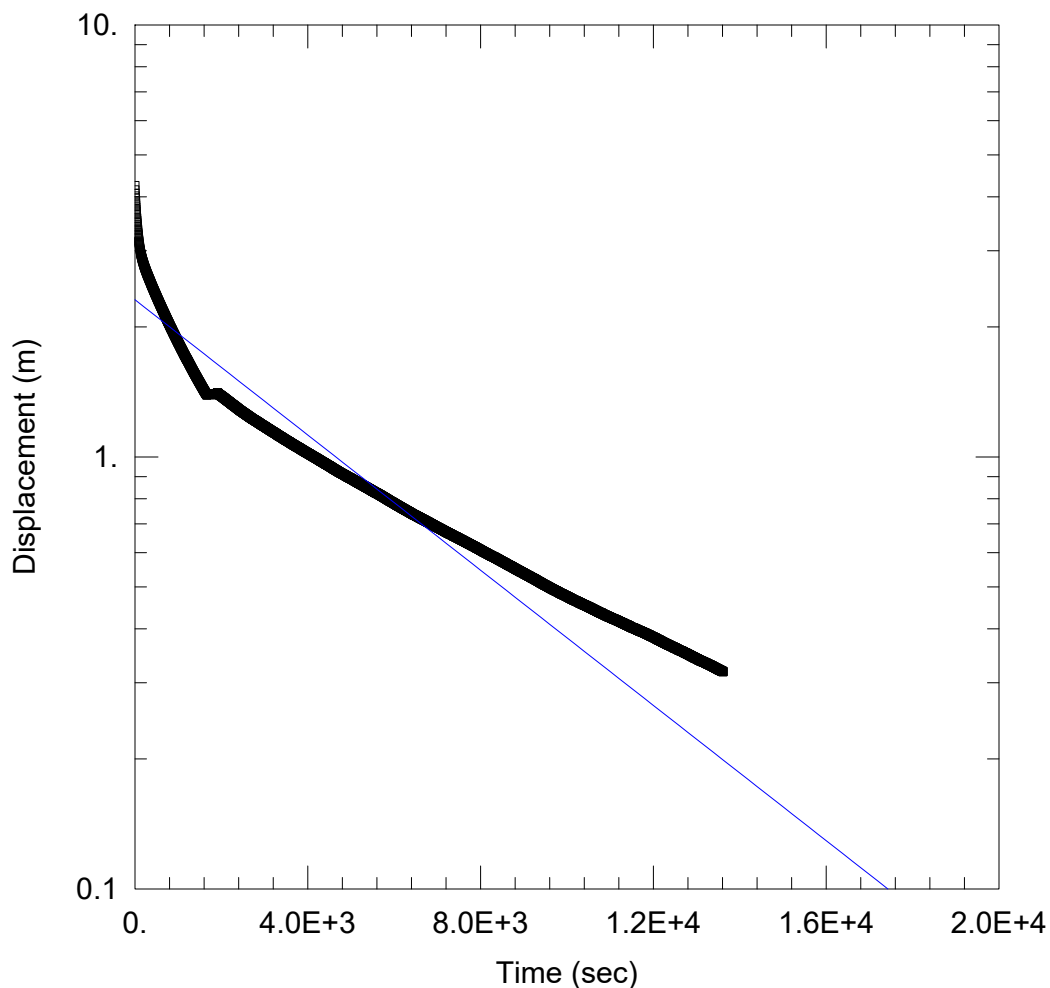
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 2.439E-5$ cm/sec

$y_0 = 2.561$ m



MW3-21 - FALLING HEAD TEST

Data Set: G:\...\11231077 - Falling Head Test MW3-21.aqt

Date: 10/05/21

Time: 09:34:44

PROJECT INFORMATION

Company: GHD

Client: DPH Developments Inc.

Project: 11231077

Location: Norwood Park Subdivision Ph.4

Test Well: MW3-21

Test Date: August 27, 2021

AQUIFER DATA

Saturated Thickness: 0.1 m

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW3-21)

Initial Displacement: 4.249 m

Static Water Column Height: 0.1 m

Total Well Penetration Depth: 1.6 m

Screen Length: 1.5 m

Casing Radius: 0.025 m

Well Radius: 0.025 m

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

$K = 0.0001241$ cm/sec

$y_0 = 2.311$ m

Appendix C.2: Infiltration Testing (in-situ)

