Preliminary Servicing & Stormwater Management Report for:

Ainley Farm Subdivision
Township of Centre Wellington (Elora)

GMBP File: 411009
July 3, 2019

GUELPH | OWEN SOUND | LISTOWEL | KITCHENER | LONDON | HAMILTON | GTA
330 Trillium Drive, Unit D, Kitchener ON N2E 3J2 P: 519.748.1440
www.GMBluePlan.ca

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PRELIMINARY SERVICING & STORMWATER MANAGEMENT REPORT AINLEY FARM SUBDIVISION TOWNSHIP OF CENTRE WELLINGTON (ELORA)

July 3, 2019
Our File: 411009

1.0 INTRODUCTION

In support of the Draft Plan of Subdivision Application for Part of Lots 17 and 18, Concession 12 in the Township of Centre Wellington (Geographic Township of Nichol) herein after referred to as the Ainley Farm Subdivision, GM BluePlan Engineering Limited have prepared this report to address the preliminary servicing and stormwater management requirements for the site and to address the comments received from Grand River Conservation Authority (dated July 31, 2018).

The servicing and stormwater management techniques were derived from the recommendations presented in the following reports:

- Stormwater Management Plan for The North Valley Subdivision (Cambridge Engineering and Planning Consultants Limited, January 1994),
- Design Report, Ville Lora Downs North Subdivision, Phase III (Gamsby and Mannerow Limited, July 2004),
- Design Report, Ville Lora Downs Subdivision, Stage VI (Gamsby and Mannerow Limited, April 1998),
- Preliminary Geotechnical Investigation completed CMT Engineering Inc. (March 29, 2006), and
- Environmental Impact Study completed by North-South Environmental Inc. (June 2006).

Together, these reports form the overview for the development of these lands while maintaining the adjacent natural features.

2.0 SITE INFORMATION

Figure 1 shows the location of the Ainley Farm Subdivision and the surrounding area. The 21.46-hectare site is bound by existing agricultural and future development lands to the north, Gerrie Road to the east, existing residential lands to the south (Ville Lora Downs Subdivision, Phase V and Phase VI) and existing wetland and residential lands to the west (Ville Lora Downs North Subdivision, Phase III).

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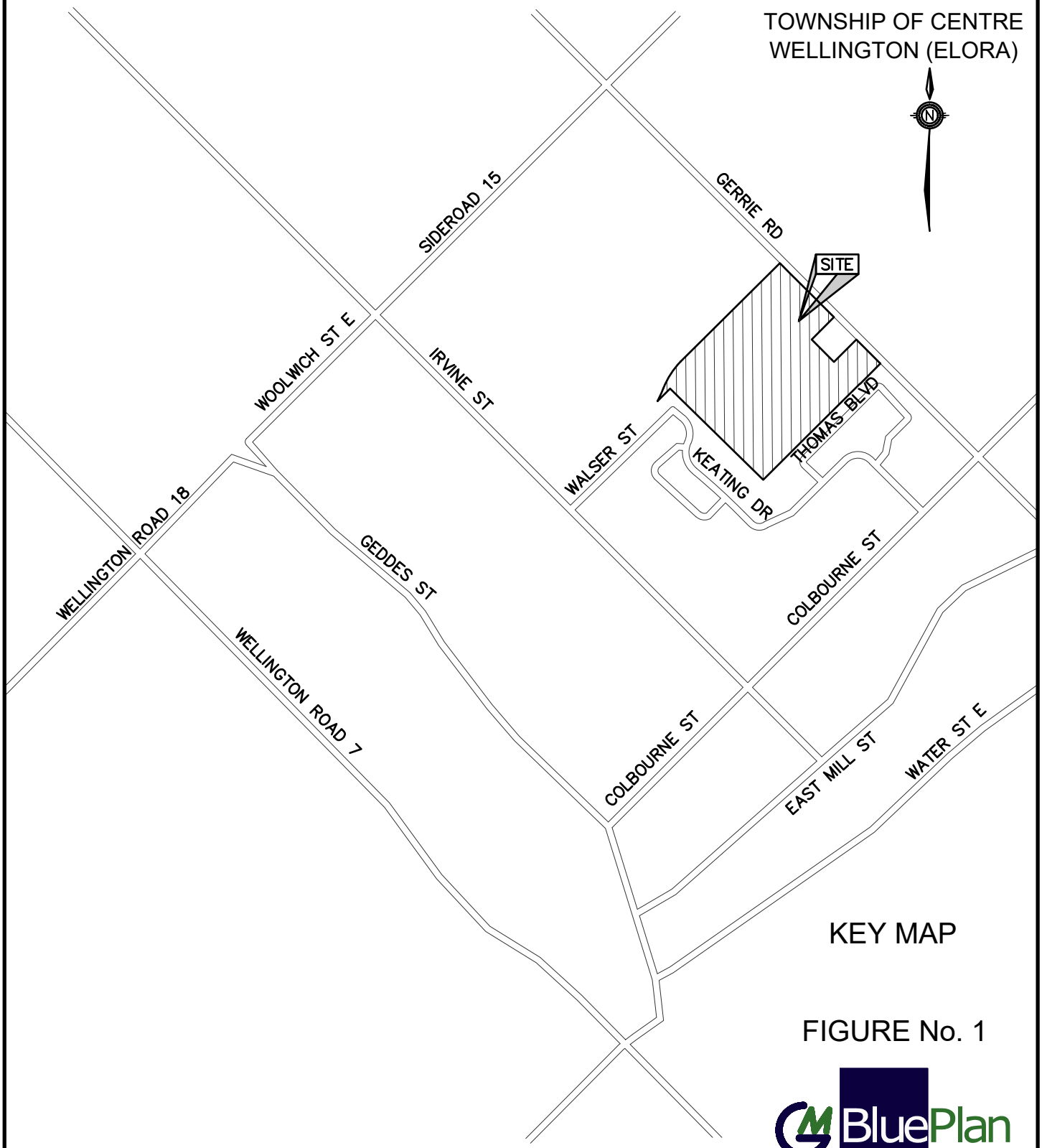
AINLEY FARM SUBDIVISION
TOWNSHIP OF CENTRE WELLINGTON (ELORA)



KEY MAP

FIGURE No. 1

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3.0 EXISTING CONDITIONS

3.1 LAND USE

The site is currently comprised of agricultural fields and a natural heritage feature consisting of a woodlot and wetland. The existing site features are shown on the General Plans (GM BluePlan Engineering Limited Drawing No. 1 to 4).

3.2 TOPOGRAPHY

The topography throughout the Ainley Farm Subdivision is undulating and consists of rolling slopes with gradients ranging from 0.5% to 20%. Original ground elevations on site range from approximately 410.0m to approximately 416.0m. The northeastern portion of the site generally drains in a northeast direction towards Gerrie Road. The remainder of the site generally drains in a southwest direction towards the existing wetland, ultimately discharging to the existing channel located immediately south of the wetland. The northwestern portion of the site, adjacent to the existing Walser Street right-of-way, drains in a southerly direction towards Walser Street.

3.3 SOILS

The predominant surface soil type on the site is Harriston Loam (Soil Survey of Wellington County Report No. 35). Harriston Loam has a hydrologic soil classification of BC and generally has good drainage characteristics.

The Preliminary Geotechnical Investigation by CMT Engineering Inc. (March 2006) established the characteristics of the underlying soils. The boreholes identified the underlying soils as topsoil overlying organic silt, silt or sandy silt, silt till or sandy silt till, sand or silty sand and clayey silt. The results of the geotechnical investigation are included in Appendix ‘A’.

4.0 PROPOSED DEVELOPMENT

The Draft Plan of Subdivision, prepared by Black, Shoemaker, Robinson & Donaldson Limited (December 11, 2018) (Figure 2), illustrates the proposed lot fabric, internal roads, park block, and open space areas and stormwater management blocks.

Access to the 21.46-hectare development will be provided via Gerrie Road and the extension of Walser Street.

Within the development, there are 116 single family lots, one (1) multi-family block, one (1) apartment block, one (1) open space block, one (1) park block and two (2) stormwater management blocks.

In addition, three (3) future single detached lots will be created on the north side of Walser Avenue through the extension of Walser Avenue into the Ainsley Farm property (Future Development Block 124).

4.1 SITE GRADING

The site layout and internal road network for the Ainley Farm Subdivision are shown on the General Plans (GM BluePlan Engineering Limited Drawing No. 1 to 4). The grade and elevation of the internal streets are controlled by the existing centre line elevations of Walser Street and Gerrie Road, the major overland flow route to the stormwater management facilities and the elevation of the existing sanitary sewers on Walser Street and Keating Drive.

The site has been graded to match the existing elevations along the property boundary of the adjacent lands. Minor grading on the adjacent lands located along the north boundary of the site is required. The adjacent lands along the north boundary of the site are owned by the Developer (James Keating Construction (2004) Limited).

4.2 STREETS

All streets will be constructed with a minimum grade of 0.5% and a maximum grade of 8.0% as per Township of Centre Wellington standards. An urban road cross-section (20 m right-of-way width), with concrete curb and gutter will be provided for Street No.1, 2, 3, 4 and the extension of Walser Street, as per Township of Centre Wellington Standard Drawing STD R1.

Concrete sidewalks (1.5 metre wide) will be constructed along both sides of the Walser Street extension and Street No. 1, 2, 3 and 4.

4.3 WATER SUPPLY

As part of the Ville Lora Downs North Subdivision Phase III, a 200mm diameter watermain was terminated at the easterly limit of Walser Street. There is currently no watermain on Gerrie Road across the frontage of the Ainley Farm Subdivision.

Water supply for the Ainley Farm Subdivision will be provided via the extension of a 200mm diameter watermain, along the Walser Street extension, Street No. 2 and a portion of Street No. 1. A 150mm diameter watermain will also be extended along the remainder of Street No. 1, Street No. 3, and Street No. 4.

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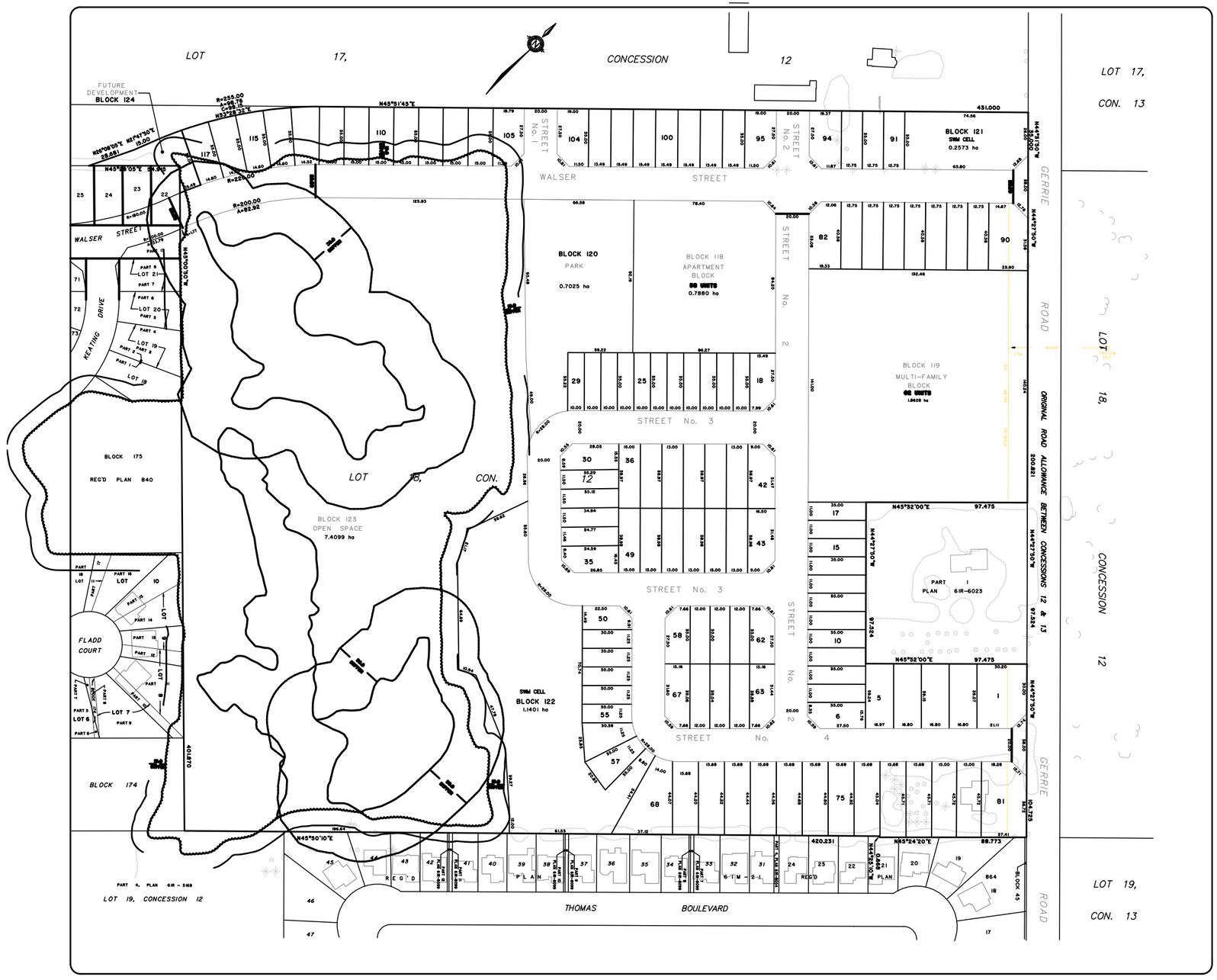
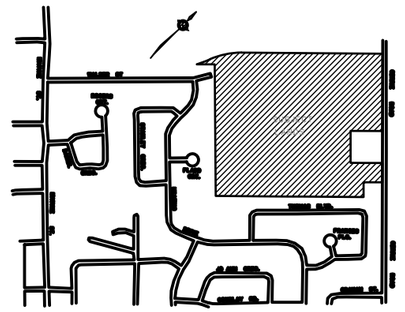
WELLINGTON (ELORA)





KEY PLAN N.T.S.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

51 (17) (a) – (c) AS SHOWN
(d) SEE SCHEDULE
(e) – (g) AS SHOWN
(h)(1) MUNICIPAL WATER SUPPLY
(h)(2) HARRISTON LOAM
(h)(3) AS SHOWN
(i)(1) MUNICIPAL STORM AND SANITARY SEWERS
(i)(2) NONE KNOWN

OWNERS CERTIFICATE

WE HEREBY AUTHORIZE BLACK, SHOEMAKER, ROBINSON, AND DONALDSON LIMITED, ONTARIO LAND SURVEYORS, URBAN AND RURAL PLANNERS TO SUBMIT THIS DRAFT PLAN OF PROPOSED SUBDIVISION.

DATE

JAMES KEATING CONSTRUCTION (2004) LTD.

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE

IAN D. ROBINSON
ONTARIO LAND SURVEYOR

METRIC

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

RELEVANT INFORMATION

LOTS/BLOCKS	LAND USE	UNITS	AREAS (ha)
LOTS 1 TO 117	SINGLE-DETACHED RESIDENTIAL	117	6.0442
BLOCK 118	APARTMENT SITE	58	0.7880
BLOCK 119	CLUSTER TOWNHOUSES	62	1.8628
BLOCK 120	PARK		0.7039
BLOCKS 121 & 122	STORMWATER MANAGEMENT		1.3974
BLOCK 123	OPEN SPACE		7.3820
STREETS	ROADS		3.2004
BLOCK 124	FUTURE DEVELOPMENT	4	0.0818
TOTAL		241	21.4605 ha.

NOTES:
ELEVATIONS AND RELEVANT INFORMATION TAKEN FROM

DRAFT PLAN OF SUBDIVISION

OF PART OF
LOTS 17 & 18, CONCESSION 12
TOWNSHIP OF CENTRE WELLINGTON
(GEOGRAPHIC TOWNSHIP OF NICHOL)
COUNTY OF WELLINGTON

SCALE 1:1000 0 20 40 60 80 METRES

BLACK, SHOEMAKER, ROBINSON & DONALDSON LIMITED
BSR&D Ontario Land Surveyors Urban and Rural Planners
A wholly owned subsidiary of J.D.Barnes Ltd.
101-257 Woodlawn Rd. W.
Guelph, Ontario N1H 8J1
TEL: (519) 822-4031
FAX: (519) 822-1220
WWW.BSRD.COM

DATE: OCTOBER 9, 2018
DRAWN BY: KS
PROJECT 04-5865-18

DRAFT PLAN OF SUBDIVISION

FIGURE No. 2

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4.4 SANITARY SEWER

During the municipal servicing of the Ville Lora Downs North Subdivision Phase III, a 200mm diameter sanitary sewer was designed, approved and constructed on Walser Street. The existing 200mm diameter sanitary sewer is currently terminated at the easterly limit of Walser Street. As part of the Ville Lora Downs Subdivision, Phase VI, a 200mm diameter sanitary sewer was also designed, approved and constructed on Keating Drive. There are currently no sanitary sewers on Gerrie Road across the frontage of the Ainley Farm.

Sanitary service for the Ainley Farm Subdivision will be provided via connections to both the existing 200mm diameter sanitary sewer on Walser Street and the existing 200mm diameter sanitary sewer on Keating Drive.

The extension of a 200mm diameter sanitary sewer along the Walser Street extension will service the lots fronting on to Walser Street, as well as a portion of the lots fronting onto Street No. 2. The extension of a 200mm diameter sanitary sewer on easement through Drimmie Part to Street No. 1, from the existing 200mm diameter sanitary sewer on Keating Drive, will service the remainder of the subdivision (Street No. 2, Street No. 3 and Street No. 4).

4.5 STORM SEWER

The storm sewer system for the Ainley Farm Subdivision will be sized to convey the 5-year design storm event and the storm sewer system will discharge to the two (2) proposed stormwater management facilities or to the existing storm sewer on Walser Street.

The storm sewers on Street No. 1, Street No. 3, Street No. 4, a portion of Street No. 2 and a portion of the Walser Street extension will discharge to the proposed Stormwater Management Facility No. 1 located to the east of the existing wetland.

The storm sewers on the remainder of Street No. 2, along with a portion of the Walser Street extension, will discharge to the proposed Stormwater Management Facility No. 2 located to the west of Gerrie Road.

The storm sewers on the remainder of the Walser Street extension will discharge directly to the existing storm sewer system on Walser Street, ultimately discharging to the existing storm sewers on Keating Drive.

4.6 DEWATERING

Dewatering may be required during the installation of sanitary sewer, storm sewer and watermain. A Permit to Take Water (PTTW) or an Environmental Activity and Sector Registry (EASR) from the Ministry of Environment, Conservation and Parks (MECP) will be required if dewatering activities will involve the removal of more than 400,000 litres of groundwater per day from the site.

If dewatering activities are required during the installation of sewers and watermain, all discharge will be directed to the interim sediment control pond prior to discharge from the site.

As part of the area grading of the site, the interim stormwater management facility will be constructed and will act as an interim sedimentation control pond for the remainder of the municipal servicing and home building construction. This will prevent sediment from being discharged to the wetland. Upon build-out, accumulated sediment will be collected and removed from the interim sediment control pond before it is constructed on Stormwater Management Facility No. 1.

4.7 FOUNDATION DRAINAGE

As per the Township of Centre Wellington municipal standards, foundation drainage will be provided via sump pits and sump pumps in each residential unit, ultimately discharging via individual storm sewer lateral connections to the storm sewer system located within the municipal right-of-way.

5.0 STORMWATER MANAGEMENT

5.1 DESIGN CRITERIA

The studies, policies and guidelines used to develop the stormwater management plan for this development were as follows:

1) Stormwater Management Planning and Design Manual, 2003
2) Design Principles for Stormwater Management Facilities, 1996
3) The Interim Stormwater Quality Control Guidelines, 1991
4) The Stormwater Quality Best Management Practices Manual, 1991
5) The MTO Drainage Management Technical Guidelines, 1989
6) The Ontario Urban Design Guidelines, 1987

The objectives of the stormwater management plan are as follows:

a) Provide Enhanced (80% Total Suspended Solids) water quality control prior to discharge to the existing wetland and to an existing tributary of the Grand River.
b) Provide quantity control for the full range of design storms to attenuate post-development runoff to the existing condition level.
c) Match pre- and post-development infiltration rates.
d) Route the Regional Storm to minimize flood damage.

A three-hour duration rainfall event was used to generate the mass rainfall data required for the 2, 5, 10, 25, 50 and 100-year design storms. The Fergus Shand Dam Chicago parameters and the total depth of rainfall for each storm are as follows:

Table No. 1: Chicago Rainfall Distribution Parameters

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
a =	695.047	1459.072	2327.596	3701.648	5089.418	6933.019
b =	6.387	13.690	19.500	25.500	30.000	34.699
c =	0.793	0.850	0.894	0.937	0.967	0.998
r =	0.38	0.38	0.38	0.38	0.38	0.38
Duration = (minutes)	180	180	180	180	180	180
Rainfall Depth = (mm)	33.014	49.792	61.359	75.581	86.737	97.921

The SCS infiltration method was used in the runoff calculations. The CN parameters used in the MIDUSS modelling are as follows:

Table No. 2: SCS Curve Number Parameters

	IMPERVIOUS AREAS	PERVIOUS AREAS
Residential	98	78
Agricultural	98	74
Wetland/Forest	98	50

The hydrologic model MIDUSS was used to create the runoff hydrographs and to route the flows through the storage structures.

5.2 STORMWATER MANAGEMENT APPROACH

In line with current practices and guidelines, the stormwater management plan for the Ainley Farm Subdivision is a "treatment train" to attenuate post-development flows and to provide Enhanced (80% total suspended solids removal) water quality control treatment prior to discharge from the site. The "treatment train" will include a combination of lot level, conveyance and end-of-pipe best management practices.

Lot level controls will simply consist of directing roof leaders to grassed areas and grassed swales.

Conveyance controls will include the use of storm sewers, grassed swales, four (4) oil/grit separator structures for Stormwater Management Facility No.1 and Stormwater Management Facility No.2.

End-of-pipe controls will be provided by two (2) extended detention stormwater management facilities designed to attenuate post-development runoff prior to discharge from the site. Runoff generated from Stormwater Management Facility No.1 will discharge to the existing wetland, ultimately discharging to the existing swale in Drimmie Park and the existing storm sewers on Keating Drive. The stormwater management facility has been designed as a wetland with 5,464m^3 of storage, discharging via a multi-stage outlet consisting of a minor outlet with a 300mm diameter orifice plate and a major outlet with a 350mm diameter orifice place, as well as a 20m wide overflow weir.

Runoff generated from Stormwater Management Facility No.2 will discharge to the roadside ditch along Gerrie Road, ultimately discharging to a tributary of the Grand River. The stormwater management facility has been designed as a wetland with 1,195m^3 of storage, discharging via a multi-stage outlet consisting of a 120mm knockout for minor storms and a 260mm orifice plate for major storms, as well as a 10m wide overflow weir.

A small portion of runoff from the westerly portion of Walser Street will discharge uncontrolled to the existing storm sewer system on Walser Street.

Major storm flows from the development will sheetflow overland via the municipal right-of-ways to either Stormwater Management Facility No.1 or Stormwater Management Facility No. 2.

This combination of lot-level, conveyance and end-of-pipe controls will control the release of the runoff from the site.

5.3 STORMWATER MANAGEMENT PLAN

The best management practices (BMP's) in the Stormwater Management Planning and Design Manual (2003) were screened. Those found to be applicable to this development are discussed in the following sections.

5.3.1 LOT LEVEL CONTROLS

Stormwater management practices recommended to provide lot level control on this site are as follows:

a) Roof Drainage to Ground Surface

The driveways and front yards will drain to the street. The roof and rear yard will generally drain to the rear of the lot with exception for lots with back to front drainage.

The roof runoff will be filtered across the grassed surface and some will infiltrate. The runoff for any event large enough to generate flow to the swale system will be adequately filtered by the grass enroute.

b) Rear Yard Swales

The lots will be graded to current Township of Centre Wellington Standards. Where practical, the length of the rear lot swales between catch basins will be increased to extend the contact time with the grassed surfaces.

To promote infiltration on the lots and in the swales, it is recommended that the average depth of graded topsoil be 300 mm.

5.3.2 CONVEYANCE CONTROLS

The storm conveyance system for the development will consist of grassed swales, storm sewers, major overland channel and four (4) oil/grit separator structures. Conveyance controls will be achieved through the regular maintenance of the grassed swales, storm sewers, major overland channel, and oil/grit separator structures as part of the Township's annual maintenance program. Maintenance requirements will include the annual removal of accumulated sediments and debris from manholes, catch basins, and oil/grit separator structures.

5.3.3 END-OF-PIPE CONTROLS

a) Existing Conditions

Under existing conditions, the majority of the site is utilized for agricultural purposes. For hydrologic modelling purposes, the 21.46-hectare site and 1.24 hectares of external areas was modelled as seven (7) catchments. These catchments are shown on the Existing Conditions Storm Drainage Area Plan (Figure 3).

Catchment 10 (7.76 hectares, 0% impervious) consists primarily of agricultural lands and an existing residential lot.

Catchment 11 (0.13 hectares, 0% impervious) represents the external lands, which consists primarily of agricultural lands of an existing residential lot.

Runoff generated from Catchment 10 and 11 currently sheetflows overland in an east to west direction, ultimately discharging to the existing wetland.

Catchment 20 (6.65 hectares, 0% impervious) consists primarily of agricultural lands and an existing residential lot.

Catchment 21 (0.82 hectares, 0% impervious) represents external lands consisting of an undeveloped residential lot.

Runoff generated from Catchment 20 and 21 currently sheetflows overland to the existing roadside ditch along Gerrie Road and ultimately to a tributary of the Grand River.

Catchment 30 (0.22 hectares, 0% impervious) represents the external lands, which consists primarily of an existing wetland and agricultural lands.

Runoff generated from Catchment 30 currently sheetflows overland, ultimately discharging to the existing wetland.

Catchment 40 (7.12 hectares, 0% impervious) represents the south-westerly portion of the site, consisting of a natural heritage feature (wetland and woodlot).

Runoff generated from Catchment 40 currently sheetflows overland in an east to west direction, discharging to an existing swale in Drimmie Park and ultimately the existing storm sewer system on Keating Drive.

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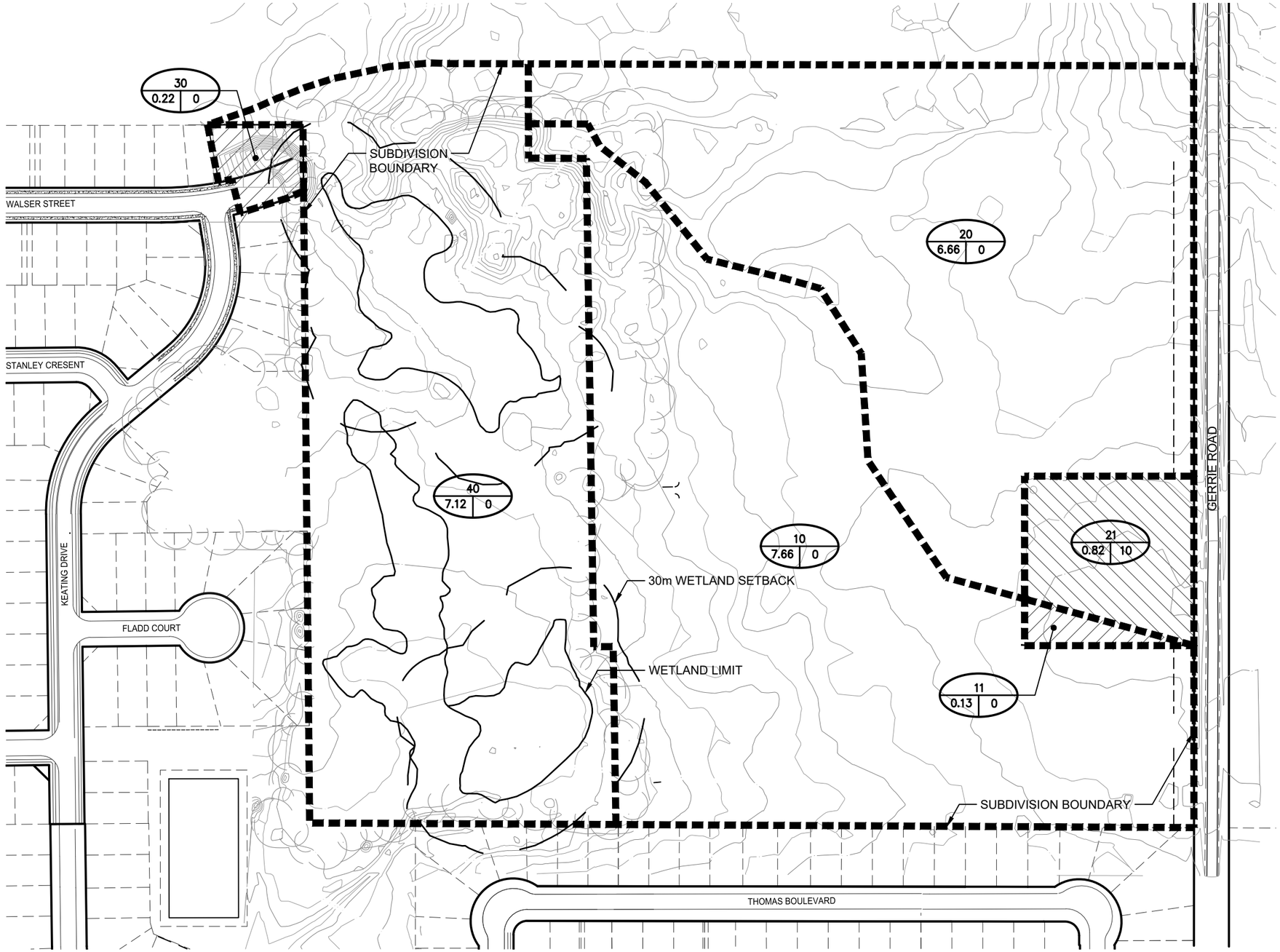

LEGEND

DRAINAGE AREA BOUNDARY

10
1.23 | 0
CATCHMENT NUMBER
% IMPERVIOUS
AREA IN HECTARES

EXTERNAL LANDS

EXISTING CONDITIONS STORM DRAINAGE AREA PLAN

FIGURE No. 3

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Table No. 3 summarizes the existing condition flow rates and runoff volumes from the site for the full range of design storm events.

Table No. 3: Existing Condition Flow Rates and Runoff Volumes

	CATCHMENTS									
	30	**Total to Walser**	**10**	**11**	**40**	**Total to Ex. Wetland**	**20**	**21**	**Total to Tributary of Grand River**	**Total from Site**
2-Year										
Flow Rate (m^3/s)	0.003	0.003	0.044	0.001	0.060	0.101	0.038	0.016	0.043	**0.143**
Runoff Volume (m^3)	11.3	11.3	397.3	6.7	364.5	779.7	340.5	60.4	400.9	**1,180.5**
5-Year										
Flow Rate (m^3/s)	0.009	0.009	0.157	0.004	0.209	0.358	0.135	0.030	0.152	**0.510**
Runoff Volume (m^3)	28.2	28.2	995.9	16.7	913.0	1,953.8	853.4	130.5	983.9	**2,937.7**
10-Year										
Flow Rate (m^3/s)	0.015	0.015	0.273	0.008	0.359	0.517	0.234	0.049	0.263	**0.828**
Runoff Volume (m^3)	42.6	42.6	1,505.1	25.2	1,380.7	2,759.8	1,289.8	188.3	1,478.1	**4,431.8**
25-Year										
Flow Rate (m^3/s)	0.024	0.024	0.454	0.012	0.584	1.015	0.389	0.078	0.435	**1.447**
Runoff Volume (m^3)	62.5	62.5	2,210.7	37.0	2,027.3	4,337.4	1,894.4	266.6	2,161.0	**6,498.4**
50-Year										
Flow Rate (m^3/s)	0.032	0.032	0.618	0.016	0.789	1.359	0.530	0.103	0.592	**1.948**
Runoff Volume (m^3)	79.6	79.6	2,811.2	47.1	2,577.4	5,515.2	2,409.1	332.7	2,741.8	**8,257.0**
100-Year										
Flow Rate (m^3/s)	0.039	0.039	0.801	0.020	0.985	1.746	0.687	0.134	0.763	**2.495**
Runoff Volume (m^3)	97.5	97.5	3,447.0	57.6	3,160.5	6,762.6	2,953.9	401.7	3,355.6	**10,118.2**
Regional										
Flow Rate (m^3/s)	0.024	0.024	0.881	0.014	0.772	1.688	0.755	0.087	0.840	**2.528**
Runoff Volume (m^3)	447.0	447.0	15,780.0	267.9	14,536.0	30,583.9	13,523.0	1,719.5	15,242.5	**46,273.5**

Table No. 4 gives the results of the ponding in the existing wetland.

Table No. 4: Wetland (Stage/Storage/Discharge)

	Available Capacity			Actual Capacity Used			Drawdown Time (hr)**
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	
Wetland Bottom	0.000	0.0	409.63	---	---	---	---
2-Year	---	---	---	0.089	54	409.65	9.3
5-Year	---	---	---	0.324	197	409.69	5.6
10-Year	---	---	---	0.549	333	409.73	5.6
25-Year	---	---	---	0.886	539	409.77	5.5
50-Year	---	---	---	1.185	724	409.79	5.4
100-Year	---	---	---	1.513	924	409.82	5.4
Regional Storm	---	---	---	1.612	1,012	409.83	52.0
Overflow	18.965	15,227.7	410.75	---	---	---	---

**Drawdown time obtained from the hydrologic modelling software MIDUSS

Table No. 5 gives the results of the existing condition drainage channel routing downstream of the existing wetland.

Table No. 5: Wetland (Existing Condition Drainage Channel Downstream of Wetland – Section 1 of 2)

	Channel Design Capacity			Actual Channel Capacity Used		
	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s
2-Year	---	---	---	0.089	0.158	0.532
5-Year	---	---	---	0.324	0.256	0.735
10-Year	---	---	---	0.549	0.312	0.839
25-Year	---	---	---	0.886	0.374	0.946
50-Year	---	---	---	1.183	0.417	1.016
100-Year	---	---	---	1.507	0.456	1.080
Regional Storm	---	---	---	1.612	0.468	1.098
Top of Bank	10.655	0.95	1.602	---	---	---

Table No. 6 gives the results of the existing condition drainage channel routing downstream of the existing wetland.

Table No. 6: Wetland (Existing Condition Drainage Channel Downstream of Wetland – Section 2 of 2)

	Channel Design Capacity			Actual Channel Capacity Used		
	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s
2-Year	---	---	---	0.089	0.080	0.500
5-Year	---	---	---	0.323	0.167	0.774
10-Year	---	---	---	0.549	0.312	0.839
25-Year	---	---	---	0.880	0.291	1.055
50-Year	---	---	---	1.180	0.341	1.150
100-Year	---	---	---	1.499	0.386	1.232
Regional Storm	---	---	---	1.606	0.401	1.256
Top of Bank	9.246	0.95	1.966	---	---	---

b) Proposed Release Rates

In order to maintain the existing condition drainage pattern to the existing wetland and Grand River tributary, the release rates have been determined by the existing condition release rates. Under post-development conditions, runoff generated from the site will be attenuated to the existing condition levels conveyed to the existing wetland and the Grand River tributary.

The release rate to Walser Street under minor storm design events is determined by the capacity of the existing storm sewers in Ville Lora Downs North Subdivision Phase III, which were designed to incorporate a small contributing area from Walser Street. The capacity of the existing 300mm diameter storm sewer conveying a portion of the proposed development is approximately $0.110m^3/s$, based on a grade of 1.34%. Excluding the existing contributing area to this storm sewer (0.05ha), the proposed development's allotment of the pipe's capacity is $0.106m^3/s$. The allowable to Walser Street under major storm events has been determined based on the allotted area of 0.65ha, as per the Villa Lora Downs North Phase III storm drainage area plans.

Therefore, the proposed release rates from the site under post-development conditions are outlined in Table No. 7.

Table No. 7: Proposed Release Rates

Release Route	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
To Ex. Wetland	$0.093m^3/s$	$0.331m^3/s$	$0.517m^3/s$	$0.940m^3/s$	$1.261m^3/s$	$1.614m^3/s$	$1.582m^3/s$
To Tributary of Grand River	$0.043m^3/s$	$0.152m^3/s$	$0.263m^3/s$	$0.435m^3/s$	$0.592m^3/s$	$0.763m^3/s$	$0.840m^3/s$
To Walser Street	$0.106m^3/s$		$0.122m^3/s$	$0.150m^3/s$	$0.173m^3/s$	$0.196m^3/s$	$0.080m^3/s$

c) Post-Development Conditions

Under post-development conditions, the existing drainage patterns of the site will be maintained. Post-development flows from the site will be attenuated to existing condition levels through the use of two (2) stormwater management facilities. Stormwater Management Facility No. 1 will outlet to the existing wetland. Stormwater Management Facility No. 2 will outlet to the existing roadside ditch along Gerrie Road and ultimately a tributary of the Grand River.

For the post-development condition analysis, the 21.46-hectare site and 1.24 hectares of external areas was modelled as fourteen (14) drainage catchments. These catchments are shown on the Post-Development Storm Drainage Area Plan (Figure No. 4).

Catchment 1000 (6.76-hectares, 50% Impervious) represents the southwest portion of development, including Street No. 3, Street No. 4, and a portion of Street No. 2. Major and minor storm runoff generated from Catchment 1000 will be directed to Stormwater Management Facility No. 1.

Catchment 1100 (0.48-hectares, 0% Impervious) represents a portion of external lands including existing residential lot. Major and minor storm runoff generated from Catchment 1100 will be directed to Stormwater Management Facility No. 1.

Catchment 1200 (0.22-hectares, 50% Impervious) represents the rear yards of lots 50-57. Runoff generated from Catchment 1200 will be directed to Infiltration Gallery No. 1.

Catchment 1300 (0.84-hectares, 50% Impervious) represents the rear yards of lots 68-81. Runoff generated from Catchment 1300 will be directed to Infiltration Gallery No. 1.

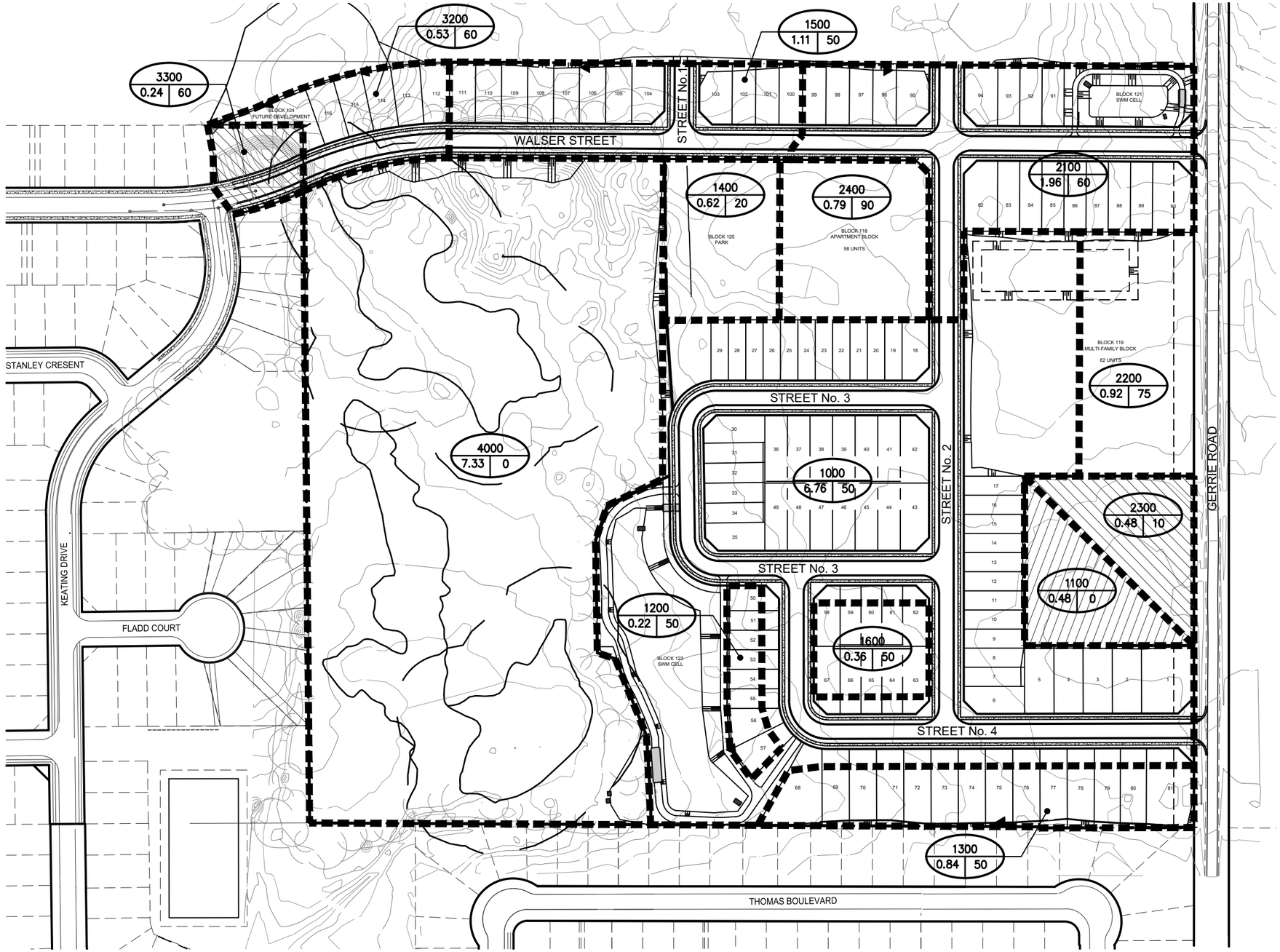
Catchment 1400 (0.62-hectares, 20% Impervious) represents the park block. Runoff generated from Catchment 1400 will be directed to Infiltration Gallery No. 2. The clear stone infiltration gallery (80m L x 10m W x 0.70m D) with two (2) 300mm diameter perforated pipes which run the length of the gallery will provide approximately 192 m^3 of storage. The clear stone infiltration gallery has been designed with sufficient capacity to infiltrate minor storm runoff generated by Catchment 1400. Flows exceeding the capacity of the clear stone infiltration gallery will be directed to Stormwater Management Facility No. 1.

Catchment 1500 (1.11-hectares, 50% Impervious) represents a portion of Walser Street and Street No. 1. Minor runoff generated from Catchment 1500 will be conveyed via storm sewers to Stormwater Management Facility No. 1, ultimately discharging to the existing wetland. Major runoff generated from Catchment 1500 will sheetflow uncontrolled to the existing wetland.

Quality control treatment (80% TSS removal) for runoff generated from Catchment 1000, 1100, 1400, and 1500 will be provided by three (3) oil/grit separator structures. The first oil/grit separator structure (Stormceptor STC 6000 or approved equivalent) will be located north of the northerly inlet to Stormwater Management Facility No. 1 (Street 3). The second oil/grit separator structure (Stormceptor STC 4000 or approved equivalent) will be located south of the northerly inlet to Stormwater Management Facility No. 1 (Street 4). The third oil/grit separator structure (Stormceptor STC 3000 or approved equivalent) will be located at the southerly inlet to Stormwater Management Facility No. 1 (Street 1).

Catchment 1600 (0.36-hectares, 50% Impervious) represents the rear yards of lots 58-67. Runoff generated from Catchment 1600 will be directed to Infiltration Gallery No. 1. The clear stone infiltration gallery (145m L x 3.5-5m W x 0.87m D), receiving flows from Catchments 1200, 1300, and 1600 with four to six (4 to 6) 600mm diameter perforated pipes which run the length of the gallery will provide approximately 301.1 m^3 of storage. Flows exceeding the capacity of the clear stone infiltration gallery will be directed to Stormwater Management Facility No. 1.

411009
AINLEY FARM SUBDIVISION
TOWNSHIP OF CENTRE WELLINGTON (ELORA)



LEGEND

DRAINAGE AREA BOUNDARY

2200 / 0.92 / 75 — CATCHMENT NUMBER; % IMPERVIOUS; AREA IN HECTARES

EXTERNAL LANDS

POST DEVELOPMENT STORM DRAINAGE AREA PLAN

FIGURE No. 4

BluePlan ENGINEERING

JOB NUMBER 411009
JANUARY 2019
Scale: 1:2500

Stormwater Management Facility No. 1 has been designed as a dry pond with approximately 5,464 m^3 of storage. Discharging from this pond will be via a multi-stage outlet consisting of a 150 mm knockout for minor storms and a 350mm diameter orifice for major storms, as well as a 20 m wide overflow weir.

Catchment 2100 (1.96-hectares, 60% Impervious) represents the north portion of development, including the remainder of Street 2, and a portion of Walser Street. Major and minor storm runoff generated from Catchment 2100 will be directed to Stormwater Management Facility No. 2, ultimately discharging to a tributary of the Grand River via the existing roadside ditch along Gerrie Road.

Catchment 2200 (0.92-hectares, 75% Impervious) represents the a portion of the multi-family residential block. Runoff generated from Catchment 2200 will discharge to the roadside ditch along Gerrie Road, and ultimately a tributary of the Grand River. At such time as development of Catchment 2200 proceeds, a privately owned and operated on-site quality and quantity control stormwater management facility will be required to attenuate stormwater runoff to the existing condition level, prior to discharge to the existing roadside ditch along Gerrie Road.

The privately owned and operated on-site stormwater management facility will be designed, reviewed and approved as part of the site plan approval process for the development block. The on-site stormwater management controls which may be utilized include, but are not limited to, a stormwater management facility (i.e. SWM pond), rooftop storage, parking lot ponding (to a maximum depth of 0.3m), below grade storage (i.e. clear stone storage, superpipe storage, etc.) and oil/grit separators. A preliminary stormwater management facility with approximately 2,085 m^3 of storage has been modelled to provide attenuation levels for the post-development runoff generated by Catchment 2200.

Catchment 2300 (0.48-hectares, 10% Impervious) represents the remainder of the existing residential lot on Gerrie Road. Major and minor storm runoff generated from Catchment 2300 will be directed to the existing roadside ditch on Gerrie Road, ultimately discharging to a tributary of the Grand River.

Catchment 2400 (0.79-hectares, 90% Impervious) represents the apartment block. Runoff generated from Catchment 2400 will be directed to Stormwater Management Facility No. 2, ultimately discharging to a tributary of the Grand River via the existing roadside ditch along Gerrie Road.

Stormwater Management Facility No. 2 has been designed as a dry pond with approximately 1,741 m^3 of storage. Discharging from this pond will be via a multi-stage outlet consisting of a 150 mm knockout for minor storms and a 300mm diameter orifice for major storms, as well as a 10 m wide overflow weir.

Quality control treatment (80% TSS removal) for runoff generated from Catchment 2100 and 2400 will be provided by one (1) oil/grit separator structure. The oil/grit separator structure (Stormceptor STC 6000 or approved equivalent) will be located at the inlet to Stormwater Management Facility No. 2.

Catchment 3200 (0.53-hectares, 60% Impervious) represents five (5) new single family lots and a portion of Walser Street that form part of the Ville Lora Downs North Phase III development. Minor storm runoff generated from Catchment 3200 will be directed to the existing storm sewers on Walser Street. Major storm runoff generated from Catchment 3200 will sheetflow overland to the existing Walser Street right-of-way.

Catchment 3300 (0.24-hectares, 60% Impervious) represents three (3) new single family lots and a portion of Walser Street that form part of the Ville Lora Downs North Phase III development. Minor storm runoff generated from Catchment 3300 will be directed to the existing storm sewers on Walser Street. Major storm runoff generated from Catchment 3300 will discharge overland to the existing Walser Street right-of-way.

Quality and quantity control for stormwater runoff generated from Catchments 3200 and 3300 will be provided by the existing stormwater management facilities approved and constructed as part of the Villa Lora Downs North Phase II development.

Catchment 4000 (7.33 hectares, 0% impervious) represents the remainder of the site, which is a natural heritage feature consisting of a woodlot and wetland area. Runoff generated from Catchment 4000 will continue to sheetflow overland, ultimately discharging to the existing swale in Drimmie Park and the existing storm sewers on Keating Drive.

Table No. 8 lists the uncontrolled flow rate and runoff volumes generated from each catchment area shown on Figure No. 4, for the 2, 5, 10, 25, 50 and 100-year design storm events and the Regional storm.

Table No. 8: Post-Development Uncontrolled Flow Rate and Runoff Volume

	CATCHMENTS																
	1000	**1100**	**1200**	**1300**	**1400**	**1500**	**1600**	**4000**	**To Ex. Wetland**	**2100**	**2200**	**2300**	**2400**	**To Roadside Ditch**	**3200**	**3300**	**To Walser Street**
2-Year																	
Flow Rate (m^3/s)	0.641	0.009	0.021	0.076	0.024	0.105	0.033	0.001	**0.899**	0.223	0.130	0.011	0.127	**0.488**	0.057	0.026	**0.083**
Runoff Volume (m^3)	1,175.5	32.9	37.6	144.9	68.2	190.9	62.0	16.2	**1,728.2**	377.7	205.8	42.8	202.0	**828.3**	102.4	46.4	**148.8**
5-Year																	
Flow Rate (m^3/s)	0.905	0.028	0.029	0.111	0.038	0.146	0.048	0.019	**1.288**	0.304	0.176	0.030	0.175	**0.676**	0.082	0.037	**0.119**
Runoff Volume (m^3)	2,031.5	76.2	65.1	251.4	133.2	330.9	107.5	156.6	**3,152.3**	638.8	338.3	89.7	325.2	**1,392.0**	173.5	78.6	**252.1**
10-Year																	
Flow Rate (m^3/s)	1.059	0.043	0.037	0.137	0.056	0.174	0.060	0.050	**1.538**	0.359	0.206	0.045	0.205	**0.802**	0.099	0.045	**0.144**
Runoff Volume (m^3)	2,665.0	111.7	85.4	330.0	184.0	434.9	141.1	326.8	**4,278.9**	830.1	433.4	127.0	411.7	**1,802.2**	225.2	102.0	**327.2**
25-Year																	
Flow Rate (m^3/s)	1.251	0.065	0.047	0.173	0.082	0.213	0.076	0.114	**1.870**	0.435	0.245	0.067	0.242	**0.972**	0.122	0.055	**0.178**
Runoff Volume (m^3)	3,471	160.0	111.3	430.8	251.3	568.2	183.8	606.6	**5,783.0**	1,073.0	552.8	177.2	518.7	**2,321.7**	290.9	131.7	**422.6**
50-Year																	
Flow Rate (m^3/s)	1.406	0.082	0.055	0.203	0.105	0.242	0.089	0.183	**2.147**	0.491	0.275	0.086	0.270	**1.103**	0.141	0.064	**0.205**
Runoff Volume (m^3)	4,119.0	200.4	132.0	512.1	306.8	675.6	218.5	874.1	**7,038.3**	1,267.8	647.8	218.8	603.0	**2,737.4**	343.5	155.5	**499.0**
100-Year																	
Flow Rate (m^3/s)	1.559	0.101	0.063	0.233	0.129	0.277	0.102	0.268	**2.433**	0.554	0.306	0.105	0.297	**1.241**	0.160	0.072	**0.232**
Runoff Volume (m^3)	4,779.0	242.1	152.9	594.6	363.6	785.9	253.9	1,180.1	**8,352.2**	1,466.7	744.1	261.6	687.8	**3,160.3**	396.7	179.7	**576.4**
Regional Storm																	
Flow Rate (m^3/s)	0.744	0.055	0.027	0.102	0.071	0.129	0.044	0.619	**1.676**	0.232	0.112	0.055	0.100	**0.500**	0.065	0.029	**0.094**
Runoff Volume (m^3)	15,873.0	1031.7	490.7	1,915.0	1,379.9	2,555.4	811.9	9,470.4	**33,528.3**	4,559.9	2,173.8	1,044.2	1,883.5	**9,661.4**	1,222.1	553.4	**1,775.5**

d) Routing

Table No. 9 compares the routing results through the proposed Infiltration Gallery No. 1.

Table No. 9: Catchment 1200, 1300 & 1600 – Infiltration Gallery No. 1 Available Stage/Storage/Discharge

CONTROL	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m
Bottom of Stone	0.000	0.0	411.83	---	---	---
2-Year	---	---	---	0.000	240.5	412.47
Top of Stone	0.000	301.1	412.70	---	---	---
CB Lip (1)	0.000	301.4	413.23	---	---	---
5-Year	---	---	---	0.045	301.8	413.45
10-Year	---	---	---	0.127	302.6	413.66
25-Year	---	---	---	0.254	303.5	413.85
50-Year	---	---	---	0.313	304.2	413.95
100-Year	---	---	---	0.378	304.8	414.04
Regional Storm	---	---	---	0.173	302.8	413.70
CB Lip (2)	0.433	305.2	414.09	---	---	---
Overflow	0.919	309.6	414.49	---	---	---

Table No. 10 compares the routing results through the proposed Infiltration Gallery No. 2.

Table No. 10: Catchment 1400 – Infiltration Gallery No. 2 Available Stage/Storage/Discharge

CONTROL	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m
Bottom of Stone	0.000	0.0	413.92	---	---	---
2-Year	---	---	---	0.001	54.7	414.12
5-Year	---	---	---	0.001	123.5	414.37
10-Year	---	---	---	0.001	138.5	414.42
Top of Stone	0.001	191.8	414.62	---	---	---
Pipe Invert	0.001	191.8	414.72	---	---	---
25-Year	---	---	---	0.017	191.9	414.83
50-Year	---	---	---	0.046	192.2	415.12
Top of Grate	0.053	192.1	415.12	---	---	---
Regional Storm	---	---	---	0.070	192.9	415.13
100-Year	---	---	---	0.090	193.7	415.14
Weir	1.244	304.7	415.42	---	---	---

Table No. 11 compares the routing results through the proposed Stormwater Management Facility No. 1.

Table No. 11: Catchment 1000, 1100, 1200, 1300, 1400, 1500 (minor) & 1600 – Stormwater Management Facility No. 1 Available Stage/Storage/Discharge

CONTROL	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m
CB Lip 1 Elevation	0.00	0.0	411.00	---	---	---
2-Year	---	---	---	0.089	802.9	411.17
5-Year	---	---	---	0.124	1,636.3	411.33
CB Lip 2 Elevation	0.133	1,994.3	411.40	---	---	---
10-Year	---	---	---	0.214	2,228.2	411.44
25-Year	---	---	---	0.337	2,841.1	411.55
50-Year	---	---	---	0.368	3,461.1	411.66
100-Year	---	---	---	0.399	4,174.8	411.79
Weir	0.415	4,554.3	411.85	---	---	---
Regional Storm	---	---	---	1.028	4,908.1	411.91
Top of Bank	2.088	5,463.6	412.00	---	---	---

Table No. 12 gives the results of the post-development condition of the existing wetland.

Table No. 12: Wetland Available Stage/Storage/Discharge

CONTROL	Available Capacity			Actual Capacity Used			Drawdown Time (hr)**
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	
Wetland Bottom	0.000	0.0	409.63	---	---	---	---
2-Year	---	---	---	0.089	54.3	409.65	9.3
5-Year	---	---	---	0.142	86.7	409.66	11.4
10-Year	---	---	---	0.256	156.2	409.68	12.5
25-Year	---	---	---	0.437	266.7	409.71	12.9
50-Year	---	---	---	0.525	317.7	409.73	13.3
100-Year	---	---	---	0.633	383.7	409.74	13.8
Regional Storm	---	---	---	1.555	1,016.4	409.83	60.0
Overflow	18.965	15,227.7	410.75	---	---	---	---

Table No. 13 gives the results of the post-development condition drainage channel routing downstream of the existing wetland.

Table No. 13: Wetland (Post-Development Condition Drainage Channel Downstream of Wetland – Section 1 of 2)

	Channel Design Capacity			Actual Channel Capacity Used		
	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s
2-Year	---	---	---	0.089	0.158	0.532
5-Year	---	---	---	0.142	0.188	0.598
10-Year	---	---	---	0.256	0.235	0.693
25-Year	---	---	---	0.437	0.287	0.792
50-Year	---	---	---	0.525	0.307	0.830
100-Year	---	---	---	0.633	0.330	0.869
Regional Storm	---	---	---	1.555	0.462	1.088
Top of Bank	10.655	0.95	1.602	---	---	---

Table No. 14 gives the results of the post-development condition drainage channel routing downstream of the existing wetland.

Table No. 14: Wetland (Post-Development Condition Drainage Channel Downstream of Wetland – Section 2 of 2)

	Channel Design Capacity			Actual Channel Capacity Used		
	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s	Peak Flow m^3/s	Average Channel Depth m	Velocity m/s
2-Year	---	---	---	0.089	0.080	0.500
5-Year	---	---	---	0.142	0.104	0.589
10-Year	---	---	---	0.256	0.146	0.718
25-Year	---	---	---	0.437	0.198	0.852
50-Year	---	---	---	0.524	0.219	0.902
100-Year	---	---	---	0.632	0.243	0.955
Regional Storm	---	---	---	1.546	0.393	1.243
Top of Bank	9.246	0.950	1.966	---	---	---

Table No. 15 compares the routing results through the proposed Stormwater Management Facility No. 2.

Table No. 15: Catchment 2100, 2400 – Stormwater Management Facility No. 2 Available Stage/Storage/Discharge

CONTROL	Available Capacity			Actual Capacity Used		
	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m	Peak Flow m^3/s	Storage Volume m^3	Storage Elevation m
120mm Knockout	0.00	0.0	410.65	---	---	---
2-Year	---	---	---	0.027	397.2	411.06
CB Lip Elevation	0.029	439.4	411.10	---	---	---
5-Year	---	---	---	0.119	549.3	411.19
10-Year	---	---	---	0.139	691.0	411.30
25-Year	---	---	---	0.158	910.4	411.46
50-Year	---	---	---	0.171	1,094.5	411.58
Weir	0.178	1,201.7	411.65	---	---	---
Regional Storm	---	---	---	0.268	1,222.6	411.66
100-Year	---	---	---	0.289	1,227.0	411.66
Top of bank	2.575	1,741.7	411.95	---	---	---

Table No. 16 summarizes the post-development flow rates from the site.

Table No. 16: Summary of Post-Development Flow Rates and Runoff Volumes from the Site

	CATCHMENTS										
	1000, 1100, 1200, 1300, 1400, 1500 (minor), 1600 (controlled)	**1500 (major) (uncontrolled)**	**4000 (uncontrolled)**	**To Ex. Wetland**	**2100, 2400 (controlled)**	**2200 (controlled)**	**2300 (uncontrolled)**	**To Roadside Ditch**	**3200 (uncontrolled)**	**3300 (uncontrolled)**	**To Walser Street**
2-Year											
Flow Rate (m^3/s)	0.089	0.000	0.001	**0.089**	0.027	0.008	0.011	**0.043**	0.061	0.026	**0.087**
Runoff Volume (m^3)	1,399.2	0.0	16.2	**1,415.4**	579.7	205.8	42.8	**828.3**	101.7	46.4	**148.1**
5-Year											
Flow Rate (m^3/s)	0.124	0.000	0.019	**0.142**	0.119	0.012	0.030	**0.149**	0.084	0.037	**0.121**
Runoff Volume (m^3)	2,799.3	0.0	156.6	**2,955.9**	964.0	338.3	89.7	**1,392.0**	172.5	78.6	**251.1**
10-Year											
Flow Rate (m^3/s)	0.213	0.028	0.050	**0.263**	0.139	0.014	0.045	**0.189**	0.098	0.045	**0.143**
Runoff Volume (m^3)	3,686.0	10.7	326.8	**4,023.5**	1,241.8	433.4	127.0	**1802.2**	224.1	102.0	**326.1**
25-Year											
Flow Rate (m^3/s)	0.337	0.067	0.114	**0.449**	0.158	0.026	0.067	**0.225**	0.115	0.055	**0.170**
Runoff Volume (m^3)	4,898.9	46.1	606.6	**5,551.6**	1,591.7	552.8	177.2	**2,321.7**	288.9	131.7	**420.6**
50-Year											
Flow Rate (m^3/s)	0.368	0.096	0.183	**0.543**	0.171	0.058	0.086	**0.260**	0.129	0.064	**0.193**
Runoff Volume (m^3)	5,795.6	90.8	874.1	**6,760.5**	1,870.8	647.8	218.8	**2,737.4**	341.6	155.5	**497.1**
100-Year											
Flow Rate (m^3/s)	0.401	0.131	0.268	**0.653**	0.289	0.093	0.105	**0.431**	0.144	0.072	**0.217**
Runoff Volume (m^3)	6,819.0	145.5	1,180.1	**8,144.6**	2,154.5	744.1	261.6	**3,160.2**	395.1	179.7	**574.8**
Regional Storm											
Flow Rate (m^3/s)	1.058	0.000	0.619	**1.677**	0.268	0.096	0.055	**0.406**	0.062	0.029	**0.091**
Runoff Volume (m^3)	23,614.6	0.0	9,470.4	**33,085.0**	6,443.4	2,173.8	1,044.2	**9,661.4**	1,238.7	553.4	**1,792.1**

The following table compares the proposed release rates to the post-development flow rates for the site.

Table No. 17: Comparison of Release Rates and Post-Development Conditions Flow Rates

DESIGN STORM	To Ex. Wetland		To Tributary of Grand River		To Walser Street	
	Proposed Release Rate (m^3/s)	Post Flow Rate (m^3/s)	Proposed Release Rate (m^3/s)	Post Flow Rate (m^3/s)	Proposed Release Rate (m^3/s)	Post Flow Rate (m^3/s)
2 Year	0.093	0.090	0.043	0.043	0.106	0.087
5 Year	0.331	0.142	0.152	0.149		0.121
10 Year	0.517	0.263	0.263	0.189	0.122	0.143
25 Year	0.940	0.449	0.435	0.225	0.150	0.170
50 Year	1.261	0.543	0.592	0.260	0.173	0.193
100 Year	1.614	0.671	0.763	0.431	0.196	0.217
Regional	1.582	1.674	0.840	0.406	0.080	0.094

Therefore, the post-development runoff generated from the site will be attenuated to the less than the proposed release rates to the existing wetland and to the Grand River tributary. Minor runoff generated from the site and conveyed to existing storm sewers on Walser Street is within 15% of the previously identified release rate. Based on our review of the flow rates, surcharged hydraulic grade lines, and storm sewer depth along Walser Street, the surcharge during the 5-year design storm event is minimal and is contained below ground. Therefore, in our opinion the existing storm sewer on Walser Street has capacity to convey the proposed 5-year post-development flow rates. In addition, major stormwater flows to Walser Street exceed the release rate included in the Ville Lora Downs Subdivision by approximately $0.020m^3/s$ under the major design storm events, equivalent to a 35% increase in contributing area. The increased runoff under major storms is minimal enough to be conveyed within the Walser Street and Keating Drive right-of-way.

5.3.4 MINOR / MAJOR DRAINAGE SYSTEM

Minor storm drainage will be conveyed to the proposed stormwater management facilities and the existing storm sewers on Walser Street via storm sewers with the capacity to convey the 5-year design storm event.

The major storm runoff generated from Street 1, and a portion of Street 2, Street 3 and Street 4 will discharge to the proposed stormwater management facility located east of the existing wetland (Stormwater Management Facility No. 1), which outlets to the existing wetland, ultimately discharging to the existing storm sewers on Keating Drive.

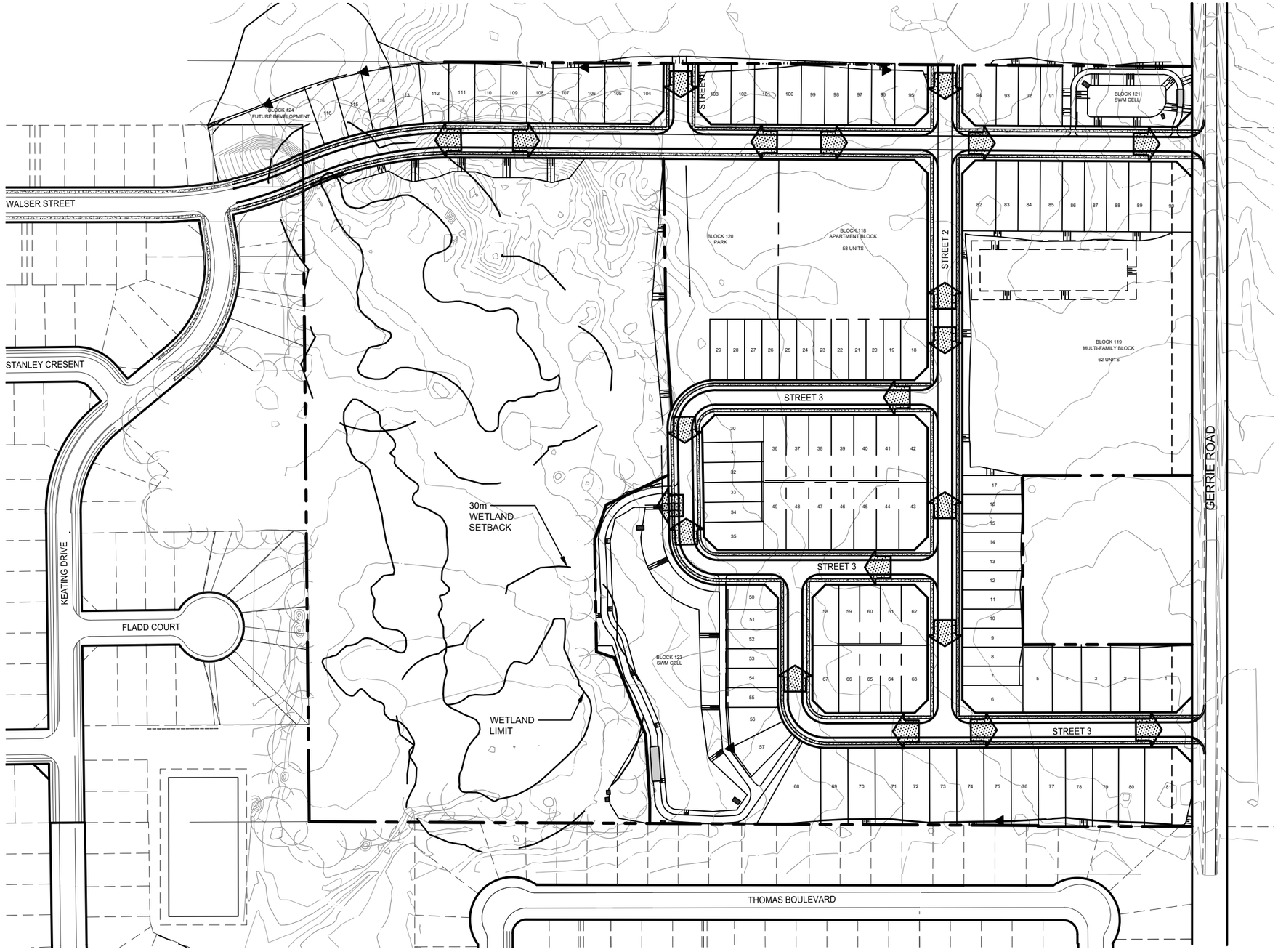
The major storm runoff generated from the remainder of Street 2 and a portion of the Walser Street extension will discharge to the proposed stormwater management facility (Stormwater Management Facility No. 2), ultimately discharging to a tributary of the Grand River.

The major storm runoff generated from the remainder of the Walser Street extension will discharge directly to the existing Walser Street Right-of-Way, ultimately discharging to the Keating Drive Right-of-Way.

Preliminary analysis indicates that the municipal right-of-way has the capacity to convey the runoff from a major design storm event.

The major design storm drainage patterns expected for the Ainley Farm Subdivision are shown on Figure 5.

411009
AINLEY FARM
SUBDIVISION
TOWNSHIP OF CENTRE
WELLINGTON (ELORA)



LEGEND

MAJOR OVERLAND FLOW

MAJOR STORM
DRAINAGE PATTERN
PLAN

FIGURE No. 5

BluePlan ENGINEERING

JOB NUMBER 411009
FEBRUARY 2019
Scale: 1:2500

5.4 WATER BUDGET

The average annual precipitation for the site is estimated to be 945.9 mm. This amount is based on precipitation data recorded at the Fergus Shand Dam meteorological station for the period from 1981 to 2010.