Project No. 11231077

Date: August 27, 2021

Equipment: ETC Pask Permeameter

Location:	TP-3	TP-3	TP-7	TP-11																																																																																																																																																																																																		
Depth of hole:	0.3 m	1.4 m	0.6 m	0.6 m																																																																																																																																																																																																		
	Test 1	Test 1	Test 1	Test 1																																																																																																																																																																																																		
	<table><tr><th>Elapsed Time (minutes)</th><th>Permeameter Level (cm)</th></tr><tr><td>0.0</td><td>40.0</td></tr><tr><td>0.5</td><td>37.0</td></tr><tr><td>1.0</td><td>34.3</td></tr><tr><td>1.5</td><td>31.9</td></tr><tr><td>2.0</td><td>29.5</td></tr><tr><td>2.5</td><td>27.5</td></tr><tr><td>3.0</td><td>25.5</td></tr><tr><td>3.5</td><td>23.5</td></tr><tr><td>4.0</td><td>21.5</td></tr><tr><td>4.5</td><td>19.5</td></tr><tr><td>5.0</td><td>17.5</td></tr><tr><td>5.5</td><td>16.0</td></tr><tr><td>6.0</td><td>14.0</td></tr><tr><td>6.5</td><td>12.0</td></tr><tr><td>7.0</td><td>10.5</td></tr><tr><td>7.5</td><td>9.0</td></tr><tr><td>8</td><td>7.5</td></tr><tr><td>8.5</td><td>6.0</td></tr><tr><td>9.0</td><td>4.5</td></tr><tr><td>9.5</td><td>3.0</td></tr><tr><td>10.0</td><td>1.5</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Elapsed Time (minutes)	Permeameter Level (cm)	0.0	40.0	0.5	37.0	1.0	34.3	1.5	31.9	2.0	29.5	2.5	27.5	3.0	25.5	3.5	23.5	4.0	21.5	4.5	19.5	5.0	17.5	5.5	16.0	6.0	14.0	6.5	12.0	7.0	10.5	7.5	9.0	8	7.5	8.5	6.0	9.0	4.5	9.5	3.0	10.0	1.5									<table><tr><th>Elapsed Time (minutes)</th><th>Permeameter Level (cm)</th></tr><tr><td>0.0</td><td>40.0</td></tr><tr><td>0.5</td><td>36.9</td></tr><tr><td>1.0</td><td>35.9</td></tr><tr><td>1.5</td><td>35.0</td></tr><tr><td>2.0</td><td>34.5</td></tr><tr><td>2.5</td><td>33.5</td></tr><tr><td>3.0</td><td>32.9</td></tr><tr><td>3.5</td><td>--</td></tr><tr><td>4.0</td><td>31.6</td></tr><tr><td>4.5</td><td>31.3</td></tr><tr><td>5.0</td><td>30.5</td></tr><tr><td>5.5</td><td>30.0</td></tr><tr><td>6.0</td><td>29.6</td></tr><tr><td>7.0</td><td>28.6</td></tr><tr><td>8.0</td><td>27.7</td></tr><tr><td>9.0</td><td>27.0</td></tr><tr><td>10</td><td>26.3</td></tr><tr><td>11.0</td><td>25.6</td></tr><tr><td>12.0</td><td>24.8</td></tr><tr><td>13.0</td><td>24.1</td></tr><tr><td>14.0</td><td>23.4</td></tr><tr><td>15.0</td><td>22.7</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Elapsed Time (minutes)	Permeameter Level (cm)	0.0	40.0	0.5	36.9	1.0	35.9	1.5	35.0	2.0	34.5	2.5	33.5	3.0	32.9	3.5	--	4.0	31.6	4.5	31.3	5.0	30.5	5.5	30.0	6.0	29.6	7.0	28.6	8.0	27.7	9.0	27.0	10	26.3	11.0	25.6	12.0	24.8	13.0	24.1	14.0	23.4	15.0	22.7									<table><tr><th>Elapsed Time (minutes)</th><th>Permeameter Level (cm)</th></tr><tr><td>0.0</td><td>45.5</td></tr><tr><td>0.5</td><td>44.8</td></tr><tr><td>1.5</td><td>42.5</td></tr><tr><td>2.0</td><td>40.5</td></tr><tr><td>2.5</td><td>36.5</td></tr><tr><td>3.0</td><td>32.5</td></tr><tr><td>3.5</td><td>24.5</td></tr><tr><td>4.0</td><td>20.5</td></tr><tr><td>4.5</td><td>16.5</td></tr><tr><td>5.0</td><td>12.5</td></tr><tr><td>5.5</td><td>8.5</td></tr><tr><td>6.0</td><td>4.5</td></tr><tr><td>6.5</td><td>0.5</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>	Elapsed Time (minutes)	Permeameter Level (cm)	0.0	45.5	0.5	44.8	1.5	42.5	2.0	40.5	2.5	36.5	3.0	32.5	3.5	24.5	4.0	20.5	4.5	16.5	5.0	12.5	5.5	8.5	6.0	4.5	6.5	0.5									<table><tr><th>Elapsed Time (minutes)</th><th>Permeameter Level (cm)</th></tr><tr><td>0.0</td><td>43.5</td></tr><tr><td>0.5</td><td>41.3</td></tr><tr><td>1.0</td><td>40.4</td></tr><tr><td>1.5</td><td>39.5</td></tr><tr><td>2</td><td>38.5</td></tr><tr><td>2.5</td><td>37.8</td></tr><tr><td>3.0</td><td>36.9</td></tr><tr><td>3.5</td><td>36.3</td></tr><tr><td>4.0</td><td>35.5</td></tr><tr><td>4.5</td><td>34.8</td></tr><tr><td>5.0</td><td>34.0</td></tr><tr><td>5.5</td><td>33.3</td></tr><tr><td>6.0</td><td>32.5</td></tr><tr><td>6.5</td><td>31.8</td></tr><tr><td>7.0</td><td>31.2</td></tr><tr><td>7.5</td><td>30.4</td></tr><tr><td>8.0</td><td>29.8</td></tr><tr><td>8.5</td><td>29.2</td></tr><tr><td>9.0</td><td>28.4</td></tr><tr><td>10.0</td><td>27.2</td></tr><tr><td>11.0</td><td>25.6</td></tr><tr><td>12.0</td><td>24.4</td></tr><tr><td>14.0</td><td>22.0</td></tr><tr><td>16.0</td><td>19.6</td></tr><tr><td>18.0</td><td>17.2</td></tr></table>	Elapsed Time (minutes)	Permeameter Level (cm)	0.0	43.5	0.5	41.3	1.0	40.4	1.5	39.5	2	38.5	2.5	37.8	3.0	36.9	3.5	36.3	4.0	35.5	4.5	34.8	5.0	34.0	5.5	33.3	6.0	32.5	6.5	31.8	7.0	31.2	7.5	30.4	8.0	29.8	8.5	29.2	9.0	28.4	10.0	27.2	11.0	25.6	12.0	24.4	14.0	22.0	16.0	19.6	18.0	17.2
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→ The Power of Commitment