From the Preliminary Geotechnical Investigation (CMT Engineering Inc., March 26, 2006), the surficial deposits across the majority of the site are described as native silt tills, with some sandy silt tills. As there are no areas of consistent sandy soils across the site, the characteristics of the silt tills will be used to develop the water budget analysis across the site.

The potential for evapotranspiration for this area is estimated to be 557.8 mm for the pervious surfaces. Therefore, 388.1 mm remain available for infiltration and runoff from the silt till.

Per Table 3.1 of the Stormwater Management Planning and Design Manual (Ministry of Environment, dated 2003), a silt till, which acts similar to clay (hence the low conductivity values), in flat cultivated land has an approximate infiltration rate of 87 mm/yr. Therefore, the runoff is estimated to be 301.1 mm/yr.

Based on the annual infiltration rates, the existing annual average groundwater recharge occurring within the 21.46-hectare site, and 1.24 hectares of external areas discharging to the site, is estimated to be 12,719 m^3. Under post-development conditions, the annual average groundwater recharge occurring on-site and within the external areas naturally is estimated to be 5,492 m^3. The additional annual recharge that will occur on-site via the two (2) proposed infiltration galleries is estimated to be 7,438 m^3, resulting in a total post-development annual recharge rate of 12,930m^3. Therefore, the infiltration rates from existing conditions have been maintained under post-development conditions via two (2) infiltration galleries.

Under existing conditions, the annual average runoff from the site and external areas is estimated to be 68,350 m^3. As a result of the proposed development the impervious area (rooftop and paved surfaces) of the site increases, the annual potential evapotranspiration for impervious surfaces decreases to 200 mm and the runoff from the site increases. The runoff from the site and external areas under post-development conditions is estimated to be 97,261 m^3 per year.

The estimated existing and post-development recharge and runoff volumes for the Ainley Farm Subdivision are detailed in Table No. 18. The estimations take into account the surficial geology, which is comprised mainly of glacial tills. The net recharge values are for the uppermost overburden aquifer. The water budget analysis has been included in Appendix D.

Table No. 18: Summary of Recharge and Runoff Volume

	Existing Condition	Post-Development Condition	Percent Change
Total Estimated Recharge	12,719 m^3	12,930 m^3	+1.7%
Total Estimated Runoff	68,350 m^3	97,261 m^3	+42.3%

6.0 SEDIMENT AND EROSION CONTROL PLAN

A silt fence will be installed along the property boundary. The silt fence will serve to minimize the opportunity for water borne sediments to be transported from the site to the adjacent properties.

Temporary straw bale check dams will be installed in rear yard swales after the initial grading has been completed to slow the flow rates and promote the settlement of water borne sediments before they reach the silt fences and stormwater management facilities.

Upon completion of the grading, any area not subject to active construction within 30 days will be top soiled and seeded as per OPSS 572.

Once catch basins have been installed, the grates will be wrapped in filter cloth. This feature will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing and sediment and erosion controls will start after installation is complete. These features will be inspected on a weekly basis or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the controls found to need repair.

Once construction and landscaping within the limits of the subdivision has been substantially completed (75% house building construction is complete), the silt fence will be removed, any accumulated sediment will be collected, and the area will be restored.

After construction of the subdivision, erosion and sediment transport will be minimal.

7.0 MAINTENANCE PLAN

A two-phase maintenance plan is recommended. Phase I will address the short-term more intensive maintenance necessary during and immediately after construction. Once all landscaping has been completed, maintenance will shift to Phase II.

As outlined in the section on Sediment and Erosion Control, Phase I will include weekly inspection of all sediment and erosion control devices plus “as needed” inspection after significant rainfall, with the repair of any damaged works and collection of captured sediment.

Phase II will be the maintenance carried out by the Township of Centre Wellington after all construction has been completed. This work will involve a yearly visual inspection of the stormwater management facilities and catch basins to determine the amount of sediment accumulation. Sediment should be removed as required and the recommended vegetation replanted.

8.0 CONCLUSIONS

From the foregoing analysis, the following conclusions are drawn:

- Water supply for the Ainley Farm Subdivision will be provided via the extension of a 200 mm diameter watermain along the Walser Street extension, Street No. 2 and a portion of Street No. 1. A 150 mm diameter watermain will be extended along the remainder of Street No. 1, Street No. 3, and Street No. 4.
- Sanitary service for the proposed lots along the Walser Street extension and a portion of Street No. 2 will be provided by the extension of a 200 mm diameter sanitary sewer from the existing 200 mm diameter sanitary sewer on Walser Street. Sanitary service for the remainder of the site will be provided by the extension of a 200 mm diameter sanitary sewer on easement from the existing 200 mm diameter sanitary sewer on Keating Drive.
- Storm sewers will be designed to convey the 5-year design storm event and will discharge to the two (2) stormwater management facilities and the existing storm sewer on Walser Street.
- Major storm runoff will be conveyed within the limits of the street right-of-ways to the two (2) stormwater management facilities and the existing Walser Street right-of-way.
- As per the Township of Centre Wellington municipal standards, foundation drainage will be collected in sump pits in each residential unit and pumped to the storm sewer system located within the municipal right-of-way.
- Quantity control for runoff generated from the development will be provided by two (2) stormwater management facilities,
- Quality control for runoff generated from the development will be provided by four (4) oil/grit separators (Stormceptor or approved equivalent).
- The post-development runoff generated from the site will be attenuated to the less than the proposed release rates to the existing wetland and to the Grand River tributary.
- Minor runoff generated from the site and conveyed to existing storm sewers on Walser Street is within 15% of the previously identified release rate and is contained below grade. Therefore, the existing storm sewer on Walser Street has capacity to convey the proposed 5-year post-development flow rates. Major stormwater flows to Walser Street exceed the release rate included in the Ville Lora Downs Subdivision by approximately 0.020m^3/s under the major design storm events, equivalent to a 35% increase in contributing area. The increased runoff under major storms is minimal enough to be conveyed within the Walser Street and Keating Drive right-of-way.
- Infiltration rates from existing conditions have been maintained under post-development conditions via two (2) infiltration galleries.
- During the construction phase, the erosion control measures will minimize the transport of sediment off-site during the construction period.

All of which is respectfully submitted.

GM BLUEPLAN ENGINEERING LIMITED
Per:

Sarah Primmer, P. Eng.
SP/pw
W:\Kitchener\411-2011\411009\Documents\Reports, Manuals, Contracts\411009 Prelim Servicing and SWM Report_revised_2019-07-03.docx

APPENDIX A

PRELIMINARY GEOTECHNICAL INVESTIGATION

CMT ENGINEERING INC.

MARCH 29, 2006

PRELIMINARY GEOTECHNICAL INVESTIGATION

AINLEY SUBDIVISION
TOWNSHIP OF CENTRE WELLINGTON
VILLAGE OF ELORA, ONTARIO

CMT Project 06-004

Prepared For:

Gamsby and Mannerow Limited

March 29, 2006

CMT ENGINEERING INC.

CMT Engineering Inc.
1011 Industrial Crescent, Unit 1
P.O. Box 159
St. Clements, Ontario N0B 2M0
Tel: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

March 29, 2006 06-004.R01

Gamsby and Mannerow Limited
255 Woodlawn Road West, Suite 210
Guelph, Ontario
N1H 8J1

Attention: Mr. Glenn Anderson, C.E.T.

Dear Sir:

Re: Preliminary Geotechnical Investigation
Ainley Subdivision
Township of Centre Wellington
Village of Elora, Ontario

As requested, CMT Engineering Inc. conducted a subsoil investigation at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements and we thank you for this opportunity to have been of service. Should you have any questions, please do not hesitate to contact our office.

Yours very truly,

Robert Koopmans, P.Eng.

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1.0 INTRODUCTION

The services of CMT Engineering Inc. were retained by Mr. Glenn Anderson of Gamsby and Mannerow Limited to carry out a subsurface investigation for the proposed Ainley Subdivision in the Township of Centre Wellington (Village of Elora).

It is our understanding that single-family and multi-family residences are proposed to be built on the eastern two-thirds of the property. The western one-third of the property is proposed for open space and may contain a storm water management pond.

The purpose of the investigation was to determine the subsurface soil profile, the water levels in the boreholes and provide recommendations with respect to site grading, bearing capacity for house foundations, trench excavations, bedding and backfilling for service pipes, site dewatering, road construction, pavement design recommendations and soil hydraulic conductivity for storm water management design.

2.0 SITE CONDITIONS

The geotechnical investigation was conducted on Part Lot 18, Concession 12 of the Township of Centre Wellington. In general, the eastern two-thirds of the property is currently farm land, while the western one-third is treed. The site topography undulates slightly and the ground surface elevation drops towards the southwest corner of the property.

3.0 FIELD AND LABORATORY PROCEDURES

On January 25, 2006, a track-mount CME 55 drillrig operated by Aardvark Drilling Inc. was used to drill eight (8) boreholes (referenced as Boreholes 101 to 108) to depths of between 3.5 m (11.5 ft) and 5.0 m (16.4 ft) below the existing ground surface elevation. Standard penetration tests were conducted at 0.76 m (2.5 ft) intervals to depths of 3.0 m (10.0 ft) and at 1.5 m (5.0 ft) intervals below 3.0 m (10.0 ft) in all boreholes. Monitoring wells were installed in all eight boreholes to determine the presence and depth of the groundwater table.

Technical staff from CMT Engineering Inc. observed the drilling operation and collected and logged the recovered soil samples. Soil samples taken from Borehole 102 (3.05 to 3.51 m), Borehole 103 (4.57 to 5.03 m), Borehole 105 (2.29 to 2.74 m) and Borehole 107 (2.29 to 2.74 m) were placed in marked sample bags for grain size analyses (refer to Appendix C for laboratory test results). A bulk sample from Borehole 103 (1.5 to 2.0 m) was submitted for laboratory Proctor testing (refer to Appendix D for the laboratory test results). A small portion of each sample was placed in a sealed marked jar for moisture content determinations.

Gamsby and Mannerow Limited surveyed the ground surface elevations for all boreholes, as well as the tops of the monitoring wells.

Drawing 1 shows the site plan with all of the borehole locations.

4.0 SUBSOIL CONDITIONS

The soil conditions at the borehole locations are summarized briefly below, while a more detailed stratigraphic description is provided in the borehole logs in Appendix A. Cross-section profiles through Boreholes 101-103-102-104 and Boreholes 105-106-107-108 are provided in Appendix B.

4.1 Topsoil

Dark brown silt topsoil was found at the top of all eight boreholes. The topsoil was frozen at the time of the investigation. The thickness of the topsoil ranged from 30 mm to 60 mm (average 42 mm).

4.2 Organic Silt

Organic silt was found underlying the topsoil in Borehole 103. The organic silt was saturated, loose and brown with some sand and occasional topsoil nodules. The moisture content of the organic silt was 83.5% and the N-count was 8 blows per 0.30 m.

4.3 Silt or Sandy Silt

Silt was found underlying the sandy silt in Borehole 105. The silt was very moist, loose and brown with some clay, trace sand and trace gravel. The moisture content of the silt was 18.5% and the N-count was 8 blows per 0.30 m.

Sandy silt was found underlying the topsoil in Borehole 102. In general, the sandy silt was moist, compact and brown with a trace of clay and a trace of gravel. The moisture content was 10.4% and the N-count was 12 blows per 0.30 m.

4.4 Silt Till or Sandy Silt Till

Glacial till comprising silt or sandy silt was found in all boreholes (101 to 108). In general, the silt till was moist, compact to very dense and brown with trace to some sand,

gravel and clay. The moisture content ranged from 6.8% to 20.4% (average 11.7%) and the N-count ranged from 14 to 100 blows per 0.30 m (average 37 blows per 0.30 m). The sandy silt till was generally moist, compact to very dense and brown with trace to some sand, gravel and clay. The moisture content ranged from 7.6% to 26.7% (average 13.4%) and the N-count ranged from 7 to 100 blows per 0.30 m (average 36 blows per 0.30 m).

4.5 Sand or Silty Sand

Sand was found in Boreholes 101, 102, 105 and 107. In general, the sand was very moist to wet, compact and brown with trace silt and/or trace gravel. The moisture content ranged from 14.3% to 20.0% (average 17.2%) and the N-count ranged from 7 to 22 blows per 0.30 m (average 15 blows per 0.30 m).

Silty sand was found in Boreholes 101, 103, 104, 105, 106 and 108. In general, the silty sand was wet to saturated, compact and brown with occasional trace gravel. The moisture content ranged from 10.5% to 27.7% (average 20.8%) and the N-count ranged from 1 to 25 blows per 0.30 m (average 10 blows per 0.30 m).

4.6 Clayey Silt

A localized layer of clayey silt was found in Borehole 107. The clayey silt was moist, compact and brown with trace sand and trace gravel. The moisture content was 13.6% and the N-count was 11 blows per 0.30 m.

4.7 Groundwater Conditions

Monitoring wells were installed in all boreholes. The monitoring wells were constructed utilizing 50 mm Schedule 40 PVC pipe with a 3 m long slot 10 screen surrounded by the sand filter comprising #3 industrial sand. The boreholes were backfilled with 3/8" bentonite holeplug from the top of the sand filter to the existing ground surface. For protection and security purposes, locking steel protective covers were installed on all of the monitoring wells.

A copy of the well record has been included in Appendix E. It is a requirement of Regulation 903 of the Ontario Water Resources Act that the monitoring well installations be abandoned within 180 days after they are no longer in use.

At the time of writing, the static water levels in the monitoring wells had been read on February 8, 2006, February 20, 2006, March 9, 2006, March 25, 2006 and March 29, 2006. A summary showing the ground surface, borehole bottom and water level elevations for Boreholes 101 to 108 are provided below:

Borehole No.	Ground Surface Elevation (m)	Elevation of Borehole Bottom (m)	Elevation of Water Table (m) (F) - Frozen				
			Feb 8, 2006	Feb 20, 2006	Mar 9, 2006	Mar 25, 2006	Mar 29, 2006
101	413.64	408.64	413.07	413.11	412.83	412.96	--
102	414.37	409.37	411.57	411.96	411.91	412.48	--
103	414.89	409.89	412.65	412.98	412.88	412.77	--
104	410.93	407.43	410.36	410.60	410.17	410.66	--
105	414.05	409.28	414.05	414.07 (F)	414.15 (F)	414.15 (F)	414.68
106	410.91	405.94	410.67	410.86 (F)	410.93 (F)	410.75	--
107	409.58	406.08	409.43	409.06 (F)	409.12 (F)	409.41	--
108	410.32	406.82	409.06	409.21	408.82	409.01	--

Due to the close proximity of the groundwater to the ground surface, some of the monitoring wells were frozen at the time of the water level readings.

The groundwater levels will be measured on a monthly basis in an effort to try and establish extreme (high and low) groundwater elevations.

5.0 DISCUSSION

It is our understanding that the property owner is proposing to develop a residential subdivision on the property investigated. The subdivision will be fully serviced with municipal sewers and water supply. A storm water management facility is proposed to be constructed in the western portion of the site.

5.1 Site Grading

Prior to the commencement of any site grading, all topsoil and organic silt soils (Borehole 103) must be removed from the proposed building envelopes (including extended zone of influence areas), road allowance and driveways.

Due to the high water table and isolated wet surface conditions, it may be necessary to utilize an excavator during topsoil stripping to minimize over-excavation as a result of soil disturbance from heavy construction traffic.

At this time, the proposed founding elevations for the residences are not available. However, it would appear that some cut and fill operations will be required to level the building site.

Prior to any placement of structural fill, the subgrade for the building envelope must be prepared large enough to accommodate a 1:1 slope commencing at a distance of 1.0 m beyond the outside edge of the proposed foundation down to approved native founding soils.

Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (1 ft) in depth for granular soils and 0.2 m (8") in depth for fine grained (silt and clay) soils and compacted using adequate heavy vibratory padfoot compaction equipment to a minimum of 98% standard Proctor maximum dry density (SPMDD). The approved structural fill materials must be free of frozen materials, organics or other deleterious materials and must not contain particles exceeding 150 mm (6") in diameter. The soils must be at moisture contents suitable to achieve the specified compaction.

A laboratory Proctor moisture-density test was performed on a bulk sample of the silt till from Borehole 103 (depth 1.5 to 2.0 m). The results of the laboratory Proctor test indicate that the optimum moisture content of the sample is 8.3%. Since the insitu moisture contents of the split spoon sample of silt till ranged from 6.8% to 20.4% (average 11.7%), it should be anticipated that the majority of the silt till will require air-drying in order to achieve the specified compaction during construction.

The fine grained soils encountered in the geotechnical investigation are highly susceptible to strength losses if subjected to frequent disturbance by construction traffic. Therefore, it is recommended to minimize construction traffic on subgrade soils.

It would be recommended that the site grading and underground service installation be undertaken during drier warm weather conditions in order to minimize dewatering operations, eliminate frost problems and most importantly improve the placement and compaction of structural fill and backfill materials. Proper compaction and backfilling operations are imperative in order to provide adequate support for structures, service pipes, driveway and roadways.

If site grading and site servicing is undertaken during cold or wet weather conditions, projected overall costs would be anticipated to be higher and the project would be expected to take longer to complete.

5.2 Site Dewatering

Based on this geotechnical investigation and similar high water tables encountered during the construction of the neighbouring Ville Lora Downs Subdivision, water concerns should be anticipated for this project. Static water levels measured in the monitoring wells suggest that perched groundwater can be expected at the locations of Boreholes 101, 102, 103, 105 and 106 which were advanced within the proposed residential development area. The water appears to be surface water that has perched on top of the relatively impermeable sandy silt till, sandy silt and silt till soils. Furthermore, artesian conditions can also be expected at the locations of Boreholes 101, 102 and 103. The artesian water appears to be located between the upper sandy silt till and lower silt till in Borehole 101, between the upper and lower silt tills in Borehole 102 and below the silt till layer in Borehole 103.

Provisions for site dewatering should be part of the site development and construction process. Normally, it would be recommended that well points be installed in order to dewater the site so that site services and residential foundations could be installed. However, based on past experience, the installation of a well point dewatering system by qualified contractors can be very expensive and not necessarily guaranteed. It is probably most cost-effective to install a series of inverted drainage pipes in advance of the service (sanitary, storm and water) trench excavations and also at the locations of the manholes. Water pumps should be utilized to pump water from the inverted pipes on a continuous basis in order to keep the water table drawn down below the excavation level. Temporary drainage trenches should be constructed to remove the site water to a storm water retention pond (or reasonable alternative). The removal of considerable amounts of fine soil particles from the pumping operation can be anticipated. As such, the drainage trenches, storm water pond, pumps and hoses will most likely require regular cleanout. It might be cost-effective in regard to road construction and house construction to investigate the possibility of installing a permanent deep drainage system to lower the water table in the immediate area. Caution would be necessary with this option, since it could affect wells and building structures on adjacent properties.

The dewatering conditions may improve if work is conducted during the drier summer months as well as following the installation of the services.

5.3 Excavations

The anticipated sanitary, storm and water pipe invert elevations are all expected to be well below the water table and therefore site dewatering will be required (see Section 5.2 above). Based on observations from the neighbouring Ville Lora Downs Subdivision, the water levels in the summer are generally lower and therefore dewatering requirements

may be less. However, the anticipated effects of the artesian water conditions are still expected to be of concern.

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 2 Soils: The native glacial till soils would be classified as Type 2 soils under Reg 213/91 and must be sloped to within 1.2 m of the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. Where excavations expose glacial till soils underlain by wet sand or silt soils, the recommendations for Type 4 soils below must be adhered to.

Type 3 Soils: The native sand and silt soils in an unsaturated condition (above the water table) would be classified as Type 3 soils under Reg 213/91 and must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical.

Type 4 Soils: All native sand or silt soils in a saturated condition (below the water table) would be classified as Type 4 soils under Reg 213/91. Excavations that expose the Type 2 and Type 3 soils noted above but are underlain by saturated sand or silt soils must be treated as Type 4 soils as well. Type 4 soils must be sloped at a minimum gradient of 3 horizontal to 1 vertical. The loose wet condition of the Type 4 soils makes them very susceptible to sloughing and slope failure during excavation.

If it is not practical to excavate according to the above requirements, then a trench box system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized.

It should be noted that some of the native glacial till soils become very dense with depth (N-values in excess of 100 blows per 0.30 m) and may prove difficult to excavate with conventional excavating equipment. It is also imperative that when the very dense soils are utilized for backfilling of service trenches, the material must be broken down (pulverized) to minimize voids and reduce the potential for settlement.

5.4 Service Pipe Bedding

The native soils are generally considered to be suitable for indirect support of the proposed service pipes. Where water inflow is a concern and the soil conditions are not suitable to support the pipe, then 80 mm to 120 mm (3" to 5") river stone (or equivalent) with a 150 mm (6") layer of 19 mm clear stone should be used to create an adequate supporting base for the pipe.

Pipe embedment and backfill for flexible pipes should be undertaken in accordance with OPSD-802.010. Pipe embedment, cover and backfill for rigid pipes should be undertaken in accordance with OPSD-802.030 or OPSD-802.031. Trenching, backfilling and compaction with respect to storm sewer pipe installations should comply with OPSS 514.

Flexible Pipes: The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.030 and OPSD-803.031. The trench excavations should be symmetrical with respect to the centreline of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, then the pipe should consist of 19 mm clear stone (meeting OPS Specifications). Normally, it would be advisable to wrap the clear stone with geotextile to prevent fine soils from entering the clear stone and thereby creating voids around the pipe. In wet conditions, this is not possible to do and generally not necessary since most of the void spaces are quickly filled with fine soils as water (with suspended fine soils) rapidly enters the excavation. It is imperative that the newly installed pipe be backfilled as soon as possible in order to prevent the potential for pipe uplift. This can occur due to buoyancy, as water enters the excavation. It is also advisable to check the elevation of the installed pipe at regular intervals to ensure that uplift has not occurred. Protection against heavy construction equipment should be undertaken in accordance with OPSD-808.010.

Rigid Pipes: In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes except that the minimum depth of bedding below a rigid pipe should be 0.15 *D* (where *D* is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

5.5 Trench Backfill

Native backfill material can be used to fill the trench from 12" (30 cm) above the pipe to the subgrade elevation provided that the material is free of organics, not frozen and is not overly wet (above the optimum moisture).

Based on the existing water table, the moisture contents determined from soil samples that were taken during the geotechnical investigation, and the laboratory Proctor test (see Appendix C), it can be assumed that most soils will be too wet to enable proper compaction. As such, these soils should be allowed to drain and air-dry as long as possible before backfilling.

If wet or frozen soils are used for backfill purposes, proper compaction of the backfill will not be possible and settlement of the trenches can be expected. Site assessments will be required to determine what options can be undertaken to construct a suitable road base. These options may include subexcavating and increasing the thickness of the granular subbase, the possible use of high strength geotextiles, or a combination of both.

5.6 Sensitivity of Subsoils

The silty nature of many of the soils encountered in the boreholes can make them highly susceptible to strength losses and will prove difficult to place and compact if they become overly wet as a result of inclement weather or water seepage. If the soils become overly wet and disturbed, they may become unsuitable for reuse and require subexcavation. As such, the following is recommended:

- provide proper measures for adequate drainage during construction
- use a smooth-lipped bucket while excavating to the subgrade elevation to reduce disturbance
- minimize construction traffic traveling over the subgrade soils

5.7 Road Construction and Pavement Design

In order to achieve a suitable subgrade for the construction of the pavement structure, the following recommendations are provided:

a) If necessary, maintain the site dewatering system during preparation of the road subgrade. Once the road subgrade is completed, the drainage pipes should be removed or cut off at the subgrade elevation and infilled with lean concrete or a bentonite slurry.

b) The design subgrade for the road should be proof-rolled using heavy rubber-tire equipment, such as a grader. Compactive effort should be applied and compaction tests should be undertaken. Areas requiring fill to achieve the subgrade elevation should be treated as indicated above prior to placement of any additional fill. The subgrade should be evaluated to determine if subexcavation and additional Granular 'B' will be required or if the installation of a reinforcing geotextile will be necessary.

c) The road subgrade should be cut to grade using a smooth-lipped bucket. The subgrade should be graded smooth (with no depressions) and sloped at a minimum of 2%. Construction traffic should not be allowed onto the prepared road subgrade. Construction traffic should travel only on the Granular 'B' subbase. It may be necessary to temporarily

increase the thickness of the Granular 'B' during road construction to accommodate the truck traffic.

d) It is recommended that 100 mm diameter perforated subdrains fitted with a filter sock be installed along each curb line to collect and redirect water beneath the pavement surface. It is suggested that the subdrains be installed in a 0.3 m (1 ft) by 0.3 m (1 ft) trench and placed approximately 50 mm (2") from the trench bottom. In drier conditions, the perforated subdrain with a factory-installed filter sock can be installed in Granular 'A' bedding. In wet conditions, 19 mm clear stone wrapped completely in non-woven geotextile (such as Terrafix 270R or equivalent) is recommended. Rapid drainage of the pavement structure is critical to ensure long-term performance of the road.

Based on the anticipated loading and considering that the subsoils contain frost-susceptible soils, the following pavement design is recommended for the proposed roads:

Material	**Recommended Thickness**
Asphaltic Concrete	HL3 - 40 mm (1.5") HL4 or HL8 - 50 mm (2.0")
Granular 'A' Base	150 mm (6.0")
Granular 'B' Subbase	450 mm (18.0")

The granular subbase materials should be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to 97% Marshall bulk relative density in accordance with OPSS 1150 and OPSS 310.

The pavement should be designed to ensure that water will not pond on the pavement surface. If the surface asphalt is not placed in a reasonable time following the placement of the binder asphalt, it is recommended that the catch basin lids be lowered or apertures provided to allow the surface water to drain rather than accumulating around the catch basins.

5.8 Bearing Capacity / Settlement

The proposed residential buildings may be supported on conventional spread and pier footings provided they are founded on undisturbed native soils at or below the elevations listed in the following table or structural fill prepared as detailed in Section 5.1 of this report:

Borehole No.	Existing Ground Surface Elevation (m)	Highest Recommended Footing Elevation (m)	Soil Type
101	413.64	413.01	sandy silt till
102	414.37	412.70	silt till
103	414.89	413.59	silt till
105	414.05	411.65	sandy silt till
106	410.91	408.51	silt till

It is ideally recommended that foundations be constructed above the water table. The native founding soils and structural fill in a drained condition would be considered suitable to support foundations designed with a safe net allowable bearing capacity of 150 kPa. It is anticipated that the water table may be within one footing width below the founding elevation. Therefore, a safe net allowable bearing capacity of 75 kPa should be used for design purposes.

With respect to the bearing capacities as determined above, total and differential settlements are estimated to be within the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

A minimum of 1.2 m (4 ft) of soil cover above the footing grade must be provided for frost protection.

5.9 Residential Drainage Considerations

If high water conditions continue to exist during the construction of the residential foundations, and the foundations are constructed near or below the water table, then the following will be required:

- a granular drainage layer and sump pump will be required as per Section 9.14.4 of the current Ontario Building Code

- slab-on-grades constructed where groundwater levels may cause hydrostatic pressure must be designed to resist such pressures

- slab-on-grade and exterior walls must be waterproofed

If foundation construction occurs above the high water table, then conventional construction methods can be utilized.

5.10 Potential Storm Water Management Facility

Boreholes 104, 107 and 108 were all drilled in the open space area (west side of property) where a storm water management facility is proposed. In general, Borehole 104 has silt till underlain by silty sand. It would appear that artesian conditions are present in the silty sand layer below the more impermeable silt till layer. Based on the monitoring well readings, the water level fluctuates to just below the ground surface elevation.

In general, Borehole 107 has sand underlain by clayey silt and lower sandy silt till. Artesian conditions may be present in the sandy silt till below the more impermeable clayey silt layer. Based on the monitoring well readings, the water level was just below the ground surface elevation. The upper sand layer has a high moisture content due to the infiltration of surface water, which is in turn impeded by the lower clayey silt layer.

In general, Borehole 108 has silty sand underlain by sandy silt till. Artesian conditions may be present in the lower portion of the sandy silt layer below the more impermeable silty sand layer (higher density, lower moisture). Based on the monitoring well readings, the water level has fluctuated to within approximately 1.0 m of the ground surface elevation.

Based on the results of the geotechnical investigation, it can be concluded that the soil and groundwater conditions in the area of Boreholes 104, 107 and 108 are unsuitable for an inground storm water management facility.

6.0 SITE INSPECTIONS

Site grading, dewatering, trench excavations, backfilling and compaction of the service pipes should be supervised by qualified geotechnical personnel to ensure that a suitable subbase is prepared, proper backfill materials are used and that the specified compaction is achieved.

The construction of the pavement structure should also be supervised by qualified personnel to ensure that suitable materials are used and that the specified compaction is achieved. It is also

recommended that the residential foundation excavations be examined to ensure that the bearing capacity of the soil is suitable to support the structures.

CMT Engineering Inc. would be pleased to provide inspection, testing and consulting services for this project.

7.0 LIMITATIONS OF THE INVESTIGATION

This investigation was conducted to determine the subsurface conditions for this project and the comments are based on the information gathered at the borehole locations only. It is therefore assumed that the borehole information is representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the borehole locations, we request that we be notified immediately.

This report is intended solely for the client named. 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.

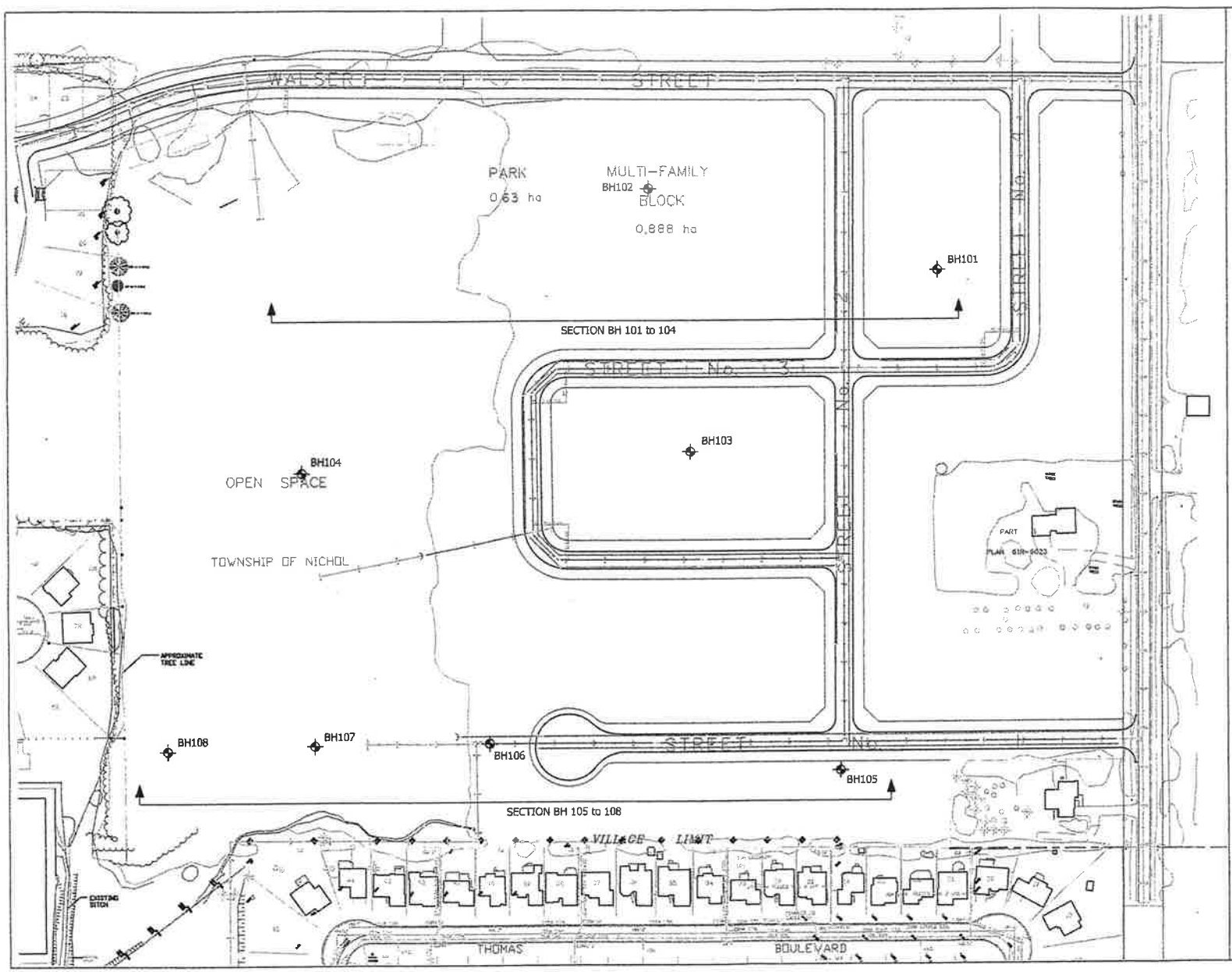
We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Respectfully submitted,

Robert Koopmans, P.Eng.
Consulting Engineer

Tim Salter, C.E.T.

ks



Base plan provided by:

GM

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1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

BOREHOLE LOCATION PLAN

Ainley Subdivision
Township of Centre Wellington
Village of Elora, ON

Project: 06-004	Drawing: 2
Date: Mar. 2006	Sheet: 1
Scale: 1:2000	

APPENDIX A

BOREHOLE LOGS
Boreholes 101 to 108

BOREHOLE 101

Date Drilled: Jan. 25, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 413.64m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation / Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	413.64			
					Topsoil Dark brown silt, frozen	0.00 413.31			
					Sandy Silt Till Compact brown sandy silt till, some clay, some gravel, moist	0.33			
1	SS		1					9.7	22
								20.7	20
2	SS		2			411.84			
					Sand Compact brown sand, very moist to wet	1.80 411.54			
					Silty Sand Compact brown silty sand, wet	2.10		24.9	14
3	SS		3						
					spoon sank through silty sand under weight of rods			27.7	1
4	SS		4			409.64			
					Sand Dense brown sand, trace silt, wet	4.00 408.94		20.4	40
5	SS		5		*Silt Till* Dense brown silt till, some sand, gravel and clay, moist	4.70 408.64			
					End of Borehole	5.00			

Well Installation: 413.07m (Feb 8/06); Stick up well with protective metal casing; Bentonite Seal; #3 Sand Filter; 50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water levels

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BOREHOLE 102

Date Drilled: Jan. 25, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 414.37m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	414.37			
					Topsoil Dark brown silt, frozen	0.00 414.07			
					Sandy Silt Compact mottled brown sandy silt till, trace clay, trace gravel, moist	0.30			
3	SS		1					10.4	12
						413.00			
					Silt Till Compact brown silt till, trace sand, trace gravel, moist	1.37			
6	SS		2					17.6	15
8	SS		3					4.8	30
						411.77			
					Sand Compact brown sand, trace silt, trace gravel, moist to very moist	2.60			
11	SS		4					20.0	22
						410.37			
					Silt Till Dense grey silt till, trace sand gravel and clay, moist	4.00			
16	SS		5					7.7	53
						409.37			
					End of Borehole	5.00			

Bentonite Seal
#3 Sand Filter
411.57m (Feb 8/06)
Stick up well with protective metal casing
50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water levels

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St. Clements, Ontario N0B 2M0
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BOREHOLE 103

Date Drilled: Jan. 24, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 414.89m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation
					Ground Surface (m)	414.89	
					Topsoil Dark brown silt, frozen	0.00	
						414.34	
					Organic Silt Loose brown organic silt, some sand, occasional topsoil nodule, very moist	0.55	
1	SS		1			413.89	
					Silt Till Compact brown silt till, trace sand, trace gravel, moist, becoming dense with depth	1.00	
2	AS		2				
3	SS		3				
	SS		4			411.54	
					Silty Sand Dense brown silty sand, wet	3.35	
4						410.89	
					Becoming loose, trace clay, saturated	4.00	
5	SS		5			409.89	
					End of Borehole	5.00	

Well Installation: Bentonite Seal; #3 Sand Filter; 412.65m (Feb 8/06); Stick up well with protective metal casing; 50mm schedule 40 PVC pipe with slot 10 screen

Moisture Content %
Wp [----X----] Wl
10 20 30 40

Depth (m)	Moisture Content %
1	>508)
2	13.6
3	9.2
4	13.1
5	23.1

Pocket Penetrometer
kPa
100 300

SPT (N)
Blows/0.3 m
10 30 50 70 90

Depth (m)	SPT (N)
1	5
2	20
3	32
4	37
5	6

Please refer to section 4.7 of this report for additional water levels

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St. Clements, Ontario N0B 2M0
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BOREHOLE 104

Date Drilled: Jan. 24, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 410.93m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer ● kPa ● 100 300 SPT (N) ■ Blows/0.3 m ■ 10 30 50 70 90
					Ground Surface (m)	410.93			
					Topsoil Dark brown silt, frozen	0.00			
						410.63			
					Silt Till Compact dark brown silt till, some clay, trace sand, trace gravel, moist	0.30			
3	SS		1				Bentonite Seal	10.2	14
5	SS		2			409.56	#3 Sand Filter	23.0	14
					Silty Sand Compact brown silty sand, saturated	1.37			
8	SS		3					17.8	8
10	SS		4					25.9	10
						407.43			
					End of Borehole	3.50			

Stick up well with protective metal casing

410.36m (Feb 8/06)

50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water level readings

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1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
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BOREHOLE 105

Date Drilled: Jan. 25, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 414.05m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	414.05	Ø 414.05m (Feb 8/06)		
0					*Topsoil* Dark brown silt, frozen	0.00			
						413.67			
1					*Silty Sand* Loose red-brown silty sand, moist	0.38			
2									
3	SS		1					18.5	4
4						412.68			
5					*Silt* Loose brown silt, some clay, trace sand, trace gravel, very moist	1.37		18.5	8
6	SS		2						
7						412.05			
					Sand wet sand seam at 2.0m depth	2.00			
8	SS		3		*Sandy Silt Till* Very dense brown sandy silt till, some clay, trace gravel, moist			7.7	26
9									
10	SS		4					8.1	100
11									
12									
13									
14									
15	SS		5			409.28		7.6	100
					End of Borehole	4.77			
16									
17									
18									
19									

Bentonite Seal
#3 Sand Filter
50mm schedule 40 PVC pipe with slot 10 screen
Stick up well with protective metal casing

Please refer to section 4.7 of this report for additional water level readings

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1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
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BOREHOLE 106

Date Drilled: Jan. 25, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 410.91m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation (Feb 8/06)	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	410.91			
					Topsoil	0.00			
					Dark brown silt, frozen	410.59			
					Silty Sand	0.32			
					Loose mottled grey silty sand, trace gravel, moist				
3 / 1	SS		1					24.0	9
5									
6 / 2	SS		2					12.1	9
						408.81			
7					*Sandy Silt Till*	2.10			
8	SS		3		Dense to very dense grey sandy silt till, trace sand, trace gravel, moist			6.8	33
9									
10 / 3								8.3	28
11	SS		4						
12									
13 / 4									
14									
15								9.0	100
16	SS		5			405.94			
17 / 5					End of Borehole	4.97			
18									
19									

Well Installation (Feb 8/06): 410.67m; Stick up well with protective metal casing; Bentonite Seal; #3 Sand Filter; 50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water level readings

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BOREHOLE 107

Date Drilled: Jan. 24, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 409.58m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION		Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	409.58			
					Topsoil	0.00			
					Dark brown silt, frozen				
						408.98			
					Sand	0.60			
	SS		1		Loose red-brown sand, some silt, moist to wet			14.3	7
						408.21			
					Clayey Silt	1.37			
	SS		2		Compact brown clayey silt, trace sand, trace gravel, moist			13.6	11
						407.48			
					Sandy Silt Till	2.10			
	AS		3		Compact to loose brown sandy silt till, trace clay, saturated			19.1	25
	SS		4					17.3	7
						406.08			
					End of Borehole	3.50			

Well Installation:
- 409.43m (Feb 8/06)
- Stick up well with protective metal casing
- Bentonite Seal
- #3 Sand Filter
- 50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water level readings

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BOREHOLE 108

Date Drilled: Jan. 25, 2006
Rig: CME 55
Contractor: Aardvark
Drilling Method: HSA

Elevation: 410.32m
Logged by: CD

Project No.: 06-004
Project: Ainley Subdivision
Township of Centre Wellington
Location: Elora

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation / Depth	Well Installation	Moisture Content % Wp [----X----] Wl 10 20 30 40	Pocket Penetrometer kPa 100 300 / SPT (N) Blows/0.3 m 10 30 50 70 90
					Ground Surface (m)	410.32			
0					***Topsoil*** Dark brown silt, frozen	0.00			
						409.74			
1					***Silty Sand*** Compact mottled brown silty sand, trace gravel, moist	0.58			
2	SS		1					10.5	25
3						408.95			
4					***Sandy Silt Till*** Dense to loose brown sandy silt till, wet	1.37			
5	SS		2					16.8	38
6									
7									
8	SS		3					19.9	18
9									
10									
11	SS		4					26.7	7
12						406.82			
13					End of Borehole	3.50			
14									

Well Installation: Stick up well with protective metal casing; Bentonite Seal; 409.06m (Feb 8/06); #3 Sand Filter; 50mm schedule 40 PVC pipe with slot 10 screen

Please refer to section 4.7 of this report for additional water level readings

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St. Clements, Ontario N0B 2M0
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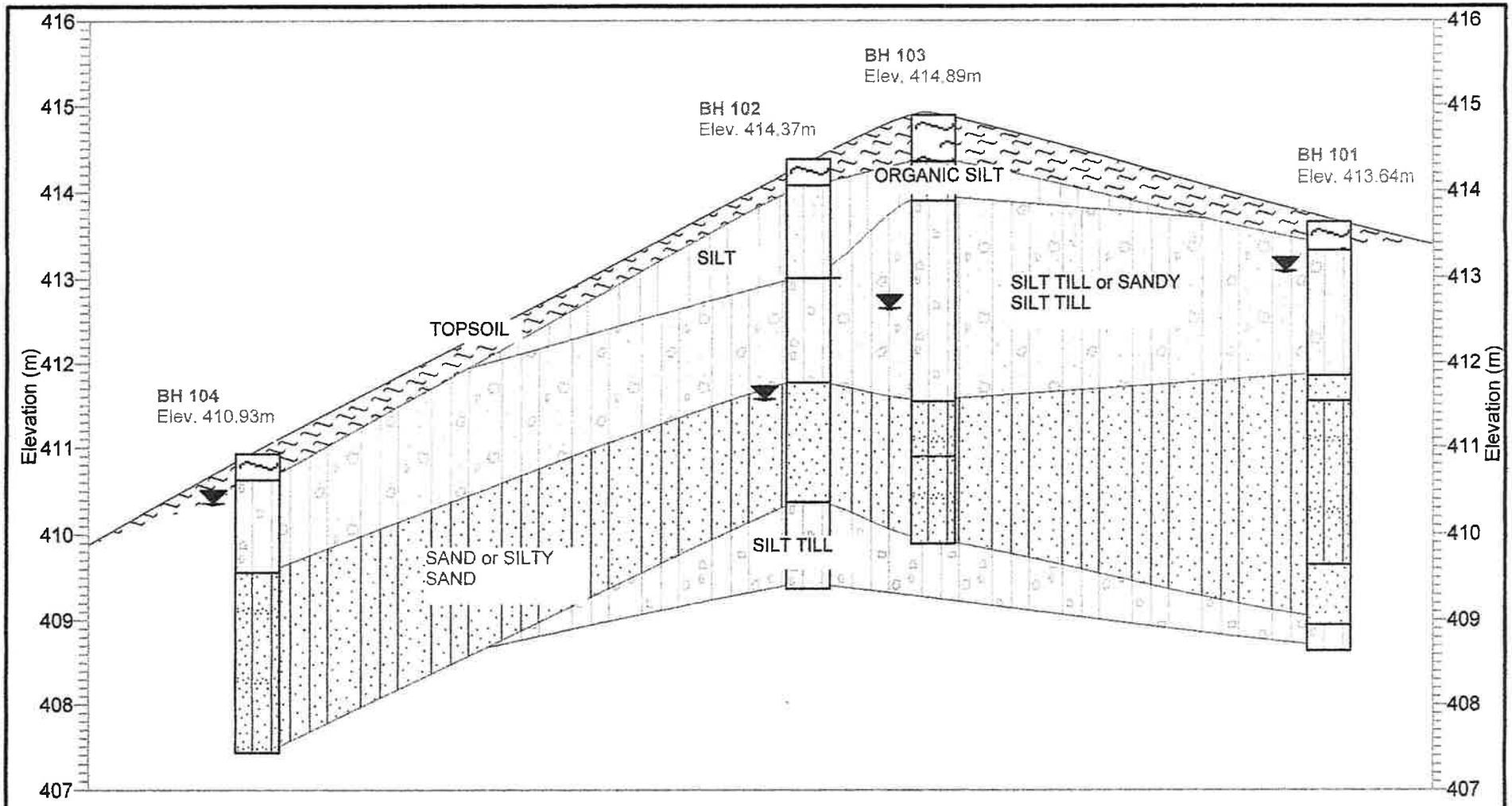
APPENDIX B

CROSS-SECTIONS



CMT ENGINEERING INC.

1011 Industrial Cres.,
Unit 1
St. Clements, Ontario

Project: AINLEY SUBDIVISION

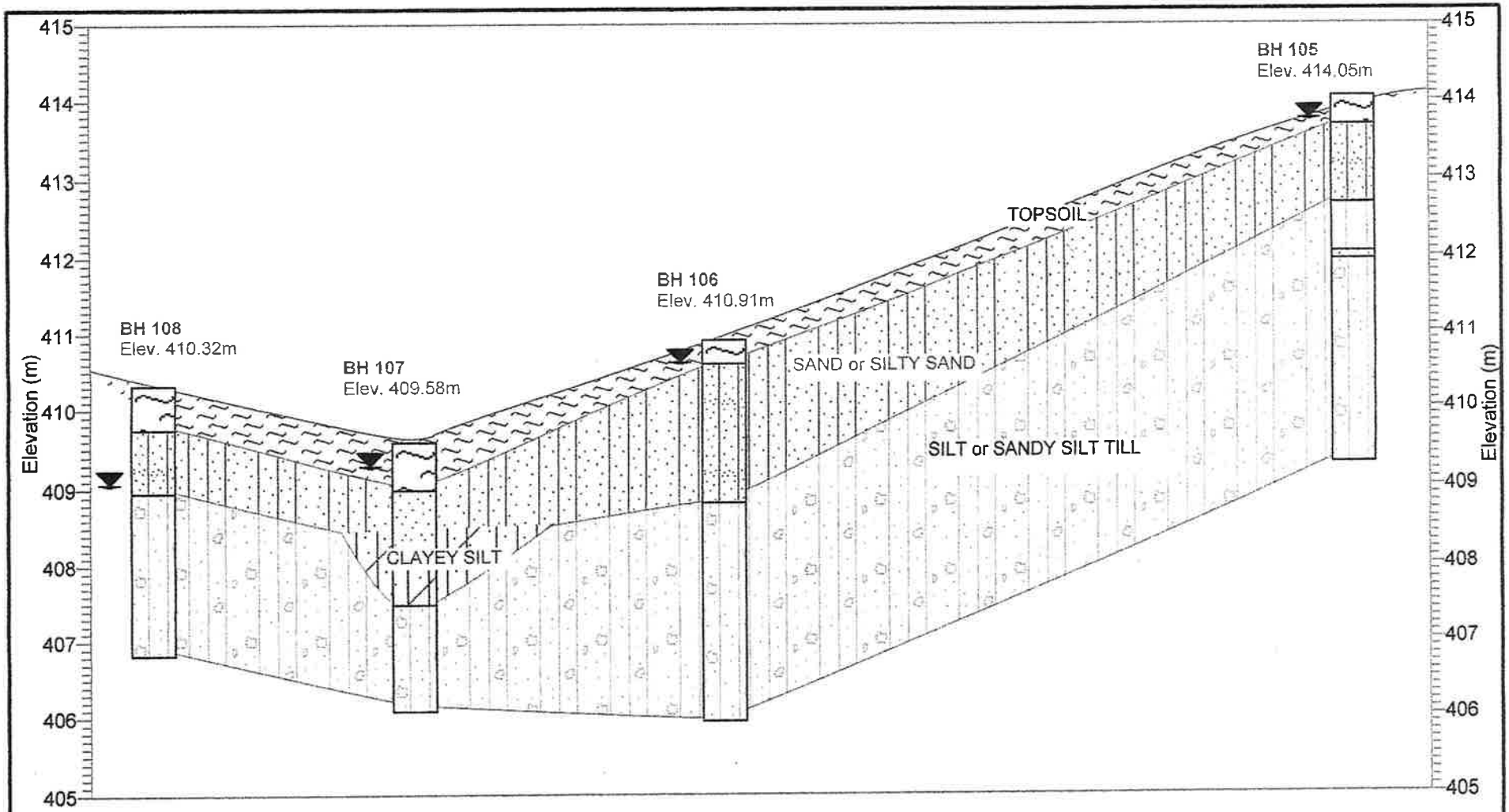
Project Number: 06-004

Location: Elora, Ontario

Drawn By: JS

Date: February, 2006

NOTE: Water levels shown were measured on Feb. 8, 2006. Please refer to Section 4.7 of this report for additional water levels.



CMT ENGINEERING INC.
1011 Industrial Cres.,
Unit 1
St. Clements, Ontario

Project: AINLEY SUBDIVISION

Project Number: 06-004

Location: Elora, Ontario

Drawn By: JS

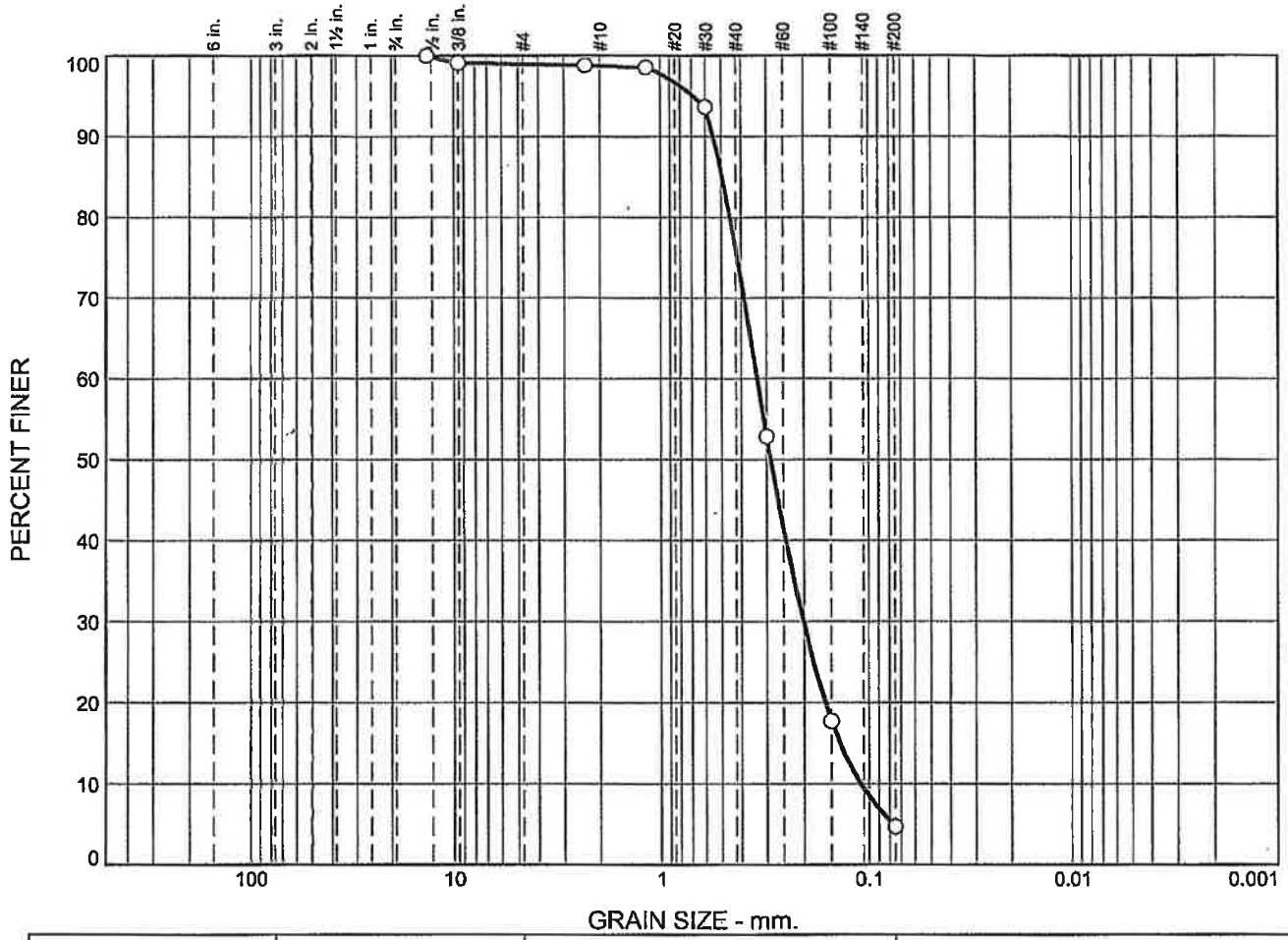
Date: February 2006

NOTE: Water levels shown were measured on Feb. 8, 2006. Please refer to Section 4.7 of this report for additional water levels.

APPENDIX C

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.0	0.2	22.7	71.4	4.7	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH102 - SS4	1	3.05-3.51m	Sand, trace silt, trace gravel	SP
				Tested by CMT - January 27, 2006	

CMT Engineering Inc.

St. Clements, ON

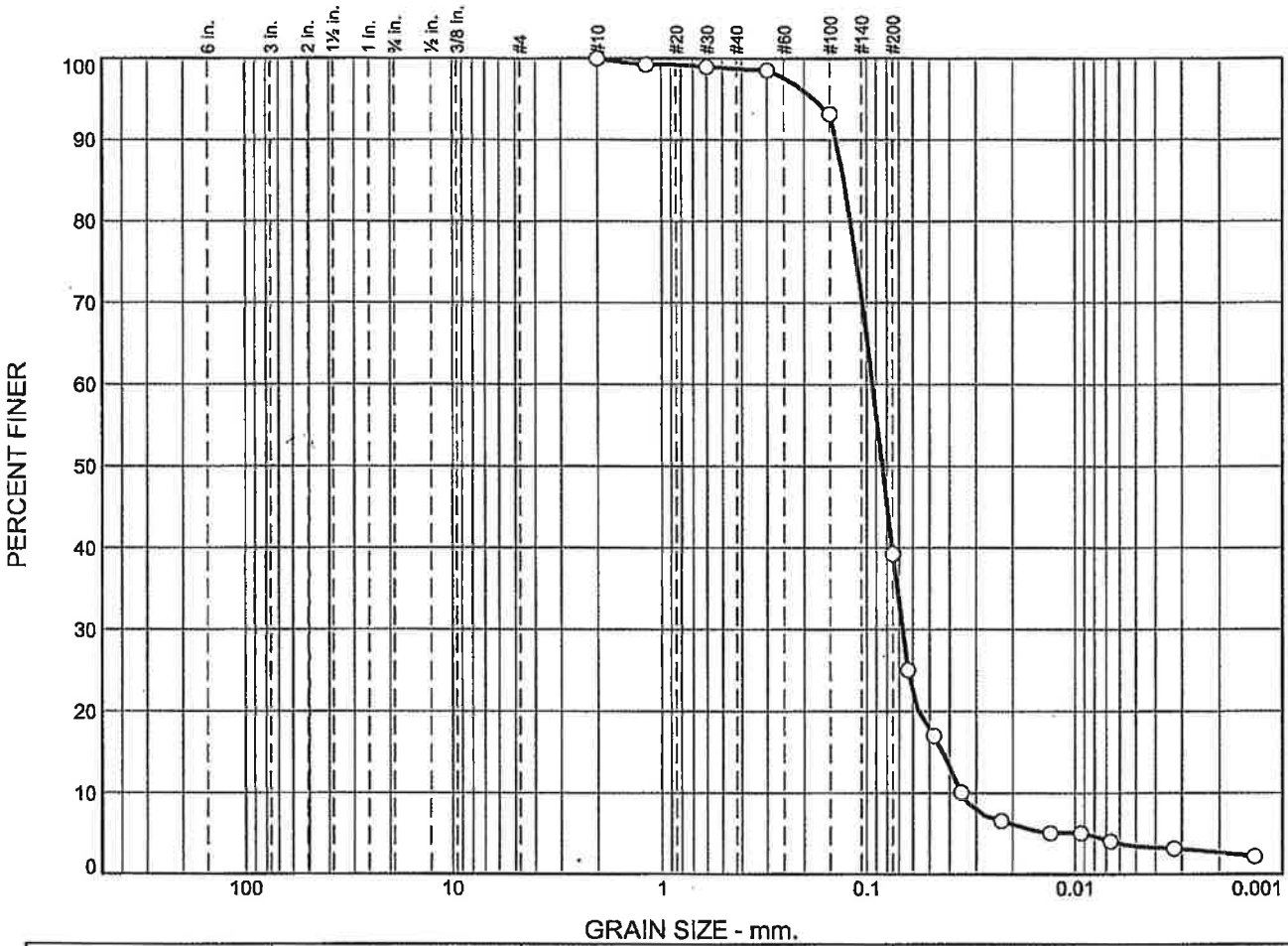
Client: Ainley Subdivision

Project: Township of Centre Wellington
Elora, Ontario

Project No.: 06-004

Figure 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.2	59.5	36.6	2.7

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH103 - SS5	1	4.57-5.03m	Silty sand, trace clay	SM
				Tested by CMT - January 27, 2006	

CMT Engineering Inc.

St. Clements, ON

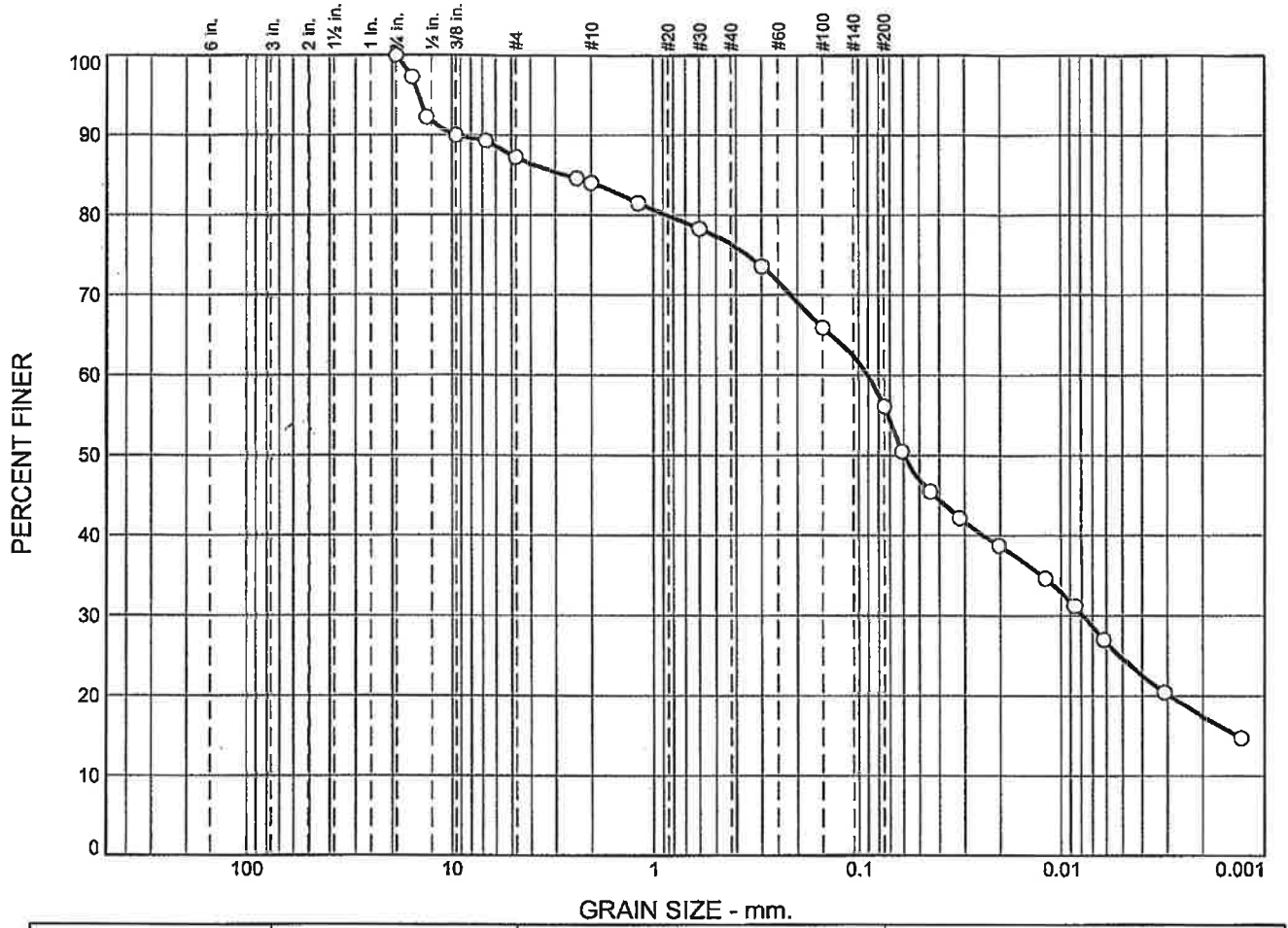
Client: Ainley Subdivision

Project: Township of Centre Wellington
Elora, Ontario

Project No.: 06-004

Figure 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
O	0.0	0.0	12.8	3.2	7.6	20.3	38.7	17.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
O	BH105 - SS3	1	2.29-2.74m	Sandy silt, some clay, some gravel	ML
				Tested by CMT - January 27, 2006	

CMT Engineering Inc.

St. Clements, ON

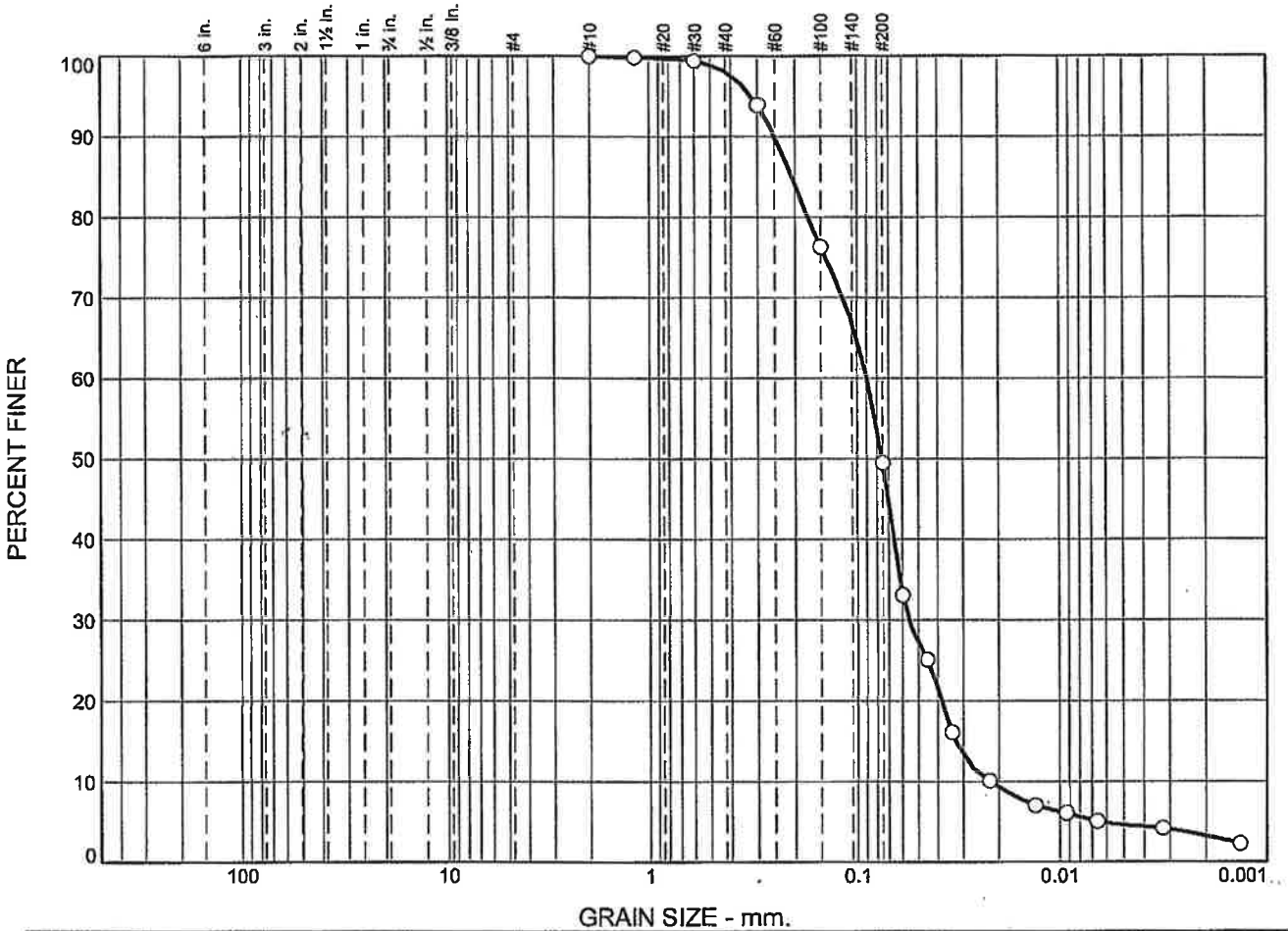
Client: Ainley Subdivision

Project: Township of Centre Wellington
Elora, Ontario

Project No.: 06-004

Figure 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.9	48.6	46.3	3.2

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH107 - SS3	1	2.29-2.74m	Sand and silt, trace clay	SM
				Tested by CMT - January 27, 2006	

CMT Engineering Inc.

St. Clements, ON

Client: Ainley Subdivision

Project: Township of Centre Wellington
Elora, Ontario

Project No.: 06-004

Figure 4

APPENDIX D

LABORATORY PROCTOR TEST

CMT ENGINEERING INC.

LABORATORY PROCTOR TEST

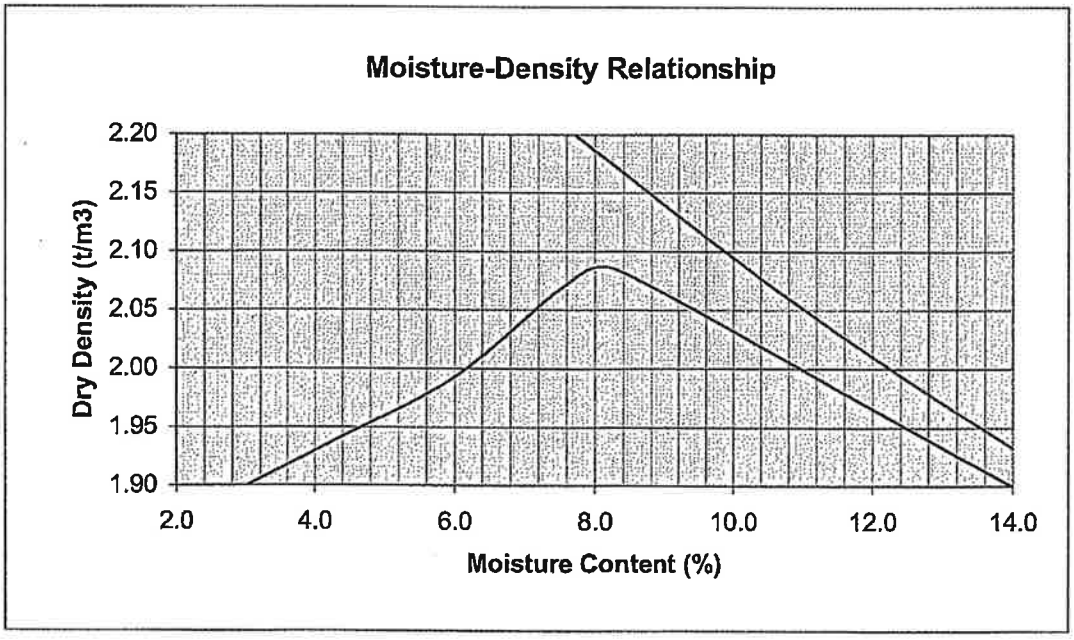
PROJECT NO.: 06-004
PROJECT: Ainley Subdivision
PROJECT LOCATION: Township of Centre Wellington (Elora)

SAMPLED FROM: Borehole 103, BS, depth 1.5 to 2.0 m
DATE SAMPLED/BY: January 25, 2006 by C.D. of CMT Inc.
DATE TESTED/BY: January 26, 2006 by J.S. of CMT Inc.

SOIL TYPE: silt till
REMARKS:

TEST STANDARD:
ASTM D698
PROCEDURE - ☑ A ☐ B ☐ C

ASSUMED SPECIFIC GRAVITY: 2.65
MAXIMUM DRY DENSITY: 2.085 t/m^3
OPTIMUM MOISTURE CONTENT: 8.3%



APPENDIX E

WELL RECORD

Ontario Ministry of the Environment

Well Tag Number (place sticker and print number below): A035811

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only: MUN | CON | LOT

Well Owner's Information and Location of Well Information

Field	Entry
First Name	James
Last Name	Keating
Mailing Address (Street Number/Name, RR,Lot,Concession)	Matheson St.
County/District/Municipality	
Township/City/Town/Village	Elora
Province	Ontario
Postal Code	
Telephone Number (include area code)	
Address of Well Location (County/District/Municipality)	Gerrie Rd.
Township	Centre Wellington
Lot	17-18
Concession	12
RR#/Street Number/Name	
City/Town/Village	Elora
Site/Compartment/Block/Tract etc.	
GPS Reading	NAD 83, Zone, Easting: No SIGNAL, Northing
Unit Make/Model	
Mode of Operation	☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth (Metres) From	To
Brown	SILT TILL			0	1.5
Brown	SILT SAND			1.5	4.5

Hole Diameter

Depth (Metres) From	To	Diameter (Centimetres)
0	4.5	22

Water Record

Water found at Metres / Kind of Water: ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other

After test of well yield, water was: ☐ Clear and sediment free ☐ Other, specify

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth (Metres) From	To
Casing				
4	☒ Plastic		0	1.5
Screen (Outside diam)		Slot No.		
4	☒ Plastic	10	1.5	4.5
No Casing or Screen	☐ Open hole			

Test of Well Yield

Pumping test method; Pump intake set at - (metres); Pumping rate - (litres/min); Duration of pumping ___hrs + ___ min; Final water level end of pumping ___ metres; Recommended pump type ☐ Shallow ☐ Deep; Recommended pump depth ___ metres; Recommended pump rate (litres/min); If flowing give rate - (litres/min); If pumping discontinued, give reason.

Draw Down Time min	Water Level Metres	Recovery Time min	Water Level Metres
Static Level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1	Bentonite Pellets	100 lbs
1	4.5	#3 Well Sand	300 lbs

Method of Construction

☐ Cable Tool ☒ Rotary (conventional) ☐ Rotary (reverse) ☐ Rotary (air) ☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

Water Use

☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☐ Commercial ☐ Municipal ☐ Public Supply ☐ Not used ☐ Cooling & air conditioning ☐ Other

Final Status of Well

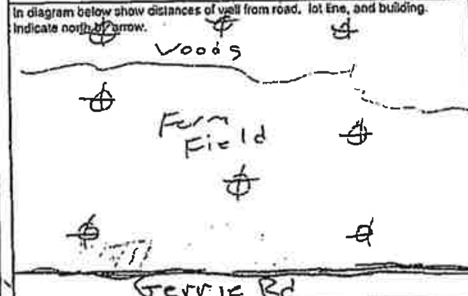
☐ Water Supply ☒ Observation well ☒ Test Hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Unfinished ☐ Dewatering ☐ Replacement well ☐ Abandoned, (Other)

Well Contractor/Technician Information

Field	Entry
Name of Well Contractor	Aardvark Drilling Inc
Well Contractor's Licence No.	7738
Business Address (street name, number, city etc.)	C-25 Lewis Rd. Guelph On N1H 1E9
Name of Well Technician (last name, first name)	Henry, Nathan
Well Technician's Licence No.	T-3305
Signature of Technician/Contractor	x [signature]
Date Submitted (YYYY MM DD)	2006 02 01

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow.



Audit No. Z 39731

Date Well Completed (YYYY MM DD): 2006 01 25

Date Delivered (YYYY MM DD): 2006 02 01

Was the well owner's information package delivered? ☐ Yes ☒ No

Ministry Use Only

Data Source | Contractor | Date Received YYYY MM DD | Date of Inspection YYYY MM DD | Remarks | Well Record Number

0506E (09/03) Contractor's Copy ☑ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

APPENDIX B

GROUNDWATER ELEVATION MONITORING

CMT ENGINEERING INC.

OCTOBER 12, 2012

CMT Engineering Inc.
CONSULTING ENGINEERS
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

(411009)

July 4, 2013

06-004.L71

Gamsby and Mannerow Limited
650 Woodlawn Road West
Block C, Unit 1
Guelph, Ontario
N1K 1B8

Dear Sir:

Re: Groundwater Monitoring
Ainley Subdivision
Elora, Ontario

Attached is a current summary of the water level measurements for the above-referenced site. The graphs have been amended to include total monthly precipitation as recorded at the Environment Canada Fergus MOE Weather Station.

I trust this information meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Yours very truly,

Tim Salter, C.E.T.

ks

Encl - Water Level Measurements

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Feb 8/06	Water Elevation (m) Feb 20/06	Water Elevation (m) Mar 9/06	Water Elevation (m) Mar 25/06	Water Elevation (m) Mar 29/06	Water Elevation (m) Apr 28/06	Water Elevation (m) June 6/06	Water Elevation (m) July 8/06	Water Elevation (m) Aug 7/06	Water Elevation (m) Sept 7/06
101	413.64	413.07	413.11	412.83	412.96	--	412.94	412.59	411.70	411.34	411.00
102	414.37	411.57	411.96	411.91	412.48	--	412.43	412.12	411.78	411.43	411.14
103	414.89	412.65	412.98	412.88	412.77	--	412.76	411.55	410.95	410.43	410.31
104	410.93	410.36	410.60	410.17	410.66	--	410.69	410.15	409.15	408.71	408.52
105	414.05	414.05	414.07 (F)	414.15 (F)	414.15 (F)	414.68	413.44	412.86	412.27	412.06	411.59
106	410.91	410.67	410.86 (F)	410.93 (F)	410.75	--	410.54	410.36	409.93	409.89	409.39
107	409.58	409.43	409.06 (F)	409.12 (F)	409.41	--	409.42	409.03	408.11	408.00	407.63
108	410.32	409.06	409.21	408.82	409.01	--	408.99	408.43	407.94	407.76	407.11

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Oct 6/06	Water Elevation (m) Nov 11/06	Water Elevation (m) Dec 7/06	Water Elevation (m) Jan 9/07	Water Elevation (m) Feb 12/07	Water Elevation (m) Mar 8/07	Water Elevation (m) Apr 10/07	Water Elevation (m) May 12/07	Water Elevation (m) June 11/07	Water Elevation (m) July 11/07
101	413.64	410.83	412.67	412.97	413.03	412.11	411.61	413.02	412.75	411.87	411.42
102	414.37	411.00	411.25	411.71	411.99	411.69	411.45	412.14	411.96	411.67	411.38
103	414.89	410.36	411.10	411.91	412.27	411.05	410.66	412.50	411.59	410.97	410.54
104	410.93	408.71	409.13	409.45	409.65	409.12	408.96	409.78	409.39	409.24	408.92
105	414.05	411.95	413.94	413.71	413.90	412.95	412.65	413.72	413.29	412.51	412.11
106	410.91	410.13	410.74	410.57	410.59	410.28	410.22	410.55	410.50	410.07	409.59
107	409.58	408.28	408.94	409.11	409.16	408.60	408.43	409.25	409.01	408.24	407.71
108	410.32	407.62	408.21	408.48	408.57	408.07	407.93	408.69	408.36	407.96	407.57

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Aug 15/07	Water Elevation (m) Sept 13/07	Water Elevation (m) Oct 12/07	Water Elevation (m) Nov 8/07	Water Elevation (m) Dec 11/07	Water Elevation (m) Jan 15/08	Water Elevation (m) Feb 12/08	Water Elevation (m) Mar 8/08	Water Elevation (m) Apr 13/08	Water Elevation (m) May 8/08
101	413.64	411.01	410.72	410.50	410.35	410.33	412.73	412.92	413.00	413.19	413.05
102	414.37	411.13	410.98	410.87	410.81	410.77	411.26	411.53	411.80	412.92	412.46
103	414.89	410.34	410.36	410.36	410.36	410.36	411.29	411.74	412.03	413.40	412.50
104	410.93	408.73	408.61	408.57	408.58	408.76	409.70	409.66	409.81	410.70	410.35
105	414.05	411.67	411.34	411.22	411.22	411.22	414.00	414.11	414.10 frozen	413.99	413.71
106	410.91	409.22	408.99	408.89	408.89	409.44	410.63	410.61	410.64	410.77	410.69
107	409.58	407.49	407.40	407.43	407.52	407.91	409.20	409.05	409.10	409.52	409.35
108	410.32	407.36	407.37	407.37	407.37	407.52	408.52	408.50	408.57	409.19	408.89

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) June 10/08	Water Elevation (m) July 8/08	Water Elevation (m) Aug 1/08	Water Elevation (m) Sept 10/08	Water Elevation (m) Oct 8/08	Water Elevation (m) Nov 17/08	Water Elevation (m) Dec 17/08	Water Elevation (m) Jan 23/09	Water Elevation (m) Feb 20/09	Water Elevation (m) Mar 18/09
101	413.64	412.58	412.60	412.55	411.67	410.86	413.08	413.135	412.725	412.960	413.053
102	414.37	412.13	412.06	411.95	411.57	410.30	411.52	411.979	412.147	412.419	412.772
103	414.89	411.53	411.60	411.56	410.86	410.64	412.14	412.746	411.796	412.600	413.046
104	410.93	409.86	409.71	409.76	409.34	408.18	409.98	410.183	409.902	410.238	410.670
105	414.05	412.96	412.87	412.93	412.26	411.60	413.99	413.969	413.221	414.066 (F)	414.070 (F)
106	410.91	410.83	410.24	410.36	410.28	409.04	410.78	410.67	410.567	411.010 (F)	410.963 (F)
107	409.58	409.00	408.72	408.86	408.40	407.36	409.24	409.249	409.009	409.246	409.502
108	410.32	408.33	408.20	408.29	407.95	406.82	408.51	408.662	408.359	408.651	408.948

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Apr 21/09	Water Elevation (m) May 21/09	Water Elevation (m) June 26/09	Water Elevation (m) July 22/09	Water Elevation (m) Aug 27/09	Water Elevation (m) Sept 29/09	Water Elevation (m) Oct 30/09	Water Elevation (m) Dec 7/09	Water Elevation (m) Jan 5/10	Water Elevation (m) Feb 9/10
101	413.64	412.95	412.77	411.93	411.54	411.27	411.16	411.72	412.26	412.04	411.55
102	414.37	412.79	412.43	411.93	411.63	411.28	411.11	411.11	411.15	411.19	411.06
103	414.89	412.88	412.03	411.17	410.80	410.44	410.36	410.57	410.91	410.83	410.47
104	410.93	410.45	410.11	409.61	409.35	409.15	409.04	409.23	409.41	409.36	409.19
105	414.05	413.45	412.98	412.21	411.93	412.05	412.12	412.97	413.25	413.05	412.72
106	410.91	410.55	410.43	410.08	409.87	409.90	410.08	410.33	410.54	410.33	410.22
107	409.58	409.35	409.12	408.62	408.13	407.97	407.97	408.47	408.85	408.81	408.60
108	410.32	408.86	408.51	408.08	407.84	407.66	407.52	407.79	408.01	408.05	407.93

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Mar 2/10	Water Elevation (m) Apr 17/10	Water Elevation (m) May 11/10	Water Elevation (m) June 1/10	Water Elevation (m) June 29/10	Water Elevation (m) Aug 5/10	Water Elevation (m) Sept 22/10	Water Elevation (m) Oct 22/10	Water Elevation (m) Nov 9/10	Water Elevation (m) Dec 6/10
101	413.64	411.31	412.70	412.87	412.31	412.92	411.66	410.97	410.83	410.84	411.37
102	414.37	411.01	411.60	411.65	411.64	411.73	411.43	411.09	410.58	410.89	410.93
103	414.89	410.37	411.53	411.73	411.21	411.80	410.76	dry	dry	dry	dry
104	410.93	409.14	409.82	410.09	409.51	409.90	409.17	408.85	408.86	408.89	409.20
105	414.05	412.47	413.22	413.36	412.67	413.37	412.16	411.49	411.75	412.25	413.30
106	410.91	410.12	410.49	410.55	410.15	410.53	409.90	409.50	409.60	409.75	410.33
107	409.58	408.38	409.12	409.34	408.69	409.23	408.06	407.69	407.80	407.88	408.72
108	410.32	407.81	408.43	408.70	408.16	408.42	407.78	407.41	407.44	407.51	407.59

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Jan 11/11	Water Elevation (m) Feb 19/11	Water Elevation (m) Mar 31/11	Water Elevation (m) July 19/11	Water Elevation (m) Sept 30/11	Water Elevation (m) Dec 7/11	Water Elevation (m) Feb 10/12	Water Elevation (m) Apr 4/12	Water Elevation (m) June 27/12	Water Elevation (m) Aug 1/12
101	413.64	412.24	412.62	413.09	412.33	411.51	413.21	412.91	412.67	411.22	410.84
102	414.37	411.10	411.09	dry	412.09	411.22	412.23	412.16	412.07	411.28	411.05
103	414.89	410.76	411.02	dry	411.42	410.49	413.25	412.28	411.73	410.45	dry
104	410.93	409.27	409.20	410.05	409.54	409.24	410.45	409.95	409.86	409.06	408.73
105	414.05	413.52	413.93	413.86	412.53	412.83	413.93	413.53	412.99	411.75	411.30
106	410.91	410.37	410.61	410.66	410.09	410.23	410.73	410.52	410.46	409.64	409.17
107	409.58	408.85	408.70	409.29	408.21	408.18	409.44	409.14	409.10	407.93	407.52
108	410.32	408.02	407.89	408.66	407.92	407.73	408.92	408.53	408.38	407.69	dry

*(F) = Frozen

WATER LEVEL MEASUREMENTS

AINLEY SUBDIVISION
ELORA, ONTARIO

Borehole No.	Ground Surface Elevation (m)	Water Elevation (m) Oct 11/12	Water Elevation (m) Dec 11/12	Water Elevation (m) Mar 9/13	Water Elevation (m) May 3/13	Water Elevation (m) July 3/13	Water Elevation (m)	Water Elevation (m)	Water Elevation (m)	Water Elevation (m)	Water Elevation (m)
101	413.64	410.48	412.25	412.19	412.94	412.74					
102	414.37	410.81	411.18	411.42	412.52	412.08					
103	414.89	dry	410.87	411.00	412.71	411.74					
104	410.93	408.69	409.36	408.32	410.21	409.94					
105	414.05	dry	413.48	413.12	413.38	412.89					
106	410.91	409.26	410.53	410.40	410.55	410.44					
107	409.58	407.61	408.91	408.84	409.32	409.21					
108	410.32	dry	418.10	408.09	408.74	408.50					

*(F) = Frozen

APPENDIX C

STORMWATER MANAGEMENT ANALYSIS

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                         Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                  UnconEx_2yr.out"
"                Licensee name:                                              gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 1:27:44 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      695.050   Coefficient A"
"        6.387   Constant B"
"        0.793   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            93.293    mm/hr"
"             Total depth                  33.014    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.003     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  23.304     1.868      23.304     minutes"
"             Time to Centroid       130.781    88.659     130.781    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        72.63      0.00       72.63      c.m"
"             Rainfall losses        27.898     5.363      27.898     mm"
"             Runoff depth           5.116      27.651     5.116      mm"
"             Runoff volume          11.26      0.00       11.26      c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.003     0.003     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.003     0.003     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume            11.255    c.m"
"                    0.003     0.003     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.003     0.000     0.003     0.003"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.044     0.000     0.003     0.003 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  78.068     6.258      78.068     minutes"
"             Time to Centroid       195.540    95.197     195.540    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        2561.88    0.00       2561.88    c.m"
"             Rainfall losses        27.894     5.228      27.894     mm"
"             Runoff depth           5.120      27.786     5.120      mm"
"             Runoff volume          397.31     0.00       397.31     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.044      0.000      0.044      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.044     0.044     0.003     0.003"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.001     0.044     0.003     0.003 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  35.323     2.832      35.323     minutes"
"             Time to Centroid       144.986    90.217     144.986    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        42.92      0.00       42.92      c.m"
"             Rainfall losses        27.897     5.467      27.897     mm"
"             Runoff depth           5.117      27.547     5.117      mm"
"             Runoff volume          6.65       0.00       6.65       c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.001     0.045     0.003     0.003"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.060     0.045     0.003     0.003 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  45.052     3.611      45.051     minutes"
"             Time to Centroid       156.495    91.497     156.495    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
```

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"             Rainfall volume        2350.59    0.00       2350.59    c.m"
"             Rainfall losses        27.895     5.642      27.895     mm"
"             Runoff depth           5.119      27.372     5.119      mm"
"             Runoff volume          364.45     0.00       364.45     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.060      0.000      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.060     0.099     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.060     0.099     0.099     0.003"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 0.101    c.m/sec"
"             Hydrograph volume          779.672    c.m"
"                    0.060     0.099     0.099     0.101"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.060     0.000     0.099     0.101"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.155   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.038     0.000     0.099     0.101 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  78.068     6.258      78.068     minutes"
"             Time to Centroid       195.540    95.197     195.539    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        2195.43    0.00       2195.43    c.m"
"             Rainfall losses        27.894     5.228      27.894     mm"
"             Runoff depth           5.120      27.786     5.120      mm"
"             Runoff volume          340.48     0.00       340.48     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.038      0.000      0.038      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.038     0.038     0.099     0.101"
" 33          CATCHMENT 21"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.038     0.099     0.101 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  35.323     2.832      23.162     minutes"
"             Time to Centroid       144.986    90.217     124.487    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        243.64     27.07      270.71     c.m"
"             Rainfall losses        27.897     5.467      25.654     mm"
"             Runoff depth           5.117      27.547     7.360      mm"
"             Runoff volume          37.76      22.59      60.35      c.m"
"             Runoff coefficient     0.155      0.834      0.223      "
"             Maximum flow           0.007      0.015      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.043     0.099     0.101"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.016     0.043     0.043     0.101"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 0.143    c.m/sec"
"             Hydrograph volume         1180.502    c.m"
"                    0.016     0.043     0.043     0.143"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    22.700    hectare"
"             Total Impervious area                    0.082    hectare"
"             Total % impervious                       0.361"
" 19          EXIT"
```

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"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                  UnconEx_5yr.out"
"                Licensee name:                                              gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 1:32:13 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1459.072   Coefficient A"
"       13.690   Constant B"
"        0.850   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           113.586    mm/hr"
"             Total depth                  49.792    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.009     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  16.417     1.691      16.417     minutes"
"             Time to Centroid       118.292    87.210     118.292    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        109.54     0.00       109.54     c.m"
"             Rainfall losses        36.983     5.811      36.983     mm"
"             Runoff depth           12.809     43.981     12.809     mm"
"             Runoff volume          28.18      0.00       28.18      c.m"
"             Runoff coefficient     0.257      0.000      0.257      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
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```
"            4   Add Runoff "
"                    0.009     0.009     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.009     0.009     0.009     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.009    c.m/sec"
"             Hydrograph volume            28.179    c.m"
"                    0.009     0.009     0.009     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.009     0.000     0.009     0.009"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.157     0.000     0.009     0.009 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  54.995     5.665      54.994     minutes"
"             Time to Centroid       162.955    92.780     162.955    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        3863.83    0.00       3863.84    c.m"
"             Rainfall losses        36.958     5.466      36.958     mm"
"             Runoff depth           12.834     44.325     12.834     mm"
"             Runoff volume          995.89     0.00       995.90     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.157      0.000      0.157      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.157     0.157     0.009     0.009"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.004     0.157     0.009     0.009 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  24.883     2.563      24.883     minutes"
"             Time to Centroid       128.082    88.517     128.082    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        64.73      0.00       64.73      c.m"
"             Rainfall losses        36.970     6.066      36.969     mm"
"             Runoff depth           12.822     43.726     12.822     mm"
"             Runoff volume          16.67      0.00       16.67      c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.004     0.159     0.009     0.009"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.209     0.159     0.009     0.009 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  31.736     3.269      31.736     minutes"
"             Time to Centroid       136.024    89.581     136.024    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
```

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                                  UnconEx_5yr
"             Rainfall volume        3545.16    0.00       3545.17    c.m"
"             Rainfall losses        36.968     6.236      36.968     mm"
"             Runoff depth           12.824     43.556     12.824     mm"
"             Runoff volume          913.04     0.00       913.04     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.209      0.000      0.209      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.209     0.353     0.009     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.209     0.353     0.353     0.009"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.358    c.m/sec"
"             Hydrograph volume          1953.787    c.m"
"                    0.209     0.353     0.353     0.358"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.209     0.000     0.353     0.358"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.258   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.135     0.000     0.353     0.358 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  54.995     5.665      54.994     minutes"
"             Time to Centroid       162.956    92.780     162.955    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        3311.14    0.00       3311.15    c.m"
"             Rainfall losses        36.958     5.466      36.958     mm"
"             Runoff depth           12.834     44.325     12.834     mm"
"             Runoff volume          853.44     0.00       853.44     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.135      0.000      0.135      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.135     0.135     0.353     0.358"
" 33          CATCHMENT 21"
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```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.135     0.353     0.358 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  24.883     2.563      18.750     minutes"
"             Time to Centroid       128.082    88.517     117.210    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        367.46     40.83      408.29     c.m"
"             Rainfall losses        36.970     6.066      33.879     mm"
"             Runoff depth           12.822     43.726     15.913     mm"
"             Runoff volume          94.63      35.86      130.48     c.m"
"             Runoff coefficient     0.258      0.878      0.320      "
"             Maximum flow           0.025      0.021      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.152     0.353     0.358"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.030     0.152     0.152     0.358"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 0.510    c.m/sec"
"             Hydrograph volume         2937.711    c.m"
"                    0.030     0.152     0.152     0.510"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      22.700    hectare"
"             Total Impervious area                      0.082    hectare"
"             Total % impervious                         0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                  UnconEx_10yr.out"
"                Licensee name:                                               gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 1:33:01 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2327.596   Coefficient A"
"       19.500   Constant B"
"        0.894   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           126.171    mm/hr"
"             Total depth                  61.359    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.015     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  14.182     1.611      14.182     minutes"
"             Time to Centroid       113.894    86.563     113.893    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        134.99     0.00       134.99     c.m"
"             Rainfall losses        41.992     6.044      41.992     mm"
"             Runoff depth           19.367     55.315     19.367     mm"
"             Runoff volume          42.61      0.00       42.61      c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.015     0.015     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.015     0.015     0.015     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.015    c.m/sec"
"             Hydrograph volume            42.608    c.m"
"                    0.015     0.015     0.015     0.015"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.015     0.000     0.015     0.015"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.273     0.000     0.015     0.015 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  47.507     5.395      47.507     minutes"
"             Time to Centroid       151.963    91.698     151.963    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        4761.47    0.00       4761.48    c.m"
"             Rainfall losses        41.963     5.633      41.963     mm"
"             Runoff depth           19.396     55.726     19.396     mm"
"             Runoff volume          1505.11    0.00       1505.12    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.273      0.000      0.273      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.273     0.273     0.015     0.015"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.008     0.273     0.015     0.015 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  21.495     2.441      21.495     minutes"
"             Time to Centroid       122.241    87.742     122.240    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        79.77      0.00       79.77      c.m"
"             Rainfall losses        41.967     6.310      41.967     mm"
"             Runoff depth           19.392     55.050     19.393     mm"
"             Runoff volume          25.21      0.00       25.21      c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.008     0.277     0.015     0.015"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.359     0.277     0.015     0.015 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  27.416     3.114      27.416     minutes"
"             Time to Centroid       128.990    88.727     128.990    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
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"             Rainfall volume        4368.77    0.00       4368.78    c.m"
"             Rainfall losses        41.968     6.469      41.968     mm"
"             Runoff depth           19.392     54.890     19.392     mm"
"             Runoff volume          1380.67    0.00       1380.68    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.359      0.000      0.359      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.359     0.608     0.015     0.015"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.359     0.608     0.608     0.015"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.616    c.m/sec"
"             Hydrograph volume          2953.615    c.m"
"                    0.359     0.608     0.608     0.616"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.359     0.000     0.608     0.616"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.316   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.234     0.000     0.608     0.616 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  47.507     5.395      47.507     minutes"
"             Time to Centroid       151.963    91.698     151.963    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        4080.39    0.00       4080.39    c.m"
"             Rainfall losses        41.963     5.633      41.963     mm"
"             Runoff depth           19.396     55.726     19.396     mm"
"             Runoff volume          1289.82    0.00       1289.82    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.234      0.000      0.234      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.234     0.234     0.608     0.616"
" 33          CATCHMENT 21"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.897   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.049     0.234     0.608     0.616 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  21.495     2.441      16.926     minutes"
"             Time to Centroid       122.241    87.742     113.968    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        452.83     50.31      503.15     c.m"
"             Rainfall losses        41.967     6.310      38.401     mm"
"             Runoff depth           19.392     55.050     22.958     mm"
"             Runoff volume          143.12     45.14      188.26     c.m"
"             Runoff coefficient     0.316      0.897      0.374      "
"             Maximum flow           0.043      0.024      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.049     0.263     0.608     0.616"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.049     0.263     0.263     0.616"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 0.878    c.m/sec"
"             Hydrograph volume         4431.696    c.m"
"                    0.049     0.263     0.263     0.878"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      22.700    hectare"
"             Total Impervious area                      0.082    hectare"
"             Total % impervious                         0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                  UnconEx_25yr.out"
"                Licensee name:                                               gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 1:33:50 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3701.648   Coefficient A"
"       25.500   Constant B"
"        0.937   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           143.371    mm/hr"
"             Total depth                  75.581    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  12.370     1.523      12.370     minutes"
"             Time to Centroid       110.314    85.984     110.314    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        166.28     0.00       166.28     c.m"
"             Rainfall losses        47.190     6.330      47.190     mm"
"             Runoff depth           28.391     69.250     28.391     mm"
"             Runoff volume          62.46      0.00       62.46      c.m"
"             Runoff coefficient     0.376      0.000      0.376      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.024     0.024     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.024     0.024     0.024     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.024    c.m/sec"
"             Hydrograph volume            62.461    c.m"
"                     0.024     0.024     0.024     0.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.024     0.000     0.024     0.024"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.454     0.000     0.024     0.024 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  41.437     5.102      41.437     minutes"
"             Time to Centroid       143.191    90.751     143.190    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        5865.07    0.01       5865.07    c.m"
"             Rainfall losses        47.093     5.908      47.093     mm"
"             Runoff depth           28.488     69.673     28.488     mm"
"             Runoff volume          2210.64    0.01       2210.65    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.454      0.000      0.454      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.454     0.454     0.024     0.024"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.012     0.454     0.024     0.024 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  18.749     2.308      18.749     minutes"
"             Time to Centroid       117.510    87.059     117.510    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        98.25      0.00       98.26      c.m"
"             Rainfall losses        47.127     6.593      47.127     mm"
"             Runoff depth           28.453     68.988     28.453     mm"
"             Runoff volume          36.99      0.00       36.99      c.m"
"             Runoff coefficient     0.376      0.000      0.376      "
"             Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.012     0.461     0.024     0.024"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.584     0.461     0.024     0.024 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  23.913     2.944      23.913     minutes"
"             Time to Centroid       123.357    87.974     123.357    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
```

```
"             Rainfall volume        5381.35    0.01       5381.36    c.m"
"             Rainfall losses        47.108     6.942      47.107     mm"
"             Runoff depth           28.473     68.639     28.473     mm"
"             Runoff volume          2027.30    0.00       2027.30    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.584      0.000      0.584      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.584     1.001     0.024     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.584     1.001     1.001     0.024"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  1.015    c.m/sec"
"             Hydrograph volume          4337.402    c.m"
"                    0.584     1.001     1.001     1.015"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.584     0.000     1.001     1.015"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.377   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.389     0.000     1.001     1.015 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  41.437     5.102      41.437     minutes"
"             Time to Centroid       143.191    90.751     143.190    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        5026.12    0.01       5026.13    c.m"
"             Rainfall losses        47.093     5.908      47.093     mm"
"             Runoff depth           28.488     69.673     28.488     mm"
"             Runoff volume          1894.43    0.00       1894.44    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.389      0.000      0.389      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.389     0.389     1.001     1.015"
" 33          CATCHMENT 21"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.078     0.389     1.001     1.015 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  18.749     2.308      15.260     minutes"
"             Time to Centroid       117.510    87.059     111.048    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        557.79     61.98      619.76     c.m"
"             Rainfall losses        47.127     6.593      43.074     mm"
"             Runoff depth           28.453     68.988     32.507     mm"
"             Runoff volume          209.99     56.57      266.56     c.m"
"             Runoff coefficient     0.376      0.913      0.430      "
"             Maximum flow           0.068      0.028      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.078     0.435     1.001     1.015"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.078     0.435     0.435     1.015"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 1.447    c.m/sec"
"             Hydrograph volume         6498.396    c.m"
"                    0.078     0.435     0.435     1.447"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    22.700    hectare"
"             Total Impervious area                    0.082    hectare"
"             Total % impervious                       0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                         Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                 UnconEx_50yr.out"
"                Licensee name:                                              gmbp"
"                Company                                 Hewlett-Packard Company"
"                Date & Time last used:                  2/15/2019 at 1:35:10 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     5089.418   Coefficient A"
"       30.000   Constant B"
"        0.967   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           156.350    mm/hr"
"             Total depth                  86.737    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.032     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  11.375     1.467      11.375     minutes"
"             Time to Centroid       108.305    85.675     108.305    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        190.82     0.00       190.82     c.m"
"             Rainfall losses        50.570     6.561      50.570     mm"
"             Runoff depth           36.167     80.176     36.167     mm"
"             Runoff volume          79.57      0.00       79.57      c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.032      0.000      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.032     0.032     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.032     0.032     0.032     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.032    c.m/sec"
"             Hydrograph volume            79.567    c.m"
"                     0.032     0.032     0.032     0.032"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.032     0.000     0.032     0.032"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.418   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.618     0.000     0.032     0.032 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  38.106     4.916      38.106     minutes"
"             Time to Centroid       138.366    90.175     138.366    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        6730.77    0.01       6730.77    c.m"
"             Rainfall losses        50.510     5.941      50.510     mm"
"             Runoff depth           36.227     80.796     36.227     mm"
"             Runoff volume          2811.21    0.01       2811.22    c.m"
"             Runoff coefficient     0.418      0.000      0.418      "
"             Maximum flow           0.618      0.000      0.618      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.618     0.618     0.032     0.032"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.618     0.032     0.032 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  17.241     2.224      17.241     minutes"
"             Time to Centroid       114.897    86.667     114.896    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        112.76     0.00       112.76     c.m"
"             Rainfall losses        50.540     6.773      50.540     mm"
"             Runoff depth           36.197     79.963     36.197     mm"
"             Runoff volume          47.06      0.00       47.06      c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.628     0.032     0.032"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.789     0.628     0.032     0.032 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  21.990     2.837      21.990     minutes"
"             Time to Centroid       120.254    87.552     120.254    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
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"             Rainfall volume        6175.65    0.01       6175.66    c.m"
"             Rainfall losses        50.538     7.307      50.538     mm"
"             Runoff depth           36.199     79.429     36.199     mm"
"             Runoff volume          2577.38    0.01       2577.39    c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.789      0.000      0.789      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.789     1.341     0.032     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.789     1.341     1.341     0.032"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  1.359    c.m/sec"
"             Hydrograph volume          5515.226    c.m"
"                    0.789     1.341     1.341     1.359"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.789     0.000     1.341     1.359"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.418   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.530     0.000     1.341     1.359 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  38.106     4.916      38.106     minutes"
"             Time to Centroid       138.366    90.175     138.366    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        5767.99    0.01       5768.00    c.m"
"             Rainfall losses        50.510     5.941      50.510     mm"
"             Runoff depth           36.227     80.796     36.227     mm"
"             Runoff volume          2409.09    0.01       2409.10    c.m"
"             Runoff coefficient     0.418      0.000      0.418      "
"             Maximum flow           0.530      0.000      0.530      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.530     0.530     1.341     1.359"
" 33          CATCHMENT 21"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.922   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.103     0.530     1.341     1.359 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  17.241     2.224      14.282     minutes"
"             Time to Centroid       114.897    86.667     109.333    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        640.12     71.12      711.24     c.m"
"             Rainfall losses        50.540     6.773      46.163     mm"
"             Runoff depth           36.197     79.963     40.574     mm"
"             Runoff volume          267.13     65.57      332.70     c.m"
"             Runoff coefficient     0.417      0.922      0.468      "
"             Maximum flow           0.091      0.031      0.103      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.103     0.592     1.341     1.359"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.103     0.592     0.592     1.359"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 1.948    c.m/sec"
"             Hydrograph volume         8257.032    c.m"
"                     0.103     0.592     0.592     1.948"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    22.700    hectare"
"             Total Impervious area                    0.082    hectare"
"             Total % impervious                       0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                 UnconEx_100yr.out"
"                Licensee name:                                               gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 1:35:55 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     6933.019   Coefficient A"
"       34.699   Constant B"
"        0.998   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           168.777    mm/hr"
"             Total depth                  97.921    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.452   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.039     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  10.606     1.421      10.606     minutes"
"             Time to Centroid       106.728    85.423     106.728    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        215.43     0.00       215.43     c.m"
"             Rainfall losses        53.628     6.787      53.628     mm"
"             Runoff depth           44.293     91.134     44.294     mm"
"             Runoff volume          97.45      0.00       97.45      c.m"
"             Runoff coefficient     0.452      0.000      0.452      "
"             Maximum flow           0.039      0.000      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.039     0.039     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.039     0.039     0.039     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.039    c.m/sec"
"             Hydrograph volume            97.446    c.m"
"                     0.039     0.039     0.039     0.039"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.039     0.000     0.039     0.039"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.454   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.801     0.000     0.039     0.039 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  35.531     4.759      35.530     minutes"
"             Time to Centroid       134.554    89.737     134.554    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        7598.69    0.01       7598.69    c.m"
"             Rainfall losses        53.501     6.084      53.501     mm"
"             Runoff depth           44.420     91.837     44.420     mm"
"             Runoff volume          3447.00    0.01       3447.01    c.m"
"             Runoff coefficient     0.454      0.000      0.454      "
"             Maximum flow           0.801      0.000      0.801      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.801     0.801     0.039     0.039"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.020     0.801     0.039     0.039 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  16.076     2.153      16.076     minutes"
"             Time to Centroid       112.853    86.345     112.853    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        127.30     0.00       127.30     c.m"
"             Rainfall losses        53.605     6.948      53.605     mm"
"             Runoff depth           44.316     90.973     44.316     mm"
"             Runoff volume          57.61      0.00       57.61      c.m"
"             Runoff coefficient     0.453      0.000      0.453      "
"             Maximum flow           0.020      0.000      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.020     0.813     0.039     0.039"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.985     0.813     0.039     0.039 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  20.504     2.747      20.504     minutes"
"             Time to Centroid       117.777    87.189     117.777    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
```

```
"             Rainfall volume        6971.99    0.01       6972.00    c.m"
"             Rainfall losses        53.532     7.496      53.532     mm"
"             Runoff depth           44.389     90.426     44.389     mm"
"             Runoff volume          3160.50    0.01       3160.50    c.m"
"             Runoff coefficient     0.453      0.000      0.453      "
"             Maximum flow           0.985      0.000      0.985      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.985     1.721     0.039     0.039"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.985     1.721     1.721     0.039"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  1.746    c.m/sec"
"             Hydrograph volume          6762.568    c.m"
"                    0.985     1.721     1.721     1.746"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.985     0.000     1.721     1.746"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.454   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.687     0.000     1.721     1.746 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  35.531     4.759      35.530     minutes"
"             Time to Centroid       134.554    89.737     134.554    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        6511.76    0.01       6511.77    c.m"
"             Rainfall losses        53.501     6.084      53.501     mm"
"             Runoff depth           44.420     91.837     44.420     mm"
"             Runoff volume          2953.94    0.01       2953.94    c.m"
"             Runoff coefficient     0.454      0.000      0.454      "
"             Maximum flow           0.687      0.000      0.687      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.687     0.687     1.721     1.746"
" 33          CATCHMENT 21"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.134     0.687     1.721     1.746 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  16.076     2.153      13.490     minutes"
"             Time to Centroid       112.853    86.345     107.930    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        722.66     80.30      802.95     c.m"
"             Rainfall losses        53.605     6.948      48.939     mm"
"             Runoff depth           44.316     90.973     48.982     mm"
"             Runoff volume          327.05     74.60      401.65     c.m"
"             Runoff coefficient     0.453      0.929      0.500      "
"             Maximum flow           0.115      0.034      0.134      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.134     0.763     1.721     1.746"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.134     0.763     0.763     1.746"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  2.495    c.m/sec"
"             Hydrograph volume         10118.162    c.m"
"                     0.134     0.763     0.763     2.495"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      22.700    hectare"
"             Total Impervious area                      0.082    hectare"
"             Total % impervious                         0.361"
" 19          EXIT"
```

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"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                       Modelling Files\2019-02-15\Uncontrolled"
"                Output filename:                                  UnconEx_REG.out"
"                Licensee name:                                               gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 1:37:14 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"              Maximum intensity            53.000    mm/hr"
"              Total depth                 285.000    mm"
"            6   200hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.713   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.000     0.000 c.m/sec"
"              Catchment 30           Pervious   Impervious Total Area "
"              Surface Area           0.220      0.000      0.220      hectare"
"              Time of concentration  12.633     2.243      12.633     minutes"
"              Time to Centroid       2530.545   2290.972   2530.545   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        627.00     0.00       627.00     c.m"
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"             Rainfall losses        81.839     43.972     81.839     mm"
"             Runoff depth           203.161    241.028    203.161    mm"
"             Runoff volume          446.95     0.00       446.95     c.m"
"             Runoff coefficient     0.713      0.000      0.713      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.024     0.024     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.024     0.024     0.024     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 0.024    c.m/sec"
"             Hydrograph volume          446.953    c.m"
"                    0.024     0.024     0.024     0.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.024     0.000     0.024     0.024"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"         0.000   % Impervious"
"         7.760   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         7.760   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.714   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.881     0.000     0.024     0.024 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  42.319     7.513      42.319     minutes"
"             Time to Centroid       2572.242   2276.224   2572.241   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2.2116     0.0000     2.2116     ha-m"
"             Rainfall losses        81.644     25.621     81.644     mm"
"             Runoff depth           203.356    259.379    203.356    mm"
"             Runoff volume          1.5780     0.0000     1.5780     ha-m"
"             Runoff coefficient     0.714      0.000      0.714      "
"             Maximum flow           0.881      0.000      0.881      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.881     0.881     0.024     0.024"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
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"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.014     0.881     0.024     0.024 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  19.148     3.399      19.148     minutes"
"             Time to Centroid       2545.193   2266.333   2545.193   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        370.50     0.00       370.50     c.m"
"             Rainfall losses        78.940     42.646     78.940     mm"
"             Runoff depth           206.060    242.354    206.060    mm"
"             Runoff volume          267.88     0.00       267.88     c.m"
"             Runoff coefficient     0.723      0.000      0.723      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.894     0.024     0.024"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.716   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

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"                    0.772     0.894     0.024     0.024 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  24.421     4.336      24.421     minutes"
"             Time to Centroid       2549.942   2258.969   2549.942   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2.0292     0.0000     2.0292     ha-m"
"             Rainfall losses        80.848     39.404     80.848     mm"
"             Runoff depth           204.152    245.596    204.152    mm"
"             Runoff volume          1.4536     0.0000     1.4536     ha-m"
"             Runoff coefficient     0.716      0.000      0.716      "
"             Maximum flow           0.772      0.000      0.772      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.772     1.667     0.024     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.772     1.667     1.667     0.024"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 1.688    c.m/sec"
"             Hydrograph volume        31030.850    c.m"
"                    0.772     1.667     1.667     1.688"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.772     0.000     1.667     1.688"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.714   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.755     0.000     1.667     1.688 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  42.319     7.513      42.319     minutes"
"             Time to Centroid       2572.242   2276.224   2572.241   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1.8952     0.0000     1.8952     ha-m"
"             Rainfall losses        81.644     25.621     81.644     mm"
"             Runoff depth           203.356    259.379    203.356    mm"
"             Runoff volume          1.3523     0.0000     1.3523     ha-m"
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"             Runoff coefficient     0.714      0.000      0.714      "
"             Maximum flow           0.755      0.000      0.755      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.755     0.755     1.667     1.688"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.087     0.755     1.667     1.688 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  19.148     3.399      17.327     minutes"
"             Time to Centroid       2545.193   2266.333   2512.963   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2103.30    233.70     2337.00    c.m"
"             Rainfall losses        78.940     42.646     75.310     mm"
"             Runoff depth           206.060    242.354    209.690    mm"
"             Runoff volume          1520.72    198.73     1719.45    c.m"
"             Runoff coefficient     0.723      0.850      0.736      "
"             Maximum flow           0.078      0.010      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.087     0.840     1.667     1.688"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                   0.087     0.840     0.840     1.688"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                 2.528    c.m/sec"
"             Hydrograph volume        46273.457    c.m"
"                   0.087     0.840     0.840     2.528"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    22.700    hectare"
"             Total Impervious area                    0.082    hectare"
"             Total % impervious                       0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Existing__2yr.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 1:58:44 PM"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"       695.050   Coefficient A"
"         6.387   Constant B"
"         0.793   Exponent C"
"         0.380   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity            93.293    mm/hr"
"              Total depth                  33.014    mm"
"             6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"            30   Catchment 30"
"         0.000   % Impervious"
"         0.220   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.220   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.155   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.003     0.000     0.000     0.000 c.m/sec"
"              Catchment 30           Pervious   Impervious Total Area "
"              Surface Area           0.220      0.000      0.220      hectare"
"              Time of concentration  23.304     1.868      23.304     minutes"
"              Time to Centroid       130.781    88.659     130.781    minutes"
"              Rainfall depth         33.014     33.014     33.014     mm"
"              Rainfall volume        72.63      0.00       72.63      c.m"
"              Rainfall losses        27.898     5.363      27.898     mm"
"              Runoff depth           5.116      27.651     5.116      mm"
"              Runoff volume          11.26      0.00       11.26      c.m"
"              Runoff coefficient     0.155      0.000      0.155      "
"              Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.003     0.003     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.003     0.003     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.003    c.m/sec"
"             Hydrograph volume            11.255    c.m"
"                    0.003     0.003     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.003     0.000     0.003     0.003"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.044     0.000     0.003     0.003 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  78.068     6.258      78.068     minutes"
"             Time to Centroid       195.540    95.197     195.540    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        2561.88    0.00       2561.88    c.m"
"             Rainfall losses        27.894     5.228      27.894     mm"
"             Runoff depth           5.120      27.786     5.120      mm"
"             Runoff volume          397.31     0.00       397.31     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.044      0.000      0.044      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.044     0.044     0.003     0.003"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.001     0.044     0.003     0.003 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  35.323     2.832      35.323     minutes"
"             Time to Centroid       144.986    90.217     144.986    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        42.92      0.00       42.92      c.m"
"             Rainfall losses        27.897     5.467      27.897     mm"
"             Runoff depth           5.117      27.547     5.117      mm"
"             Runoff volume          6.65       0.00       6.65       c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.001     0.045     0.003     0.003"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.060     0.045     0.003     0.003 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  45.052     3.611      45.051     minutes"
"             Time to Centroid       156.495    91.497     156.495    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
```

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"             Rainfall volume        2350.59    0.00       2350.59    c.m"
"             Rainfall losses        27.895     5.642      27.895     mm"
"             Runoff depth           5.119      27.372     5.119      mm"
"             Runoff volume          364.45     0.00       364.45     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.060      0.000      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.060     0.099     0.003     0.003"
" 54          POND DESIGN"
"       0.099   Current peak flow    c.m/sec"
"       0.050   Target outflow    c.m/sec"
"       768.4   Hydrograph volume    c.m"
"          6.   Number of stages"
"     409.630   Minimum water level    metre"
"     410.750   Maximum water level    metre"
"     409.630   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               409.630     0.000     0.000"
"               409.750    0.6650   402.200"
"               410.000     3.601  2187.900"
"               410.250     7.811  5318.900"
"               410.500    12.984  9642.300"
"               410.750    18.965  15227.70"
"             Peak outflow                 0.095    c.m/sec"
"             Maximum level              409.647    metre"
"             Maximum storage             57.616    c.m"
"             Centroidal lag               3.111   hours"
"                  0.060     0.099     0.095     0.003 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                   0.060     0.095     0.095     0.003"
" 52          CHANNEL DESIGN"
"       0.095   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow               0.162    metre"
"            Velocity                    0.541    m/sec"
"            Channel capacity           10.655    c.m/sec"
"            Critical depth              0.133    metre"
" 53          ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.460   X-factor <= 0.5"
"     100.360   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"     100.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                 0.095    c.m/sec"
"                   0.060     0.095     0.095     0.003 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                   0.060     0.095     0.095     0.003"
" 52          CHANNEL DESIGN"
"       0.095   Current peak flow    c.m/sec"
```

```
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.083    metre"
"             Velocity                      0.512    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.059    metre"
" 53          ROUTE    Channel Route 40"
"        39.80       Channel Route 40 Reach length   ( metre)"
"        0.442   X-factor <= 0.5"
"       58.297   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.095    c.m/sec"
"                    0.060     0.095     0.095     0.003 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.060     0.095     0.095     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.060     0.095     0.095     0.003"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  0.095    c.m/sec"
"             Hydrograph volume           768.416    c.m"
"                    0.060     0.095     0.095     0.095"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.060     0.000     0.095     0.095"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.038     0.000     0.095     0.095 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  78.068     6.258      78.068     minutes"
"             Time to Centroid       195.540    95.197     195.539    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        2195.43    0.00       2195.43    c.m"
"             Rainfall losses        27.894     5.228      27.894     mm"
"             Runoff depth           5.120      27.786     5.120      mm"
"             Runoff volume          340.48     0.00       340.48     c.m"
"             Runoff coefficient     0.155      0.000      0.155      "
"             Maximum flow           0.038      0.000      0.038      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.038     0.038     0.095     0.095"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.155   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.016     0.038     0.095     0.095 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  35.323     2.832      23.162     minutes"
"             Time to Centroid       144.986    90.217     124.487    minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        243.64     27.07      270.71     c.m"
"             Rainfall losses        27.897     5.467      25.654     mm"
"             Runoff depth           5.117      27.547     7.360      mm"
"             Runoff volume          37.76      22.59      60.35      c.m"
"             Runoff coefficient     0.155      0.834      0.223      "
"             Maximum flow           0.007      0.015      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.043     0.095     0.095"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.016     0.043     0.043     0.095"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.043    c.m/sec"
```

```
                                  Existing__2yr
"              Hydrograph volume          400.831    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                 0.138    c.m/sec"
"              Hydrograph volume         1169.246    c.m"
"                      0.016     0.043     0.043     0.138"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    22.700    hectare"
"              Total Impervious area                    0.082    hectare"
"              Total % impervious                       0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Existing__5yr.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 2:01:12 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1459.072   Coefficient A"
"       13.690   Constant B"
"        0.850   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           113.586    mm/hr"
"             Total depth                  49.792    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.257   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.009     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  16.417     1.691      16.417     minutes"
"             Time to Centroid       118.292    87.210     118.292    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        109.54     0.00       109.54     c.m"
"             Rainfall losses        36.983     5.811      36.983     mm"
"             Runoff depth           12.809     43.981     12.809     mm"
"             Runoff volume          28.18      0.00       28.18      c.m"
"             Runoff coefficient     0.257      0.000      0.257      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.009     0.009     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.009     0.009     0.009     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.009    c.m/sec"
"             Hydrograph volume            28.179    c.m"
"                    0.009     0.009     0.009     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.009     0.000     0.009     0.009"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.157     0.000     0.009     0.009 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  54.995     5.665      54.994     minutes"
"             Time to Centroid       162.955    92.780     162.955    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        3863.83    0.00       3863.84    c.m"
"             Rainfall losses        36.958     5.466      36.958     mm"
"             Runoff depth           12.834     44.325     12.834     mm"
"             Runoff volume          995.89     0.00       995.90     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.157      0.000      0.157      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.157     0.157     0.009     0.009"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.004     0.157     0.009     0.009 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  24.883     2.563      24.883     minutes"
"             Time to Centroid       128.082    88.517     128.082    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        64.73      0.00       64.73      c.m"
"             Rainfall losses        36.970     6.066      36.969     mm"
"             Runoff depth           12.822     43.726     12.822     mm"
"             Runoff volume          16.67      0.00       16.67      c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.004     0.159     0.009     0.009"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.209     0.159     0.009     0.009 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  31.736     3.269      31.736     minutes"
"             Time to Centroid       136.024    89.581     136.024    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
```

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"             Rainfall volume        3545.16    0.00       3545.17    c.m"
"             Rainfall losses        36.968     6.236      36.968     mm"
"             Runoff depth           12.824     43.556     12.824     mm"
"             Runoff volume          913.04     0.00       913.04     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.209      0.000      0.209      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.209     0.353     0.009     0.009"
" 54          POND DESIGN"
"        0.353   Current peak flow    c.m/sec"
"        0.050   Target outflow    c.m/sec"
"       1925.6   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  409.630     0.000     0.000"
"                  409.750    0.6650   402.200"
"                  410.000     3.601  2187.900"
"                  410.250     7.811  5318.900"
"                  410.500    12.984  9642.300"
"                  410.750    18.965  15227.70"
"             Peak outflow                 0.324    c.m/sec"
"             Maximum level              409.688    metre"
"             Maximum storage            195.955    c.m"
"             Centroidal lag               2.666   hours"
"                  0.209     0.353     0.324     0.009 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.209     0.324     0.324     0.009"
" 52          CHANNEL DESIGN"
"        0.324   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                0.256    metre"
"             Velocity                     0.735    m/sec"
"             Channel capacity            10.655    c.m/sec"
"             Critical depth               0.217    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.436   X-factor <= 0.5"
"       73.851   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       75.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 0.323    c.m/sec"
"                    0.209     0.324     0.323     0.009 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.209     0.323     0.323     0.009"
" 52          CHANNEL DESIGN"
"        0.323   Current peak flow    c.m/sec"
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"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.167    metre"
"             Velocity                      0.774    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.129    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.386   X-factor <= 0.5"
"       38.571   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       42.857   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.322    c.m/sec"
"                    0.209     0.323     0.322     0.009 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.209     0.322     0.322     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.209     0.322     0.322     0.009"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  0.322    c.m/sec"
"             Hydrograph volume          1925.607    c.m"
"                    0.209     0.322     0.322     0.322"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.209     0.000     0.322     0.322"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.135     0.000     0.322     0.322 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  54.995     5.665      54.994     minutes"
"             Time to Centroid       162.956    92.780     162.955    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        3311.14    0.00       3311.15    c.m"
"             Rainfall losses        36.958     5.466      36.958     mm"
"             Runoff depth           12.834     44.325     12.834     mm"
"             Runoff volume          853.44     0.00       853.44     c.m"
"             Runoff coefficient     0.258      0.000      0.258      "
"             Maximum flow           0.135      0.000      0.135      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.135     0.135     0.322     0.322"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.258   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.135     0.322     0.322 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  24.883     2.563      18.750     minutes"
"             Time to Centroid       128.082    88.517     117.210    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        367.46     40.83      408.29     c.m"
"             Rainfall losses        36.970     6.066      33.879     mm"
"             Runoff depth           12.822     43.726     15.913     mm"
"             Runoff volume          94.63      35.86      130.48     c.m"
"             Runoff coefficient     0.258      0.878      0.320      "
"             Maximum flow           0.025      0.021      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.152     0.322     0.322"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.030     0.152     0.152     0.322"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.152    c.m/sec"
```

```
                                  Existing__5yr
"              Hydrograph volume          983.926    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                 0.472    c.m/sec"
"              Hydrograph volume         2909.531    c.m"
"                      0.030     0.152     0.152     0.472"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    22.700    hectare"
"              Total Impervious area                    0.082    hectare"
"              Total % impervious                       0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                 Existing__10yr.out"
"                Licensee name:                                                 gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 2:03:37 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2327.596   Coefficient A"
"       19.500   Constant B"
"        0.894   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           126.171    mm/hr"
"             Total depth                  61.359    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.015     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  14.182     1.611      14.182     minutes"
"             Time to Centroid       113.894    86.563     113.893    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        134.99     0.00       134.99     c.m"
"             Rainfall losses        41.992     6.044      41.992     mm"
"             Runoff depth           19.367     55.315     19.367     mm"
"             Runoff volume          42.61      0.00       42.61      c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.015     0.015     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.015     0.015     0.015     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.015    c.m/sec"
"             Hydrograph volume            42.608    c.m"
"                    0.015     0.015     0.015     0.015"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.015     0.000     0.015     0.015"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.273     0.000     0.015     0.015 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  47.507     5.395      47.507     minutes"
"             Time to Centroid       151.963    91.698     151.963    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        4761.47    0.00       4761.48    c.m"
"             Rainfall losses        41.963     5.633      41.963     mm"
"             Runoff depth           19.396     55.726     19.396     mm"
"             Runoff volume          1505.11    0.00       1505.12    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.273      0.000      0.273      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.273     0.273     0.015     0.015"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.008     0.273     0.015     0.015 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  21.495     2.441      21.495     minutes"
"             Time to Centroid       122.241    87.742     122.240    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        79.77      0.00       79.77      c.m"
"             Rainfall losses        41.967     6.310      41.967     mm"
"             Runoff depth           19.392     55.050     19.393     mm"
"             Runoff volume          25.21      0.00       25.21      c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.008     0.277     0.015     0.015"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.359     0.277     0.015     0.015 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  27.416     3.114      27.416     minutes"
"             Time to Centroid       128.990    88.727     128.990    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
```

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                                  Existing__10yr
"             Rainfall volume        4368.77    0.00       4368.78    c.m"
"             Rainfall losses        41.968     6.469      41.968     mm"
"             Runoff depth           19.392     54.890     19.392     mm"
"             Runoff volume          1380.67    0.00       1380.68    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.359      0.000      0.359      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.359     0.608     0.015     0.015"
" 54          POND DESIGN"
"        0.608   Current peak flow    c.m/sec"
"        0.050   Target outflow    c.m/sec"
"       2911.0   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"                 409.630     0.000     0.000"
"                 409.750    0.6650   402.200"
"                 410.000     3.601  2187.900"
"                 410.250     7.811  5318.900"
"                 410.500    12.984  9642.300"
"                 410.750    18.965  15227.70"
"             Peak outflow                  0.549    c.m/sec"
"             Maximum level               409.729    metre"
"             Maximum storage             332.166    c.m"
"             Centroidal lag                2.515   hours"
"                  0.359     0.608     0.549     0.015 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.359     0.549     0.549     0.015"
" 52          CHANNEL DESIGN"
"        0.549   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                0.312    metre"
"             Velocity                     0.839    m/sec"
"             Channel capacity            10.655    c.m/sec"
"             Critical depth               0.267    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.422   X-factor <= 0.5"
"       64.729   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 0.547    c.m/sec"
"                    0.359     0.549     0.547     0.015 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.359     0.547     0.547     0.015"
" 52          CHANNEL DESIGN"
"        0.547   Current peak flow    c.m/sec"
```

```
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.224    metre"
"             Velocity                      0.914    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.179    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.350   X-factor <= 0.5"
"       32.667   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       37.500   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.546    c.m/sec"
"                    0.359     0.547     0.546     0.015 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.359     0.546     0.546     0.015"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.359     0.546     0.546     0.015"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  0.546    c.m/sec"
"             Hydrograph volume          2911.006    c.m"
"                    0.359     0.546     0.546     0.546"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.359     0.000     0.546     0.546"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.234     0.000     0.546     0.546 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  47.507     5.395      47.507     minutes"
"             Time to Centroid       151.963    91.698     151.963    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        4080.39    0.00       4080.39    c.m"
"             Rainfall losses        41.963     5.633      41.963     mm"
"             Runoff depth           19.396     55.726     19.396     mm"
"             Runoff volume          1289.82    0.00       1289.82    c.m"
"             Runoff coefficient     0.316      0.000      0.316      "
"             Maximum flow           0.234      0.000      0.234      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.234     0.234     0.546     0.546"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.897   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.049     0.234     0.546     0.546 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  21.495     2.441      16.926     minutes"
"             Time to Centroid       122.241    87.742     113.968    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        452.83     50.31      503.15     c.m"
"             Rainfall losses        41.967     6.310      38.401     mm"
"             Runoff depth           19.392     55.050     22.958     mm"
"             Runoff volume          143.12     45.14      188.26     c.m"
"             Runoff coefficient     0.316      0.897      0.374      "
"             Maximum flow           0.043      0.024      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.049     0.263     0.546     0.546"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.049     0.263     0.263     0.546"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.263    c.m/sec"
```

```
                                  Existing__10yr
"              Hydrograph volume          1478.082    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                  0.806    c.m/sec"
"              Hydrograph volume          4389.088    c.m"
"                      0.049     0.263     0.263     0.806"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                       22.700    hectare"
"              Total Impervious area                       0.082    hectare"
"              Total % impervious                          0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                    Modelling Files\2019-02-15"
"                Output filename:                             Existing__25yr.out"
"                Licensee name:                                             gmbp"
"                Company                                 Hewlett-Packard Company"
"                Date & Time last used:                  2/15/2019 at 2:06:47 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3701.648   Coefficient A"
"       25.500   Constant B"
"        0.937   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           143.371    mm/hr"
"             Total depth                  75.581    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  12.370     1.523      12.370     minutes"
"             Time to Centroid       110.314    85.984     110.314    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        166.28     0.00       166.28     c.m"
"             Rainfall losses        47.190     6.330      47.190     mm"
"             Runoff depth           28.391     69.250     28.391     mm"
"             Runoff volume          62.46      0.00       62.46      c.m"
"             Runoff coefficient     0.376      0.000      0.376      "
"             Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
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"            4   Add Runoff "
"                    0.024     0.024     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.024     0.024     0.024     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.024    c.m/sec"
"             Hydrograph volume            62.461    c.m"
"                    0.024     0.024     0.024     0.024"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.024     0.000     0.024     0.024"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.454     0.000     0.024     0.024 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  41.437     5.102      41.437     minutes"
"             Time to Centroid       143.191    90.751     143.190    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        5865.07    0.01       5865.07    c.m"
"             Rainfall losses        47.093     5.908      47.093     mm"
"             Runoff depth           28.488     69.673     28.488     mm"
"             Runoff volume          2210.64    0.01       2210.65    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.454      0.000      0.454      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.454     0.454     0.024     0.024"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

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"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.012     0.454     0.024     0.024 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  18.749     2.308      18.749     minutes"
"             Time to Centroid       117.510    87.059     117.510    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        98.25      0.00       98.26      c.m"
"             Rainfall losses        47.127     6.593      47.127     mm"
"             Runoff depth           28.453     68.988     28.453     mm"
"             Runoff volume          36.99      0.00       36.99      c.m"
"             Runoff coefficient     0.376      0.000      0.376      "
"             Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.012     0.461     0.024     0.024"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.584     0.461     0.024     0.024 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  23.913     2.944      23.913     minutes"
"             Time to Centroid       123.357    87.974     123.357    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
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                                  Existing__25yr
"             Rainfall volume        5381.35    0.01       5381.36    c.m"
"             Rainfall losses        47.108     6.942      47.107     mm"
"             Runoff depth           28.473     68.639     28.473     mm"
"             Runoff volume          2027.30    0.00       2027.30    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.584      0.000      0.584      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.584     1.001     0.024     0.024"
" 54          POND DESIGN"
"        1.001   Current peak flow    c.m/sec"
"        0.050   Target outflow    c.m/sec"
"       4274.9   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  409.630     0.000     0.000"
"                  409.750    0.6650   402.200"
"                  410.000     3.601  2187.900"
"                  410.250     7.811  5318.900"
"                  410.500    12.984  9642.300"
"                  410.750    18.965  15227.70"
"             Peak outflow                  0.886    c.m/sec"
"             Maximum level               409.769    metre"
"             Maximum storage             536.694    c.m"
"             Centroidal lag                2.394   hours"
"                  0.584     1.001     0.886     0.024 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.584     0.886     0.886     0.024"
" 52          CHANNEL DESIGN"
"        0.886   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                0.374    metre"
"             Velocity                     0.946    m/sec"
"             Channel capacity            10.655    c.m/sec"
"             Critical depth               0.324    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.407   X-factor <= 0.5"
"       57.429   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                 0.880    c.m/sec"
"                     0.584     0.886     0.880     0.024 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.584     0.880     0.880     0.024"
" 52          CHANNEL DESIGN"
"        0.880   Current peak flow    c.m/sec"
```

```
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.291    metre"
"             Velocity                      1.055    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.239    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.310   X-factor <= 0.5"
"       28.289   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       37.500   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.877    c.m/sec"
"                    0.584     0.880     0.877     0.024 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.584     0.877     0.877     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.584     0.877     0.877     0.024"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  0.877    c.m/sec"
"             Hydrograph volume          4274.952    c.m"
"                    0.584     0.877     0.877     0.877"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.584     0.000     0.877     0.877"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.389     0.000     0.877     0.877 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  41.437     5.102      41.437     minutes"
"             Time to Centroid       143.191    90.751     143.190    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        5026.12    0.01       5026.13    c.m"
"             Rainfall losses        47.093     5.908      47.093     mm"
"             Runoff depth           28.488     69.673     28.488     mm"
"             Runoff volume          1894.43    0.00       1894.44    c.m"
"             Runoff coefficient     0.377      0.000      0.377      "
"             Maximum flow           0.389      0.000      0.389      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.389     0.389     0.877     0.877"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.078     0.389     0.877     0.877 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  18.749     2.308      15.260     minutes"
"             Time to Centroid       117.510    87.059     111.048    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        557.79     61.98      619.76     c.m"
"             Rainfall losses        47.127     6.593      43.074     mm"
"             Runoff depth           28.453     68.988     32.507     mm"
"             Runoff volume          209.99     56.57      266.56     c.m"
"             Runoff coefficient     0.376      0.913      0.430      "
"             Maximum flow           0.068      0.028      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.078     0.435     0.877     0.877"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.078     0.435     0.435     0.877"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.435    c.m/sec"
```

```
                                  Existing__25yr
"              Hydrograph volume          2160.991    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                  1.308    c.m/sec"
"              Hydrograph volume          6435.943    c.m"
"                      0.078     0.435     0.435     1.308"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                       22.700    hectare"
"              Total Impervious area                       0.082    hectare"
"              Total % impervious                          0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                 Existing__50yr.out"
"                Licensee name:                                                 gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 2:17:43 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     5089.420   Coefficient A"
"       30.000   Constant B"
"        0.967   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           156.350    mm/hr"
"             Total depth                  86.737    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.032     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  11.375     1.467      11.375     minutes"
"             Time to Centroid       108.305    85.675     108.305    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        190.82     0.00       190.82     c.m"
"             Rainfall losses        50.570     6.561      50.570     mm"
"             Runoff depth           36.167     80.176     36.167     mm"
"             Runoff volume          79.57      0.00       79.57      c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.032      0.000      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.032     0.032     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.032     0.032     0.032     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.032    c.m/sec"
"             Hydrograph volume            79.567    c.m"
"                    0.032     0.032     0.032     0.032"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.032     0.000     0.032     0.032"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.418   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.618     0.000     0.032     0.032 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  38.106     4.916      38.106     minutes"
"             Time to Centroid       138.366    90.175     138.366    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        6730.77    0.01       6730.78    c.m"
"             Rainfall losses        50.510     5.941      50.510     mm"
"             Runoff depth           36.227     80.796     36.227     mm"
"             Runoff volume          2811.21    0.01       2811.22    c.m"
"             Runoff coefficient     0.418      0.000      0.418      "
"             Maximum flow           0.618      0.000      0.618      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.618     0.618     0.032     0.032"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.618     0.032     0.032 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  17.241     2.224      17.241     minutes"
"             Time to Centroid       114.897    86.667     114.896    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        112.76     0.00       112.76     c.m"
"             Rainfall losses        50.540     6.773      50.540     mm"
"             Runoff depth           36.197     79.963     36.197     mm"
"             Runoff volume          47.06      0.00       47.06      c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.628     0.032     0.032"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.789     0.628     0.032     0.032 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  21.990     2.837      21.990     minutes"
"             Time to Centroid       120.254    87.552     120.254    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
```

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                                  Existing__50yr
"             Rainfall volume        6175.65    0.01       6175.66    c.m"
"             Rainfall losses        50.538     7.307      50.538     mm"
"             Runoff depth           36.199     79.429     36.199     mm"
"             Runoff volume          2577.38    0.01       2577.39    c.m"
"             Runoff coefficient     0.417      0.000      0.417      "
"             Maximum flow           0.789      0.000      0.789      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.789     1.341     0.032     0.032"
" 54          POND DESIGN"
"        1.341   Current peak flow    c.m/sec"
"        0.050   Target outflow    c.m/sec"
"       5435.7   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  409.630     0.000     0.000"
"                  409.750    0.6650   402.200"
"                  410.000     3.601  2187.900"
"                  410.250     7.811  5318.900"
"                  410.500    12.984  9642.300"
"                  410.750    18.965  15227.70"
"             Peak outflow                  1.183    c.m/sec"
"             Maximum level               409.794    metre"
"             Maximum storage             718.586    c.m"
"             Centroidal lag                2.328   hours"
"                  0.789     1.341     1.183     0.032 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.789     1.183     1.183     0.032"
" 52          CHANNEL DESIGN"
"        1.183   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                0.417    metre"
"             Velocity                     1.016    m/sec"
"             Channel capacity            10.655    c.m/sec"
"             Critical depth               0.364    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.396   X-factor <= 0.5"
"       53.425   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.180    c.m/sec"
"                    0.789     1.183     1.180     0.032 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.789     1.180     1.180     0.032"
" 52          CHANNEL DESIGN"
"        1.180   Current peak flow    c.m/sec"
```

```
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.341    metre"
"             Velocity                      1.150    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.283    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.282   X-factor <= 0.5"
"       25.955   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       33.333   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.178    c.m/sec"
"                    0.789     1.180     1.178     0.032 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.789     1.178     1.178     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.789     1.178     1.178     0.032"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  1.178    c.m/sec"
"             Hydrograph volume          5435.679    c.m"
"                    0.789     1.178     1.178     1.178"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.789     0.000     1.178     1.178"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.418   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.530     0.000     1.178     1.178 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  38.106     4.916      38.106     minutes"
"             Time to Centroid       138.366    90.175     138.366    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        5767.99    0.01       5768.00    c.m"
"             Rainfall losses        50.510     5.941      50.510     mm"
"             Runoff depth           36.227     80.796     36.227     mm"
"             Runoff volume          2409.10    0.01       2409.10    c.m"
"             Runoff coefficient     0.418      0.000      0.418      "
"             Maximum flow           0.530      0.000      0.530      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.530     0.530     1.178     1.178"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.417   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.922   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.103     0.530     1.178     1.178 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  17.241     2.224      14.282     minutes"
"             Time to Centroid       114.897    86.667     109.333    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        640.12     71.12      711.24     c.m"
"             Rainfall losses        50.540     6.774      46.163     mm"
"             Runoff depth           36.197     79.963     40.574     mm"
"             Runoff volume          267.14     65.57      332.71     c.m"
"             Runoff coefficient     0.417      0.922      0.468      "
"             Maximum flow           0.091      0.031      0.103      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.103     0.592     1.178     1.178"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.103     0.592     0.592     1.178"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.592    c.m/sec"
```

```
                                  Existing__50yr
"              Hydrograph volume          2741.806    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                  1.754    c.m/sec"
"              Hydrograph volume          8177.484    c.m"
"                      0.103     0.592     0.592     1.754"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                       22.700    hectare"
"              Total Impervious area                       0.082    hectare"
"              Total % impervious                          0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                Existing__100yr.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 2:20:28 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     3600.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     6933.020   Coefficient A"
"       34.699   Constant B"
"        0.998   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           168.777    mm/hr"
"             Total depth                  97.921    mm"
"           6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"          30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.452   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.039     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  10.606     1.421      10.606     minutes"
"             Time to Centroid       106.728    85.423     106.728    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        215.43     0.00       215.43     c.m"
"             Rainfall losses        53.628     6.787      53.628     mm"
"             Runoff depth           44.294     91.134     44.294     mm"
"             Runoff volume          97.45      0.00       97.45      c.m"
"             Runoff coefficient     0.452      0.000      0.452      "
"             Maximum flow           0.039      0.000      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.039     0.039     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.039     0.039     0.039     0.000"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Walser Street"
"             Maximum flow                  0.039    c.m/sec"
"             Hydrograph volume            97.446    c.m"
"                     0.039     0.039     0.039     0.039"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.039     0.000     0.039     0.039"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           10   Catchment 10"
"        0.000   % Impervious"
"        7.760   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        7.760   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.454   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.801     0.000     0.039     0.039 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           7.760      0.000      7.760      hectare"
"             Time of concentration  35.531     4.759      35.530     minutes"
"             Time to Centroid       134.554    89.737     134.554    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        7598.69    0.01       7598.69    c.m"
"             Rainfall losses        53.501     6.084      53.501     mm"
"             Runoff depth           44.420     91.837     44.420     mm"
"             Runoff volume          3447.00    0.01       3447.01    c.m"
"             Runoff coefficient     0.454      0.000      0.454      "
"             Maximum flow           0.801      0.000      0.801      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.801     0.801     0.039     0.039"
" 33          CATCHMENT 11"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
```

```
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.020     0.801     0.039     0.039 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  16.076     2.153      16.076     minutes"
"             Time to Centroid       112.853    86.345     112.853    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        127.30     0.00       127.30     c.m"
"             Rainfall losses        53.605     6.948      53.605     mm"
"             Runoff depth           44.316     90.973     44.316     mm"
"             Runoff volume          57.61      0.00       57.61      c.m"
"             Runoff coefficient     0.453      0.000      0.453      "
"             Maximum flow           0.020      0.000      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.020     0.813     0.039     0.039"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.985     0.813     0.039     0.039 c.m/sec"
"             Catchment 40           Pervious   Impervious Total Area "
"             Surface Area           7.120      0.000      7.120      hectare"
"             Time of concentration  20.504     2.747      20.504     minutes"
"             Time to Centroid       117.777    87.189     117.777    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
```

```
"             Rainfall volume        6971.99    0.01       6972.00    c.m"
"             Rainfall losses        53.532     7.496      53.532     mm"
"             Runoff depth           44.389     90.426     44.389     mm"
"             Runoff volume          3160.50    0.01       3160.50    c.m"
"             Runoff coefficient     0.453      0.000      0.453      "
"             Maximum flow           0.985      0.000      0.985      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.985     1.721     0.039     0.039"
" 54          POND DESIGN"
"        1.721   Current peak flow    c.m/sec"
"        0.050   Target outflow    c.m/sec"
"       6665.1   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  409.630     0.000     0.000"
"                  409.750    0.6650   402.200"
"                  410.000     3.601  2187.900"
"                  410.250     7.811  5318.900"
"                  410.500    12.984  9642.300"
"                  410.750    18.965  15227.70"
"             Peak outflow                  1.507    c.m/sec"
"             Maximum level               409.822    metre"
"             Maximum storage             917.763    c.m"
"             Centroidal lag                2.275   hours"
"                  0.985     1.721     1.507     0.039 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.985     1.507     1.507     0.039"
" 52          CHANNEL DESIGN"
"        1.507   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                0.456    metre"
"             Velocity                     1.080    m/sec"
"             Channel capacity            10.655    c.m/sec"
"             Critical depth               0.400    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.386   X-factor <= 0.5"
"       50.288   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.499    c.m/sec"
"                  0.985     1.507     1.499     0.039 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.985     1.499     1.499     0.039"
" 52          CHANNEL DESIGN"
"        1.499   Current peak flow    c.m/sec"
```

```
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.386    metre"
"             Velocity                      1.232    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.325    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.256   X-factor <= 0.5"
"       24.228   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       33.333   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.499    c.m/sec"
"                    0.985     1.499     1.499     0.039 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.985     1.499     1.499     0.039"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.985     1.499     1.499     0.039"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                  1.499    c.m/sec"
"             Hydrograph volume          6665.154    c.m"
"                    0.985     1.499     1.499     1.499"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.985     0.000     1.499     1.499"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"        0.000   % Impervious"
"        6.650   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        6.650   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.454   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.687     0.000     1.499     1.499 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  35.531     4.759      35.530     minutes"
"             Time to Centroid       134.554    89.737     134.554    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        6511.76    0.01       6511.77    c.m"
"             Rainfall losses        53.501     6.084      53.501     mm"
"             Runoff depth           44.420     91.837     44.420     mm"
"             Runoff volume          2953.94    0.01       2953.95    c.m"
"             Runoff coefficient     0.454      0.000      0.454      "
"             Maximum flow           0.687      0.000      0.687      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.687     0.687     1.499     1.499"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.453   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.134     0.687     1.499     1.499 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  16.076     2.153      13.490     minutes"
"             Time to Centroid       112.853    86.345     107.930    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        722.66     80.30      802.95     c.m"
"             Rainfall losses        53.605     6.948      48.939     mm"
"             Runoff depth           44.316     90.973     48.982     mm"
"             Runoff volume          327.05     74.60      401.65     c.m"
"             Runoff coefficient     0.453      0.929      0.500      "
"             Maximum flow           0.115      0.034      0.134      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.134     0.763     1.499     1.499"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.134     0.763     0.763     1.499"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.763    c.m/sec"
```

```
                                  Existing__100yr
"              Hydrograph volume          3355.597    c.m"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total"
"              Maximum flow                  2.243    c.m/sec"
"              Hydrograph volume         10020.747    c.m"
"                      0.134     0.763     0.763     2.243"
" 38           START/RE-START TOTALS 21"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      22.700    hectare"
"              Total Impervious area                      0.082    hectare"
"              Total % impervious                         0.361"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Existing_REG.out"
"                Licensee name:                                               gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 2:27:05 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"             Maximum intensity            53.000    mm/hr"
"             Total depth                 285.000    mm"
"            6   200hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           30   Catchment 30"
"        0.000   % Impervious"
"        0.220   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.220   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.713   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.024     0.000     0.000     0.000 c.m/sec"
"             Catchment 30           Pervious   Impervious Total Area "
"             Surface Area           0.220      0.000      0.220      hectare"
"             Time of concentration  12.633     2.243      12.633     minutes"
"             Time to Centroid       2530.545   2290.972   2530.545   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        627.00     0.00       627.00     c.m"
```

```
                                    Existing_REG
"              Rainfall losses        81.839     43.972     81.839     mm"
"              Runoff depth           203.161    241.028    203.161    mm"
"              Runoff volume          446.95     0.00       446.95     c.m"
"              Runoff coefficient     0.713      0.000      0.713      "
"              Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
                     0.024     0.024     0.000     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
                     0.024     0.024     0.024     0.000"
" 40           HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
                  To Walser Street"
"              Maximum flow                 0.024    c.m/sec"
"              Hydrograph volume          446.953    c.m"
                     0.024     0.024     0.024     0.024"
" 40           HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
                     0.024     0.000     0.024     0.024"
" 33           CATCHMENT 10"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"            10   Catchment 10"
"         0.000   % Impervious"
"         7.760   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         7.760   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.714   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
                     0.881     0.000     0.024     0.024 c.m/sec"
"              Catchment 10           Pervious   Impervious Total Area "
"              Surface Area           7.760      0.000      7.760      hectare"
"              Time of concentration  42.319     7.513      42.319     minutes"
"              Time to Centroid       2572.242   2276.224   2572.241   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        2.2116     0.0000     2.2116     ha-m"
"              Rainfall losses        81.644     25.621     81.644     mm"
"              Runoff depth           203.356    259.379    203.356    mm"
"              Runoff volume          1.5780     0.0000     1.5780     ha-m"
"              Runoff coefficient     0.714      0.000      0.714      "
"              Maximum flow           0.881      0.000      0.881      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
                     0.881     0.881     0.024     0.024"
" 33           CATCHMENT 11"
"             1   Triangular SCS"
```

```
"            1   Equal length"
"            1   SCS method"
"           11   Catchment 11"
"        0.000   % Impervious"
"        0.130   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.130   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.014     0.881     0.024     0.024 c.m/sec"
"             Catchment 11           Pervious   Impervious Total Area "
"             Surface Area           0.130      0.000      0.130      hectare"
"             Time of concentration  19.148     3.399      19.148     minutes"
"             Time to Centroid       2545.193   2266.333   2545.193   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        370.50     0.00       370.50     c.m"
"             Rainfall losses        78.940     42.646     78.940     mm"
"             Runoff depth           206.060    242.354    206.060    mm"
"             Runoff volume          267.88     0.00       267.88     c.m"
"             Runoff coefficient     0.723      0.000      0.723      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.894     0.024     0.024"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           40   Catchment 40"
"        0.000   % Impervious"
"        7.120   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.120   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.716   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.772     0.894     0.024     0.024 c.m/sec"
"            Catchment 40           Pervious   Impervious Total Area "
"            Surface Area           7.120      0.000      7.120      hectare"
"            Time of concentration  24.421     4.336      24.421     minutes"
"            Time to Centroid       2549.942   2258.969   2549.942   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        2.0292     0.0000     2.0292     ha-m"
"            Rainfall losses        80.848     39.404     80.848     mm"
"            Runoff depth           204.152    245.596    204.152    mm"
"            Runoff volume          1.4536     0.0000     1.4536     ha-m"
"            Runoff coefficient     0.716      0.000      0.716      "
"            Maximum flow           0.772      0.000      0.772      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.772     1.667     0.024     0.024"
" 54         POND DESIGN"
"       1.667   Current peak flow    c.m/sec"
"       0.050   Target outflow    c.m/sec"
"     30583.9   Hydrograph volume    c.m"
"          6.   Number of stages"
"     409.630   Minimum water level    metre"
"     410.750   Maximum water level    metre"
"     409.630   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               409.630     0.000     0.000"
"               409.750    0.6650   402.200"
"               410.000     3.601  2187.900"
"               410.250     7.811  5318.900"
"               410.500    12.984  9642.300"
"               410.750    18.965  15227.70"
"            Peak outflow                  1.612    c.m/sec"
"            Maximum level               409.831    metre"
"            Maximum storage             977.909    c.m"
"            Centroidal lag               42.858   hours"
"                 0.772     1.667     1.612     0.024 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                    0.772     1.612     1.612     0.024"
" 52         CHANNEL DESIGN"
"       1.612   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.468    metre"
"            Velocity                      1.098    m/sec"
"            Channel capacity             10.655    c.m/sec"
"            Critical depth                0.411    metre"
" 53         ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.383   X-factor <= 0.5"
"      49.448   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                  1.606    c.m/sec"
```

```
"                    0.772     1.612     1.606     0.024 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.772     1.606     1.606     0.024"
" 52          CHANNEL DESIGN"
"         1.606   Current peak flow    c.m/sec"
"         0.035   Manning 'n'"
"            0.   Cross-section type: 0=trapezoidal; 1=general"
"         2.000   Basewidth    metre"
"         2.950   Left bank slope"
"         3.000   Right bank slope"
"         0.950   Channel depth    metre"
"         1.040   Gradient   %"
"              Depth of flow                 0.401    metre"
"              Velocity                      1.256    m/sec"
"              Channel capacity              9.246    c.m/sec"
"              Critical depth                0.339    metre"
" 53          ROUTE    Channel Route 40"
"         39.80      Channel Route 40 Reach length   ( metre)"
"         0.248   X-factor <= 0.5"
"        23.758   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"        35.644   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"              Peak outflow                  1.603    c.m/sec"
"                    0.772     1.606     1.603     0.024 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.772     1.603     1.603     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.772     1.603     1.603     0.024"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"              Maximum flow                  1.603    c.m/sec"
"              Hydrograph volume         30582.604    c.m"
"                    0.772     1.603     1.603     1.603"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.772     0.000     1.603     1.603"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           20   Catchment 20"
"         0.000   % Impervious"
"         6.650   Total Area"
"       150.000   Flow length"
"         2.000   Overland Slope"
"         6.650   Pervious Area"
"       150.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"       150.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.714   Pervious Runoff coefficient"
```

```
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.755     0.000     1.603     1.603 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           6.650      0.000      6.650      hectare"
"             Time of concentration  42.319     7.513      42.319     minutes"
"             Time to Centroid       2572.242   2276.224   2572.241   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1.8952     0.0000     1.8952     ha-m"
"             Rainfall losses        81.644     25.621     81.644     mm"
"             Runoff depth           203.356    259.379    203.356    mm"
"             Runoff volume          1.3523     0.0000     1.3523     ha-m"
"             Runoff coefficient     0.714      0.000      0.714      "
"             Maximum flow           0.755      0.000      0.755      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.755     0.755     1.603     1.603"
" 33          CATCHMENT 21"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"           21   Catchment 20"
"       10.000   % Impervious"
"        0.820   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.738   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.082   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.723   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.087     0.755     1.603     1.603 c.m/sec"
"             Catchment 21           Pervious   Impervious Total Area "
"             Surface Area           0.738      0.082      0.820      hectare"
"             Time of concentration  19.148     3.399      17.327     minutes"
"             Time to Centroid       2545.193   2266.333   2512.963   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2103.30    233.70     2337.00    c.m"
"             Rainfall losses        78.940     42.646     75.310     mm"
"             Runoff depth           206.060    242.354    209.690    mm"
"             Runoff volume          1520.72    198.73     1719.45    c.m"
"             Runoff coefficient     0.723      0.850      0.736      "
"             Maximum flow           0.078      0.010      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.087     0.840     1.603     1.603"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.087     0.840     0.840     1.603"
" 64          SHOW TABLE"
"            2   Flow hydrograph"
"            4   Inflow Hydrograph"
"             Maximum flow                 0.840    c.m/sec"
"             Hydrograph volume        15242.604    c.m"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total"
"             Maximum flow                 2.443    c.m/sec"
"             Hydrograph volume        45825.211    c.m"
"                     0.087     0.840     0.840     2.443"
" 38          START/RE-START TOTALS 21"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      22.700    hectare"
"             Total Impervious area                      0.082    hectare"
"             Total % impervious                         0.361"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Allowable_10yr.out"
"                Licensee name:                                                 gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 5:00:51 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2327.600   Coefficient A"
"       19.500   Constant B"
"        0.894   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           126.171    mm/hr"
"             Total depth                  61.359    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"            1   Area Included in Subdivision Design"
"       60.000   % Impervious"
"        0.650   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.260   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.390   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.122     0.000     0.000     0.000 c.m/sec"
"             Catchment 1            Pervious   Impervious Total Area "
"             Surface Area           0.260      0.390      0.650      hectare"
"             Time of concentration  13.094     1.611      4.125      minutes"
"             Time to Centroid       111.234    86.563     91.965     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        159.53     239.30     398.84     c.m"
"             Rainfall losses        38.098     6.044      18.866     mm"
"             Runoff depth           23.262     55.315     42.494     mm"
"             Runoff volume          60.48      215.73     276.21     c.m"
"             Runoff coefficient     0.379      0.901      0.693      "
"             Maximum flow           0.023      0.112      0.122      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
                                Allowable_10yr
"             4   Add Runoff "
"                    0.122     0.122     0.000     0.000"
" 38           START/RE-START TOTALS 1"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      0.650    hectare"
"              Total Impervious area                     0.390    hectare"
"              Total % impervious                       60.000"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Allowable_25yr.out"
"                Licensee name:                                                 gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 5:05:43 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3701.648   Coefficient A"
"       25.500   Constant B"
"        0.937   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           143.371    mm/hr"
"             Total depth                  75.581    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"            1   Area Included in Subdivision Design"
"       60.000   % Impervious"
"        0.650   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.260   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.390   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.150     0.000     0.000     0.000 c.m/sec"
"             Catchment 1            Pervious   Impervious Total Area "
"             Surface Area           0.260      0.390      0.650      hectare"
"             Time of concentration  11.553     1.523      3.959      minutes"
"             Time to Centroid       108.042    85.984     91.342     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        196.51     294.77     491.28     c.m"
"             Rainfall losses        42.253     6.330      20.699     mm"
"             Runoff depth           33.328     69.250     54.881     mm"
"             Runoff volume          86.65      270.08     356.73     c.m"
"             Runoff coefficient     0.441      0.916      0.726      "
"             Maximum flow           0.035      0.132      0.150      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
                                Allowable_25yr
"             4   Add Runoff "
"                    0.150     0.150     0.000     0.000"
" 38           START/RE-START TOTALS 1"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      0.650    hectare"
"              Total Impervious area                     0.390    hectare"
"              Total % impervious                       60.000"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                      Modelling Files\2019-02-15"
"                Output filename:                                 Allowable_50yr.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 5:06:49 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     5089.418   Coefficient A"
"       30.000   Constant B"
"        0.967   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           156.350    mm/hr"
"             Total depth                  86.737    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"            1   Area Included in Subdivision Design"
"       60.000   % Impervious"
"        0.650   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.260   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.390   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.173     0.000     0.000     0.000 c.m/sec"
"             Catchment 1            Pervious   Impervious Total Area "
"             Surface Area           0.260      0.390      0.650      hectare"
"             Time of concentration  10.695     1.467      3.845      minutes"
"             Time to Centroid       106.283    85.675     90.985     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        225.52     338.27     563.79     c.m"
"             Rainfall losses        44.994     6.561      21.934     mm"
"             Runoff depth           41.743     80.176     64.803     mm"
"             Runoff volume          108.53     312.68     421.22     c.m"
"             Runoff coefficient     0.481      0.924      0.747      "
"             Maximum flow           0.045      0.146      0.173      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
                                Allowable_50yr
"             4   Add Runoff "
"                    0.173     0.173     0.000     0.000"
" 38           START/RE-START TOTALS 1"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      0.650    hectare"
"              Total Impervious area                     0.390    hectare"
"              Total % impervious                       60.000"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                      Modelling Files\2019-02-15"
"                Output filename:                              Allowable_100yr.out"
"                Licensee name:                                               gmbp"
"                Company                                  Hewlett-Packard Company"
"                Date & Time last used:                   2/15/2019 at 5:07:38 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     6933.019   Coefficient A"
"       34.699   Constant B"
"        0.998   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           168.777    mm/hr"
"             Total depth                  97.921    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"            1   Area Included in Subdivision Design"
"       60.000   % Impervious"
"        0.650   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.260   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.390   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.515   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.931   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.196     0.000     0.000     0.000 c.m/sec"
"             Catchment 1            Pervious   Impervious Total Area "
"             Surface Area           0.260      0.390      0.650      hectare"
"             Time of concentration  10.027     1.421      3.740      minutes"
"             Time to Centroid       104.871    85.423     90.664     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        254.60     381.89     636.49     c.m"
"             Rainfall losses        47.483     6.787      23.065     mm"
"             Runoff depth           50.438     91.134     74.856     mm"
"             Runoff volume          131.14     355.42     486.56     c.m"
"             Runoff coefficient     0.515      0.931      0.764      "
"             Maximum flow           0.055      0.160      0.196      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.196     0.196     0.000     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                        0.650    hectare"
"             Total Impervious area                       0.390    hectare"
"             Total % impervious                         60.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                  Allowable_REG.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 5:09:43 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"              Maximum intensity            53.000    mm/hr"
"              Total depth                 285.000    mm"
"            6   000hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"            1   1"
"       60.000   % Impervious"
"        0.650   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.260   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.390   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.754   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.080     0.000     0.000     0.000 c.m/sec"
"              Catchment 1            Pervious   Impervious Total Area "
"              Surface Area           0.260      0.390      0.650      hectare"
"              Time of concentration  12.485     2.243      6.061      minutes"
"              Time to Centroid       2505.276   2290.972   2370.872   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        741.00     1111.50    1852.50    c.m"
```

```
                                  Allowable_REG
"              Rainfall losses        70.073     43.972     54.413     mm"
"              Runoff depth           214.927    241.028    230.587    mm"
"              Runoff volume          558.81     940.01     1498.82    c.m"
"              Runoff coefficient     0.754      0.846      0.809      "
"              Maximum flow           0.030      0.050      0.080      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.080     0.080     0.000     0.000"
" 38           START/RE-START TOTALS 1"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                      0.650    hectare"
"              Total Impervious area                     0.390    hectare"
"              Total % impervious                       60.000"
" 19           EXIT"
```

Ainley Farm Subdivision
Our File: 411009
February 2019

Catchment 1200: Proposed Infiltration Gallery

STORAGE VOLUME CALCULATIONS

ELEV (m)	INC D (m)	SURFACE AREA (Infil. Gall) (sq m)	INCR. PIPE STORAGE VOL (cu m)	INCR. GALLERY STORAGE VOL (cu m)	ACCUM STORAGE VOL (cu m)	
411.830	0.000	597.50	0.00	0.00	0.00	Bottom of Stone
411.930	0.100	597.50	0.00	19.92	19.92	
412.230	0.400	597.50	95.85	27.80	143.57	
412.530	0.700	597.50	95.85	27.80	267.22	
412.630	0.800	597.50	0.00	19.92	287.13	
412.700	0.870	597.50	0.00	13.94	301.07	Top of Stone
412.800	0.970	1.85	0.00	0.06	301.14	
413.000	1.170	1.85	0.00	0.12	301.26	
413.230	1.400	1.85	0.00	0.14	301.40	Weir (1)
413.430	1.600	5.00	0.00	0.33	301.74	
413.630	1.800	10.00	0.00	0.67	302.40	
413.830	2.000	15.00	0.00	1.00	303.40	
414.030	2.200	20.00	0.00	1.33	304.74	
414.090	2.260	25.00	0.00	0.50	305.24	Weir (2)
414.290	2.460	30.00	0.00	2.00	307.24	
414.490	2.660	35.00	0.00	2.33	309.57	Overflow

BOTTOM INFILTRATION

L1(dw) =	85.0	m
W1(dw) =	3.5	m
L2(dw) =	60.0	m
W2(dw) =	5.0	m
D(dw) =	0.87	m
A(c) =	597.5	sq m
VOL(dw)=	328.1	cu m
VOL(st)=	109.4	cu m
K =	4	mm/hr
=	1.11E-04	cm/s

SIDE INFILTRATION ALL SIDES

L1(dw) =	85.0	m
W1(dw) =	3.5	m
L2(dw) =	60.0	m
W2(dw) =	5.0	m
D(dw) =	0.87	m
A(c) =	267.1	sq m
K =	4	mm/hr
=	1.11E-04	cm/s

Weir (1)
Elevation = 413.23

d1 =	2.66	m
h =	1.40	m
H =	1.26	m
2g =	19.620	
L =	0.36	m
Q =	0.790	m^3/s

Weir (2)
Elevation = 414.09

d1 =	2.66	m
h =	2.26	m
H =	0.40	m
2g =	19.620	
L =	0.36	m
Q =	0.128	m^3/s

ELEVATION	STAGE (m)	STORAGE (cu m)	INFILTRATION DISCHARGE (cu m/s)	OVERFLOW WEIR (cu m/s)	OVERFLOW WEIR (cu m/s)	TOTAL DISCHARGE (cu m/s)	
411.830	0.000	0.00	0.0003	0.000	0.000	0.0003	Bottom of Stone
411.930	0.100	19.92	0.0003	0.000	0.000	0.0003	
412.230	0.400	143.57	0.0003	0.000	0.000	0.0003	
412.530	0.700	267.22	0.0003	0.000	0.000	0.0003	
412.630	0.800	287.13	0.0003	0.000	0.000	0.0003	
412.700	0.870	301.07	0.0003	0.000	0.000	0.0003	Top of Stone
412.800	0.970	301.14	0.0003	0.000	0.000	0.0003	
413.000	1.170	301.26	0.0003	0.000	0.000	0.0003	
413.230	1.400	301.40	0.0003	0.000	0.000	0.0003	Weir (1)
413.430	1.600	301.74	0.0000	0.045	0.000	0.0451	
413.630	1.800	302.40	0.0000	0.131	0.000	0.1310	
413.830	2.000	303.40	0.0000	0.246	0.000	0.2461	
414.030	2.200	304.74	0.0000	0.386	0.000	0.3862	
414.090	2.260	305.24	0.0000	0.433	0.000	0.4327	Weir (2)
414.290	2.460	307.24	0.0000	0.602	0.045	0.6461	
414.490	2.660	309.57	0.0000	0.790	0.128	0.9189	Overflow

Ainley Farm Subdivision
Our File: 411009
February 2019

Catchment 1400: Proposed Infiltration Gallery

STORAGE VOLUME CALCULATIONS

ELEV (m)	INC D (m)	SURFACE AREA (sq m)	INCR. PIPE STORAGE VOL (cu m)	INCR. GALLERY STORAGE VOL (cu m)	ACCUM STORAGE VOL (cu m)	
413.920	0.000	800.00	0.00	0.00	0.00	Bottom of Stone
414.020	0.100	800.00	0.00	26.67	26.67	
414.120	0.200	800.00	1.91	26.03	54.61	
414.220	0.300	800.00	1.91	26.03	82.54	
414.320	0.400	800.00	1.91	26.03	110.48	
414.420	0.500	800.00	1.91	26.03	138.42	
414.520	0.600	800.00	0.00	26.67	165.09	
414.620	0.700	800.00	0.00	26.67	191.76	Top of Stone
414.720	0.800	0.72	0.07	0.00	191.83	Pipe Invert
414.820	0.900	0.72	0.07	0.00	191.90	
414.920	1.000	0.72	0.07	0.00	191.97	
415.020	1.100	0.72	0.07	0.00	192.04	
415.120	1.200	0.72	0.07	0.00	192.12	Top of Grate
415.220	1.300	185.00	9.29	0.00	201.40	
415.320	1.400	565.00	37.50	0.00	238.90	
415.420	1.500	750.00	65.75	0.00	304.65	Weir
415.520	1.600	800.00	77.50	0.00	382.15	Overflow

BOTTOM INFILTRATION

L1(dw) =	80.0	m
W1(dw) =	10.0	m
D(dw) =	0.70	m
A(c) =	800.0	sq m
VOL(dw)=	560.0	cu m
VOL(st)=	186.7	cu m
K =	4	mm/hr
=	1.11E-04	cm/s

SIDE INFILTRATION
ALL SIDES

L1(dw) =	80.0	m
W1(dw) =	10.0	m
D(dw) =	0.7	m
A(c) =	126.0	sq m
K =	4	mm/hr
=	1.11E-04	cm/s

Pipe Outlet

300 mm diameter pipe
200 mm orifice

Q =	0.075	m^3/s
Cd =	0.6	
H =	0.80	m
2g =	19.62	
A =	0.031	m^2
D =	0.2	m
D/2 =	0.1	m

Overflow Weir

Elevation = 411.90

d1 =	1.600	m
h =	1.500	m
H =	0.100	m
2g =	19.620	
L =	5.000	m
Q =	0.218	m^3/s

ELEVATION	STAGE (m)	STORAGE (cu m)	INFILTRATION DISCHARGE (cu m/s)	PIPE DISCHARGE (cu m/s)	OVERFLOW WEIR (cu m/s)	TOTAL DISCHARGE (cu m/s)	
413.920	0.000	0.00	0.0009	0.000	0.000	0.0009	Bottom of Stone
414.020	0.100	26.67	0.0009	0.000	0.000	0.0009	
414.120	0.200	54.61	0.0009	0.000	0.000	0.0009	
414.220	0.300	82.54	0.0009	0.000	0.000	0.0009	
414.320	0.400	110.48	0.0009	0.000	0.000	0.0009	
414.420	0.500	138.42	0.0009	0.000	0.000	0.0009	
414.520	0.600	165.09	0.0009	0.000	0.000	0.0009	
414.620	0.700	191.76	0.0009	0.000	0.000	0.0009	Top of Stone
414.720	0.800	191.83	0.0009	0.000	0.000	0.0009	Pipe Invert
414.820	0.900	191.90	0.0000	0.026	0.000	0.0264	
414.920	1.000	191.97	0.0000	0.037	0.000	0.0373	
415.020	1.100	192.04	0.0000	0.046	0.000	0.0457	
415.120	1.200	192.12	0.0000	0.053	0.000	0.0528	Top of Grate
415.220	1.300	201.40	0.0000	0.059	0.219	0.2777	
415.320	1.400	238.90	0.0000	0.065	0.629	0.6941	
415.420	1.500	304.65	0.0000	0.070	1.175	1.2444	
415.520	1.600	382.15	0.0000	0.075	1.834	1.9086	Overflow

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
G&M File: 411009
February 2019

Catchment 1000 : Stormwater Management Facility No. 1

Stage Storage Volume Calculations

Elevation (m)	Stage (m)	Surface Area (m^2)	Increm. Storage (m^3)	Accum. Storage (m^3)	
411.00	0.00	3,447	0	0.0	CB.1 Lip
411.10	0.10	5,051	425	424.9	
411.20	0.20	5,171	511	936.0	
411.30	0.30	5,291	523	1,459.1	
411.40	0.40	5,413	535	1,994.3	CB.2 Lip
411.50	0.50	5,535	547	2,541.7	
411.60	0.60	5,657	560	3,101.3	
411.70	0.70	5,781	572	3,673.2	
411.80	0.80	5,905	584	4,257.5	
411.85	0.85	5,968	297	4,554.3	Weir
412.00	1.00	6,156	909	5,463.6	Top of bank

Outlet #1

375 mm diameter pipe
300 mm orifice

Q =	0.197	m^3/s
Cd =	0.600	
H =	1.100	m
2g =	19.620	
A =	0.071	m^2
D =	0.300	m
D/2 =	0.150	m
Invert =	410.75	

Outlet #2

450 mm diameter pipe
350 mm orifice

Q =	0.252	m^3/s
Cd =	0.600	
H =	0.975	m
2g =	19.620	
A =	0.096	m^2
D =	0.350	m
D/2 =	0.175	m
Invert =	410.85	

Overflow Weir

Elevation = 411.90

d1 =	1.00	m
h =	0.85	m
H =	0.15	m
2g =	19.620	
L =	20.00	m
Q =	1.638	m^3/s

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
G&M File: 411009
February 2019

Stage/Storage/Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Outlet #1 300 mm (m^3/s)	Outlet #2 450mm (m^3/s)	Overflow Weir (m^3/s)	Actual Discharge (m^3/s)	
411.00	0.00	0.0	0.000	0.000	0.000	0.000	CB.1 Lip
411.10	0.10	424.9	0.051	0.000	0.000	0.051	
411.20	0.20	936.0	0.103	0.000	0.000	0.103	
411.30	0.30	1,459.1	0.119	0.000	0.000	0.119	
411.40	0.40	1,994.3	0.133	0.000	0.000	0.133	CB.2 Lip
411.50	0.50	2,541.7	0.146	0.176	0.000	0.322	
411.60	0.60	3,101.3	0.157	0.194	0.000	0.351	
411.70	0.70	3,673.2	0.168	0.210	0.000	0.378	
411.80	0.80	4,257.5	0.178	0.225	0.000	0.403	
411.85	0.85	4,554.3	0.183	0.232	0.000	0.415	Weir
412.00	1.00	5,463.6	0.197	0.252	1.638	2.088	Top of bank

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
G&M File: 411009
February 2019

Catchment 2100 : Stormwater Management Facility No. 2

Stage Storage Volume Calculations

Elevation (m)	Stage (m)	Surface Area (m^2)	Increm. Storage (m^3)	Accum. Storage (m^3)	
410.65	0.00	488.80	0	0.0	Bottom of Pond/Knockout
410.70	0.05	511.10	25	25.0	
410.80	0.15	572.00	54	79.2	
410.90	0.25	634.70	60	139.5	
411.00	0.35	699.30	67	206.2	
411.10	0.45	765.60	73	279.4	
411.20	0.55	833.70	80	359.4	
411.30	0.65	903.60	87	446.3	CB Lip
411.40	0.75	975.23	94	540.2	
411.50	0.85	1048.80	101	641.4	
411.60	0.95	1124.10	109	750.1	
411.65	1.00	1150.00	57	806.9	Weir
411.95	1.30	1440.00	389	1,195.4	Top of bank

Outlet #1
120 mm Diameter Knockout

Q =	0.021	m^3/s
Cd =	0.600	
H =	0.490	m
2g =	19.620	
A =	0.011	m^2
D =	0.120	m
D/2 =	0.060	m

Outlet #2
260 mm diameter orifice

Q =	0.156	m^3/s
Cd =	0.600	
H =	0.820	m
2g =	19.620	
A =	0.053	m^2
D =	0.260	m
D/2 =	0.130	m
Invert =	410.60	

Overflow Weir
Elevation = 411.65

d1 =	1.30	m
h =	1.00	m
H =	0.30	m
2g =	19.62	
L =	10.00	m
Q =	2.369	m^3/s

Stage/Storage/Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Outlet #1 100 mm (m^3/s)	Outlet #2 425 mm (m^3/s)	Overflow Weir (m^3/s)	Actual Discharge (m^3/s)	
410.65	0.00	0.0	0.000	0.000	0.000	0.000	Bottom of Pond/Knockout
410.70	0.05	25.0	0.005	0.000	0.000	0.005	
410.80	0.15	79.2	0.009	0.000	0.000	0.009	
410.90	0.25	139.5	0.013	0.000	0.000	0.013	
411.00	0.35	206.2	0.016	0.000	0.000	0.016	
411.10	0.45	279.4	0.019	0.000	0.000	0.019	
411.20	0.55	359.4	0.021	0.000	0.000	0.021	
411.30	0.65	446.3	0.023	0.000	0.000	0.023	CB Lip
411.40	0.75	540.2	0.000	0.115	0.000	0.115	
411.50	0.85	641.4	0.000	0.124	0.000	0.124	
411.60	0.95	750.1	0.000	0.132	0.000	0.132	
411.65	1.00	806.9	0.000	0.135	0.000	0.135	Weir
411.95	1.30	1,195.4	0.000	0.156	2.369	2.525	Top of bank

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
G&M File: 411009
February 2019

Catchment 4000: Wetland

Stage Storage Volume Calculations

Elevation (m)	Stage (m)	Surface Area (m^2)	Increm. Storage (m^3)	Accum. Storage (m^3)	
409.63	0.00	0	0	0.0	Wetland Bottom
409.75	0.12	3871	232	232.2	
410.00	0.37	10414	1786	2017.9	
410.25	0.62	14634	3131	5148.9	
410.50	0.87	19953	4323	9472.3	
410.75	1.12	24730	5585	15057.7	Overflow

WEIR CALCULATIONS

d1 =	1.12	m
h =	0.12	m
H =	1.00	m
2g =	19.62	
L =	3	m
Q =	5.468	m^3/s

Stage/Storage/Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Actual Discharge (m^3/s)	
409.63	0.00	0.0	0.000	Wetland Bottom
409.75	0.12	232.2	0.000	
410.00	0.37	2017.9	0.625	
410.25	0.62	5148.9	1.862	
410.50	0.87	9472.3	3.503	
410.75	1.12	15057.7	5.468	Overflow

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                      Modelling Files\2019-02-15"
"                Output filename:                                    Post__2yr.out"
"                Licensee name:                                                gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 2:43:26 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
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"        6.387   Constant B"
"        0.793   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            93.292    mm/hr"
"             Total depth                  33.014    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"        50.000   % Impervious"
"         0.220   Total Area"
"        10.000   Flow length"
"         2.000   Overland Slope"
"         0.110   Pervious Area"
"        10.000   Pervious length"
"         2.000   Pervious slope"
"         0.110   Impervious Area"
"        10.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.207   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.829   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.021     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  13.484     1.233      3.680      minutes"
"             Time to Centroid       116.839    87.775     93.582     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        36.32      36.32      72.63      c.m"
"             Rainfall losses        26.179     5.640      15.910     mm"
"             Runoff depth           6.835      27.374     17.104     mm"
"             Runoff volume          7.52       30.11      37.63      c.m"
"             Runoff coefficient     0.207      0.829      0.518      "
"             Maximum flow           0.003      0.021      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.021     0.021     0.000     0.000"
" 33          CATCHMENT 1300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1300   Catchment 1300"
"       50.000   % Impervious"
"        0.840   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.420   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.420   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.076     0.021     0.000     0.000 c.m/sec"
"             Catchment 1300          Pervious   Impervious Total Area "
"             Surface Area            0.420      0.420      0.840      hectare"
"             Time of concentration   20.437     1.868      5.553      minutes"
"             Time to Centroid        125.085    88.659     95.887     minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         138.66     138.66     277.32     c.m"
"             Rainfall losses         26.169     5.363      15.766     mm"
"             Runoff depth            6.845      27.651     17.248     mm"
"             Runoff volume           28.75      116.13     144.88     c.m"
"             Runoff coefficient      0.207      0.838      0.522      "
"             Maximum flow            0.008      0.075      0.076      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.076     0.097     0.000     0.000"
" 33          CATCHMENT 1600"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1600   Catchment 1600"
"       50.000   % Impervious"
"        0.360   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.180   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.180   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.836   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.033     0.097     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   17.197     1.572      4.676      minutes"
"             Time to Centroid        121.230    88.299     94.841     minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         59.42      59.42      118.85     c.m"
"             Rainfall losses         26.170     5.407      15.789     mm"
"             Runoff depth            6.844      27.606     17.225     mm"
"             Runoff volume           12.32      49.69      62.01      c.m"
"             Runoff coefficient      0.207      0.836      0.522      "
"             Maximum flow            0.004      0.033      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.033     0.130     0.000     0.000"
" 54          POND DESIGN"
"        0.130   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        244.5   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.000    c.m/sec"
"             Maximum level               412.465    metre"
"             Maximum storage             240.501    c.m"
"             Centroidal lag              100.901   hours"
"                  0.033     0.130     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.000    c.m/sec"
"             Hydrograph volume           236.400    c.m"
"                    0.033     0.130     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.033     0.000     0.000     0.000"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.837   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.024     0.000     0.000     0.000 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   26.066     2.383      14.173     minutes"
"             Time to Centroid        131.779    89.515     110.556    minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         163.75     40.94      204.69     c.m"
"             Rainfall losses         26.167     5.389      22.011     mm"
"             Runoff depth            6.847      27.625     11.002     mm"
"             Runoff volume           33.96      34.25      68.22      c.m"
"             Runoff coefficient      0.207      0.837      0.333      "
"             Maximum flow            0.008      0.023      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.024     0.024     0.000     0.000"
" 54          POND DESIGN"
"        0.024   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"         68.2   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
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```
"              415.520     1.909   382.150"
"            Peak outflow                 0.001    c.m/sec"
"            Maximum level              414.120    metre"
"            Maximum storage             54.655    c.m"
"            Centroidal lag              13.440   hours"
"                 0.024     0.024     0.001     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.024     0.001     0.001     0.000"
" 33         CATCHMENT 1500"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                 0.105     0.001     0.001     0.000 c.m/sec"
"            Catchment 1500          Pervious   Impervious Total Area "
"            Surface Area            0.555      0.555      1.110      hectare"
"            Time of concentration   30.977     2.832      8.436      minutes"
"            Time to Centroid        137.612    90.217     99.655     minutes"
"            Rainfall depth          33.014     33.014     33.014     mm"
"            Rainfall volume         183.23     183.23     366.45     c.m"
"            Rainfall losses         26.164     5.467      15.815     mm"
"            Runoff depth            6.850      27.547     17.198     mm"
"            Runoff volume           38.02      152.89     190.90     c.m"
"            Runoff coefficient      0.207      0.834      0.521      "
"            Maximum flow            0.008      0.104      0.105      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.105     0.106     0.001     0.000"
" 56         DIVERSION"
"         1500   Node number"
"        0.146   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.000    c.m/sec"
"            Volume of diverted flow       0.000    c.m"
"            DIV01500.002hyd"
"            Major flow at 1500"
"                 0.105     0.106     0.106     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.105     0.106     0.106     0.000"
" 33         CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.208   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.641     0.106     0.106     0.000 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   53.679     4.907      14.516     minutes"
"             Time to Centroid        164.608    93.181     107.253    minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         1115.87    1115.87    2231.73    c.m"
"             Rainfall losses         26.162     5.089      15.626     mm"
"             Runoff depth            6.851      27.925     17.388     mm"
"             Runoff volume           231.58     943.87     1175.45    c.m"
"             Runoff coefficient      0.208      0.846      0.527      "
"             Maximum flow            0.035      0.638      0.641      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.641     0.747     0.106     0.000"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.009     0.747     0.106     0.000 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   20.437     1.868      20.437     minutes"
"             Time to Centroid        125.085    88.659     125.085    minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         158.47     0.00       158.47     c.m"
"             Rainfall losses         26.169     5.363      26.169     mm"
"             Runoff depth            6.845      27.651     6.845      mm"
"             Runoff volume           32.86      0.00       32.86      c.m"
"             Runoff coefficient      0.207      0.000      0.207      "
"             Maximum flow            0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.750     0.106     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.009     0.750     0.750     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    0.750    c.m/sec"
"             Hydrograph volume            1703.822    c.m"
"                    0.009     0.750     0.750     0.750"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    0.750    c.m/sec"
"             Hydrograph volume            1703.822    c.m"
"                    0.009     0.750     0.750     0.000"
" 54          POND DESIGN"
"         0.750   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        1703.8   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.089    c.m/sec"
"             Maximum level                 411.174    metre"
"             Maximum storage               802.937    c.m"
"             Centroidal lag                 17.722   hours"
"                  0.009     0.750     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.009     0.089     0.089     0.000"
" 47          FILEI_O Read/Open DIV01500.002hyd"
```

```
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.002hyd"
"             Major flow at 1500"
"             Total volume                  0.000    c.m"
"             Maximum flow                  0.000    c.m/sec"
"                  0.000     0.089     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.000     0.089     0.089     0.000"
" 33          CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.007   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.001     0.089     0.089     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   236.857    3.611      236.829    minutes"
"             Time to Centroid        321.153    91.497     321.125    minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         2419.91    0.00       2419.91    c.m"
"             Rainfall losses         32.792     5.642      32.792     mm"
"             Runoff depth            0.222      27.372     0.222      mm"
"             Runoff volume           16.24      0.00       16.24      c.m"
"             Runoff coefficient      0.007      0.000      0.007      "
"             Maximum flow            0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.001     0.090     0.089     0.000"
" 54          POND DESIGN"
"        0.090   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       1718.7   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   405.300"
```

```
"               410.000     3.601  2191.000"
"               410.250     7.811  5322.000"
"               410.500    12.984  9645.400"
"               410.750    18.965  15230.80"
"             Peak outflow                  0.089    c.m/sec"
"             Maximum level               409.646    metre"
"             Maximum storage              54.277    c.m"
"             Centroidal lag               17.775   hours"
"                  0.001     0.090     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.001     0.089     0.089     0.000"
" 52          CHANNEL DESIGN"
"        0.089   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.158    metre"
"             Velocity                      0.532    m/sec"
"             Channel capacity             10.655    c.m/sec"
"             Critical depth                0.129    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.461   X-factor <= 0.5"
"      102.011   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"      100.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.089    c.m/sec"
"                    0.001     0.089     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.001     0.089     0.089     0.000"
" 52          CHANNEL DESIGN"
"        0.089   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.080    metre"
"             Velocity                      0.500    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.057    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.444   X-factor <= 0.5"
"       59.654   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       60.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
```

```
"             Peak outflow                  0.089    c.m/sec"
"                    0.001     0.089     0.089     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.089    c.m/sec"
"             Hydrograph volume          1718.583    c.m"
"                    0.001     0.089     0.089     0.089"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.001     0.000     0.089     0.089"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"      60.000   % Impervious"
"       1.960   Total Area"
"      40.000   Flow length"
"       2.000   Overland Slope"
"       0.784   Pervious Area"
"      40.000   Pervious length"
"       2.000   Pervious slope"
"       1.176   Impervious Area"
"      40.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      78.000   Pervious SCS Curve No."
"       0.207   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       7.164   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.834   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.223     0.000     0.089     0.089 c.m/sec"
"             Catchment 2100         Pervious   Impervious Total Area "
"             Surface Area           0.784      1.176      1.960      hectare"
"             Time of concentration  30.977     2.832      6.834      minutes"
"             Time to Centroid       137.612    90.217     96.956     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        258.83     388.24     647.07     c.m"
"             Rainfall losses        26.164     5.467      13.746     mm"
"             Runoff depth           6.850      27.547     19.268     mm"
"             Runoff volume          53.70      323.95     377.66     c.m"
"             Runoff coefficient     0.207      0.834      0.584      "
"             Maximum flow           0.012      0.221      0.223      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.223     0.223     0.089     0.089"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"      90.000   % Impervious"
"       0.790   Total Area"
"      20.000   Flow length"
"       2.000   Overland Slope"
"       0.079   Pervious Area"
"      20.000   Pervious length"
```

```
"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.127     0.223     0.089     0.089 c.m/sec"
"             Catchment 2400         Pervious   Impervious Total Area "
"             Surface Area           0.079      0.711      0.790      hectare"
"             Time of concentration  20.437     1.868      2.365      minutes"
"             Time to Centroid       125.085    88.659     89.634     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        26.08      234.73     260.81     c.m"
"             Rainfall losses        26.169     5.363      7.444      mm"
"             Runoff depth           6.845      27.651     25.570     mm"
"             Runoff volume          5.41       196.60     202.00     c.m"
"             Runoff coefficient     0.207      0.838      0.775      "
"             Maximum flow           0.002      0.127      0.127      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.127     0.347     0.089     0.089"
" 54          POND DESIGN"
"        0.347   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        579.7   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  410.650     0.000     0.000"
"                  410.700   0.00600    42.000"
"                  410.800   0.01300   130.000"
"                  410.900   0.02000   225.000"
"                  411.000   0.02500   328.000"
"                  411.100   0.02900   439.000"
"                  411.200    0.1260   558.000"
"                  411.300    0.1390   686.000"
"                  411.400    0.1510   822.000"
"                  411.500    0.1630   967.000"
"                  411.600    0.1730  1121.000"
"                  411.650    0.1780  1202.000"
"                  411.950     2.575  1742.000"
"             Peak outflow                  0.027    c.m/sec"
"             Maximum level               411.062    metre"
"             Maximum storage             397.232    c.m"
"             Centroidal lag                4.834   hours"
"                  0.127     0.347     0.027     0.089 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.127     0.027     0.027     0.089"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.027     0.027     0.089 c.m/sec"
"             Catchment 2300          Pervious   Impervious Total Area "
"             Surface Area            0.432      0.048      0.480      hectare"
"             Time of concentration   20.437     1.868      14.685     minutes"
"             Time to Centroid        125.085    88.659     113.801    minutes"
"             Rainfall depth          33.014     33.014     33.014     mm"
"             Rainfall volume         142.62     15.85      158.47     c.m"
"             Rainfall losses         26.169     5.363      24.088     mm"
"             Runoff depth            6.845      27.651     8.926      mm"
"             Runoff volume           29.57      13.27      42.84      c.m"
"             Runoff coefficient      0.207      0.838      0.270      "
"             Maximum flow            0.008      0.009      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.036     0.027     0.089"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.011     0.036     0.036     0.089"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.036    c.m/sec"
"             Hydrograph volume           622.521    c.m"
"                    0.011     0.036     0.036     0.036"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.011     0.000     0.036     0.036"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
```

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"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.207   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.130     0.000     0.036     0.036 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  30.977     2.832      4.986      minutes"
"             Time to Centroid       137.612    90.217     93.844     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        75.93      227.80     303.73     c.m"
"             Rainfall losses        26.164     5.467      10.641     mm"
"             Runoff depth           6.850      27.547     22.373     mm"
"             Runoff volume          15.75      190.08     205.83     c.m"
"             Runoff coefficient     0.207      0.834      0.678      "
"             Maximum flow           0.004      0.129      0.130      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.130     0.130     0.036     0.036"
" 54          POND DESIGN"
"        0.130   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        205.8   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.008    c.m/sec"
"             Maximum level               413.864    metre"
"             Maximum storage             151.519    c.m"
"             Centroidal lag                6.574   hours"
"                  0.130     0.130     0.008     0.036 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.043    c.m/sec"
"             Hydrograph volume           828.346    c.m"
"                    0.130     0.130     0.008     0.043"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

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"                    0.130     0.000     0.008     0.043"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.208   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.830   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.061     0.000     0.008     0.043 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   38.137     3.486      8.435      minutes"
"              Time to Centroid        146.130    91.278     99.112     minutes"
"              Rainfall depth          33.014     33.014     33.014     mm"
"              Rainfall volume         69.99      104.98     174.97     c.m"
"              Rainfall losses         26.163     5.605      13.828     mm"
"              Runoff depth            6.851      27.409     19.185     mm"
"              Runoff volume           14.52      87.16      101.68     c.m"
"              Runoff coefficient      0.208      0.830      0.581      "
"              Maximum flow            0.003      0.061      0.061      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.061     0.061     0.008     0.043"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.207   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
```

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"        0.838   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.026     0.061     0.008     0.043 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  20.437     1.868      4.499      minutes"
"             Time to Centroid       125.085    88.659     93.819     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        31.69      47.54      79.23      c.m"
"             Rainfall losses        26.169     5.363      13.685     mm"
"             Runoff depth           6.845      27.651     19.329     mm"
"             Runoff volume          6.57       39.82      46.39      c.m"
"             Runoff coefficient     0.207      0.838      0.585      "
"             Maximum flow           0.002      0.026      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.026     0.087     0.008     0.043"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.026     0.087     0.087     0.043"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.087    c.m/sec"
"             Hydrograph volume          148.072    c.m"
"                0.026     0.087     0.087     0.087"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.087    c.m/sec"
"             Hydrograph volume          148.072    c.m"
"                0.026     0.087     0.087     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.026     0.087     0.087     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.098    c.m/sec"
"             Hydrograph volume         1866.656    c.m"
"                0.026     0.087     0.087     0.098"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.098    c.m/sec"
"             Hydrograph volume         1866.656    c.m"
"                0.026     0.098     0.087     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.026     0.098     0.098     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                 0.135    c.m/sec"
"             Hydrograph volume         2695.002    c.m"
"                0.026     0.098     0.098     0.135"
" 40          HYDROGRAPH   Confluence    200"
```

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                                    Post__2yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  0.135    c.m/sec"
"              Hydrograph volume          2695.002    c.m"
"                     0.026     0.135     0.098     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                      Modelling Files\2019-02-15"
"                Output filename:                                    Post__5yr.out"
"                Licensee name:                                              gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 2:45:23 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1459.072   Coefficient A"
"       13.690   Constant B"
"        0.850   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           113.586    mm/hr"
"             Total depth                  49.792    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.317   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.871   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.029     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  9.868      1.116      3.453      minutes"
"             Time to Centroid       109.069    86.405     92.457     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        54.77      54.77      109.54     c.m"
"             Rainfall losses        33.989     6.414      20.202     mm"
"             Runoff depth           15.803     43.377     29.590     mm"
"             Runoff volume          17.38      47.72      65.10      c.m"
"             Runoff coefficient     0.317      0.871      0.594      "
"             Maximum flow           0.007      0.028      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.029     0.029     0.000     0.000"
" 33          CATCHMENT 1300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1300   Catchment 1300"
"       50.000   % Impervious"
"        0.840   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.420   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.420   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.111     0.029     0.000     0.000 c.m/sec"
"             Catchment 1300          Pervious   Impervious Total Area "
"             Surface Area            0.420      0.420      0.840      hectare"
"             Time of concentration   14.957     1.691      5.209      minutes"
"             Time to Centroid        115.000    87.210     94.579     minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         209.13     209.13     418.25     c.m"
"             Rainfall losses         33.921     5.811      19.866     mm"
"             Runoff depth            15.871     43.981     29.926     mm"
"             Runoff volume           66.66      184.72     251.38     c.m"
"             Runoff coefficient      0.319      0.883      0.601      "
"             Maximum flow            0.025      0.103      0.111      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.111     0.141     0.000     0.000"
" 33          CATCHMENT 1600"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1600   Catchment 1600"
"       50.000   % Impervious"
"        0.360   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.180   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.180   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.318   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.881   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.048     0.141     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   12.585     1.423      4.386      minutes"
"             Time to Centroid        112.243    86.878     93.610     minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         89.63      89.63      179.25     c.m"
"             Rainfall losses         33.944     5.926      19.935     mm"
"             Runoff depth            15.848     43.866     29.857     mm"
"             Runoff volume           28.53      78.96      107.49     c.m"
"             Runoff coefficient      0.318      0.881      0.600      "
"             Maximum flow            0.011      0.045      0.048      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.048     0.189     0.000     0.000"
" 54          POND DESIGN"
"        0.189   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        424.0   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.045    c.m/sec"
"             Maximum level               413.445    metre"
"             Maximum storage             301.791    c.m"
"             Centroidal lag               93.389   hours"
"                  0.048     0.189     0.045     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.045    c.m/sec"
"             Hydrograph volume           360.765    c.m"
"                    0.048     0.189     0.045     0.045"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.048     0.000     0.045     0.045"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.882   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.038     0.000     0.045     0.045 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   19.076     2.157      12.156     minutes"
"             Time to Centroid        119.796    87.903     106.752    minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         246.97     61.74      308.71     c.m"
"             Rainfall losses         33.923     5.866      28.312     mm"
"             Runoff depth            15.868     43.926     21.480     mm"
"             Runoff volume           78.71      54.47      133.17     c.m"
"             Runoff coefficient      0.319      0.882      0.431      "
"             Maximum flow            0.025      0.031      0.038      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.038     0.038     0.045     0.045"
" 54          POND DESIGN"
"        0.038   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        133.2   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
```

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"              415.520     1.909   382.150"
"            Peak outflow                 0.001    c.m/sec"
"            Maximum level              414.367    metre"
"            Maximum storage            123.517    c.m"
"            Centroidal lag              22.519   hours"
"                 0.038     0.038     0.001     0.045 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.038     0.001     0.001     0.045"
" 33         CATCHMENT 1500"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                 0.146     0.001     0.001     0.045 c.m/sec"
"            Catchment 1500          Pervious   Impervious Total Area "
"            Surface Area            0.555      0.555      1.110      hectare"
"            Time of concentration   22.670     2.563      7.922      minutes"
"            Time to Centroid        124.006    88.517     97.975     minutes"
"            Rainfall depth          49.792     49.792     49.792     mm"
"            Rainfall volume         276.34     276.34     552.69     c.m"
"            Rainfall losses         33.904     6.066      19.985     mm"
"            Runoff depth            15.888     43.726     29.807     mm"
"            Runoff volume           88.18      242.68     330.86     c.m"
"            Runoff coefficient      0.319      0.878      0.599      "
"            Maximum flow            0.026      0.139      0.146      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.146     0.146     0.001     0.045"
" 56         DIVERSION"
"         1500   Node number"
"        0.146   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.000    c.m/sec"
"            Volume of diverted flow       0.104    c.m"
"            DIV01500.005hyd"
"            Major flow at 1500"
"                 0.146     0.146     0.146     0.045 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.146     0.146     0.146     0.045"
" 33         CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.888   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.905     0.146     0.146     0.045 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   39.284     4.442      13.658     minutes"
"             Time to Centroid        143.413    91.124     104.955    minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         1682.96    1682.96    3365.92    c.m"
"             Rainfall losses         33.893     5.585      19.739     mm"
"             Runoff depth            15.898     44.206     30.052     mm"
"             Runoff volume           537.36     1494.17    2031.54    c.m"
"             Runoff coefficient      0.319      0.888      0.604      "
"             Maximum flow            0.110      0.891      0.905      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.905     1.051     0.146     0.045"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.028     1.051     0.146     0.045 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   14.957     1.691      14.957     minutes"
"             Time to Centroid        114.999    87.210     114.999    minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         239.00     0.00       239.00     c.m"
"             Rainfall losses         33.921     5.811      33.921     mm"
"             Runoff depth            15.871     43.981     15.871     mm"
"             Runoff volume           76.18      0.00       76.18      c.m"
"             Runoff coefficient      0.319      0.000      0.319      "
"             Maximum flow            0.028      0.000      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.028     1.062     0.146     0.045"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.028     1.062     1.062     0.045"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.062    c.m/sec"
"             Hydrograph volume            2932.428    c.m"
"                    0.028     1.062     1.062     1.062"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.062    c.m/sec"
"             Hydrograph volume            2932.428    c.m"
"                    0.028     1.062     1.062     0.000"
" 54          POND DESIGN"
"         1.062   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        2932.4   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.124    c.m/sec"
"             Maximum level                 411.333    metre"
"             Maximum storage              1636.316    c.m"
"             Centroidal lag                 13.589   hours"
"                  0.028     1.062     0.124     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.028     0.124     0.124     0.000"
" 47          FILEI_O Read/Open DIV01500.005hyd"
```

```
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.005hyd"
"             Major flow at 1500"
"             Total volume                  0.104    c.m"
"             Maximum flow                  0.000    c.m/sec"
"                  0.000     0.124     0.124     0.000 c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.000     0.124     0.124     0.000"
" 33           CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.043   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.019     0.124     0.124     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   82.074     3.269      82.072     minutes"
"             Time to Centroid        193.297    89.581     193.294    minutes"
"             Rainfall depth          49.792     49.792     49.792     mm"
"             Rainfall volume         3649.73    0.00       3649.73    c.m"
"             Rainfall losses         47.655     6.236      47.655     mm"
"             Runoff depth            2.137      43.556     2.137      mm"
"             Runoff volume           156.63     0.00       156.64     c.m"
"             Runoff coefficient      0.043      0.000      0.043      "
"             Maximum flow            0.019      0.000      0.019      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.019     0.143     0.124     0.000"
" 54           POND DESIGN"
"         0.143   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        3086.2   Hydrograph volume    c.m"
"            6.   Number of stages"
"       409.630   Minimum water level    metre"
"       410.750   Maximum water level    metre"
"       409.630   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 409.630     0.000     0.000"
"                 409.750    0.6650   405.300"
```

```
"               410.000     3.601  2191.000"
"               410.250     7.811  5322.000"
"               410.500    12.984  9645.400"
"               410.750    18.965  15230.80"
"             Peak outflow                  0.142    c.m/sec"
"             Maximum level               409.656    metre"
"             Maximum storage              86.642    c.m"
"             Centroidal lag               13.232   hours"
"                  0.019     0.143     0.142     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.019     0.142     0.142     0.000"
" 52          CHANNEL DESIGN"
"        0.142   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.000   Basewidth    metre"
"        7.410   Left bank slope"
"        6.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.188    metre"
"             Velocity                      0.598    m/sec"
"             Channel capacity             10.655    c.m/sec"
"             Critical depth                0.156    metre"
" 53          ROUTE    Channel Route 72"
"        72.40      Channel Route 72 Reach length   ( metre)"
"        0.453   X-factor <= 0.5"
"       90.765   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       75.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  0.142    c.m/sec"
"                    0.019     0.142     0.142     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.019     0.142     0.142     0.000"
" 52          CHANNEL DESIGN"
"        0.142   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        2.000   Basewidth    metre"
"        2.950   Left bank slope"
"        3.000   Right bank slope"
"        0.950   Channel depth    metre"
"        1.040   Gradient   %"
"             Depth of flow                 0.104    metre"
"             Velocity                      0.589    m/sec"
"             Channel capacity              9.246    c.m/sec"
"             Critical depth                0.077    metre"
" 53          ROUTE    Channel Route 40"
"        39.80      Channel Route 40 Reach length   ( metre)"
"        0.427   X-factor <= 0.5"
"       50.699   K-lag   ( seconds)"
"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       50.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
```

```
"             Peak outflow                  0.142    c.m/sec"
"                    0.019     0.142     0.142     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.142    c.m/sec"
"             Hydrograph volume          3085.926    c.m"
"                    0.019     0.142     0.142     0.142"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.019     0.000     0.142     0.142"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"       60.000  % Impervious"
"        1.960  Total Area"
"       40.000  Flow length"
"        2.000  Overland Slope"
"        0.784  Pervious Area"
"       40.000  Pervious length"
"        2.000  Pervious slope"
"        1.176  Impervious Area"
"       40.000  Impervious length"
"        2.000  Impervious slope"
"        0.250  Pervious Manning 'n'"
"       78.000  Pervious SCS Curve No."
"        0.319  Pervious Runoff coefficient"
"        0.100  Pervious Ia/S coefficient"
"        7.164  Pervious Initial abstraction"
"        0.015  Impervious Manning 'n'"
"       98.000  Impervious SCS Curve No."
"        0.878  Impervious Runoff coefficient"
"        0.100  Impervious Ia/S coefficient"
"        0.518  Impervious Initial abstraction"
"                    0.304     0.000     0.142     0.142 c.m/sec"
"             Catchment 2100         Pervious   Impervious Total Area "
"             Surface Area           0.784      1.176      1.960      hectare"
"             Time of concentration  22.670     2.563      6.484      minutes"
"             Time to Centroid       124.006    88.517     95.437     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        390.37     585.55     975.92     c.m"
"             Rainfall losses        33.904     6.066      17.201     mm"
"             Runoff depth           15.888     43.726     32.591     mm"
"             Runoff volume          124.56     514.22     638.78     c.m"
"             Runoff coefficient     0.319      0.878      0.655      "
"             Maximum flow           0.036      0.295      0.304      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.304     0.304     0.142     0.142"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"       90.000  % Impervious"
"        0.790  Total Area"
"       20.000  Flow length"
"        2.000  Overland Slope"
"        0.079  Pervious Area"
"       20.000  Pervious length"
```

```
"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.175     0.304     0.142     0.142 c.m/sec"
"             Catchment 2400         Pervious   Impervious Total Area "
"             Surface Area           0.079      0.711      0.790      hectare"
"             Time of concentration  14.957     1.691      2.203      minutes"
"             Time to Centroid       115.000    87.210     88.281     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        39.34      354.02     393.35     c.m"
"             Rainfall losses        33.921     5.811      8.622      mm"
"             Runoff depth           15.871     43.981     41.170     mm"
"             Runoff volume          12.54      312.70     325.24     c.m"
"             Runoff coefficient     0.319      0.883      0.827      "
"             Maximum flow           0.005      0.175      0.175      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.175     0.479     0.142     0.142"
" 54          POND DESIGN"
"        0.479   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"        964.0   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  410.650     0.000     0.000"
"                  410.700   0.00600    42.000"
"                  410.800   0.01300   130.000"
"                  410.900   0.02000   225.000"
"                  411.000   0.02500   328.000"
"                  411.100   0.02900   439.000"
"                  411.200    0.1260   558.000"
"                  411.300    0.1390   686.000"
"                  411.400    0.1510   822.000"
"                  411.500    0.1630   967.000"
"                  411.600    0.1730  1121.000"
"                  411.650    0.1780  1202.000"
"                  411.950     2.575  1742.000"
"             Peak outflow                  0.119    c.m/sec"
"             Maximum level               411.193    metre"
"             Maximum storage             549.320    c.m"
"             Centroidal lag                4.059   hours"
"                  0.175     0.479     0.119     0.142 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.175     0.119     0.119     0.142"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.119     0.119     0.142 c.m/sec"
"             Catchment 2300         Pervious   Impervious Total Area "
"             Surface Area           0.432      0.048      0.480      hectare"
"             Time of concentration  14.957     1.691      11.834     minutes"
"             Time to Centroid       114.999    87.210     108.457    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        215.10     23.90      239.00     c.m"
"             Rainfall losses        33.921     5.811      31.110     mm"
"             Runoff depth           15.871     43.981     18.682     mm"
"             Runoff volume          68.56      21.11      89.67      c.m"
"             Runoff coefficient     0.319      0.883      0.375      "
"             Maximum flow           0.025      0.012      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.138     0.119     0.142"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.030     0.138     0.138     0.142"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.138    c.m/sec"
"             Hydrograph volume          1052.909    c.m"
"                    0.030     0.138     0.138     0.138"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.030     0.000     0.138     0.138"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
```

```
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.319   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.176     0.000     0.138     0.138 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  22.670     2.563      4.735      minutes"
"             Time to Centroid       124.006    88.517     92.351     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        114.52     343.56     458.08     c.m"
"             Rainfall losses        33.904     6.066      13.025     mm"
"             Runoff depth           15.888     43.726     36.767     mm"
"             Runoff volume          36.54      301.71     338.25     c.m"
"             Runoff coefficient     0.319      0.878      0.738      "
"             Maximum flow           0.011      0.173      0.176      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.176     0.176     0.138     0.138"
" 54          POND DESIGN"
"        0.176   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        338.3   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.012    c.m/sec"
"             Maximum level               413.963    metre"
"             Maximum storage             257.625    c.m"
"             Centroidal lag                6.867   hours"
"                  0.176     0.176     0.012     0.138 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.149    c.m/sec"
"             Hydrograph volume          1391.158    c.m"
"                    0.176     0.176     0.012     0.149"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

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"                    0.176     0.000     0.012     0.149"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.319   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.877   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.084     0.000     0.012     0.149 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   27.910     3.156      7.991      minutes"
"              Time to Centroid        130.112    89.411     97.361     minutes"
"              Rainfall depth          49.792     49.792     49.792     mm"
"              Rainfall volume         105.56     158.34     263.90     c.m"
"              Rainfall losses         33.900     6.148      17.249     mm"
"              Runoff depth            15.891     43.643     32.543     mm"
"              Runoff volume           33.69      138.79     172.48     c.m"
"              Runoff coefficient      0.319      0.877      0.654      "
"              Maximum flow            0.009      0.083      0.084      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.084     0.084     0.012     0.149"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.319   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
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"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.037     0.084     0.012     0.149 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  14.957     1.691      4.264      minutes"
"             Time to Centroid       115.000    87.210     92.599     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        47.80      71.70      119.50     c.m"
"             Rainfall losses        33.921     5.811      17.055     mm"
"             Runoff depth           15.871     43.981     32.737     mm"
"             Runoff volume          15.24      63.33      78.57      c.m"
"             Runoff coefficient     0.319      0.883      0.657      "
"             Maximum flow           0.006      0.035      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.037     0.121     0.012     0.149"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.037     0.121     0.121     0.149"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"             To Walser Street"
"             Maximum flow                 0.121    c.m/sec"
"             Hydrograph volume          251.044    c.m"
"                0.037     0.121     0.121     0.121"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"             To Walser Street"
"             Maximum flow                 0.121    c.m/sec"
"             Hydrograph volume          251.044    c.m"
"                0.037     0.121     0.121     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.037     0.121     0.121     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"             Existing Wetland"
"             Maximum flow                 0.150    c.m/sec"
"             Hydrograph volume         3336.969    c.m"
"                0.037     0.121     0.121     0.150"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"             Existing Wetland"
"             Maximum flow                 0.150    c.m/sec"
"             Hydrograph volume         3336.970    c.m"
"                0.037     0.150     0.121     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.037     0.150     0.150     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"             To Trib. of Grand River"
"             Maximum flow                 0.280    c.m/sec"
"             Hydrograph volume         4728.137    c.m"
"                0.037     0.150     0.150     0.280"
" 40          HYDROGRAPH   Confluence    200"
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                                    Post__5yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  0.280    c.m/sec"
"              Hydrograph volume          4728.137    c.m"
"                     0.037     0.280     0.150     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                    Post__10yr.out"
"                Licensee name:                                                gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 2:48:35 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2327.596   Coefficient A"
"       19.500   Constant B"
"        0.894   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           126.171    mm/hr"
"             Total depth                  61.359    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.037     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200          Pervious   Impervious Total Area "
"             Surface Area            0.110      0.110      0.220      hectare"
"             Time of concentration   8.639      1.063      3.329      minutes"
"             Time to Centroid        106.058    85.846     91.893     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         67.50      67.50      134.99     c.m"
"             Rainfall losses         38.124     6.938      22.531     mm"
"             Runoff depth            23.235     54.421     38.828     mm"
"             Runoff volume           25.56      59.86      85.42      c.m"
"             Runoff coefficient      0.379      0.887      0.633      "
"             Maximum flow            0.011      0.032      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.037     0.037     0.000     0.000"
" 33          CATCHMENT 1300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1300   Catchment 1300"
"       50.000   % Impervious"
"        0.840   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.420   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.420   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.137     0.037     0.000     0.000 c.m/sec"
"             Catchment 1300          Pervious   Impervious Total Area "
"             Surface Area            0.420      0.420      0.840      hectare"
"             Time of concentration   13.094     1.611      5.010      minutes"
"             Time to Centroid        111.234    86.563     93.866     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         257.71     257.71     515.42     c.m"
"             Rainfall losses         38.098     6.044      22.071     mm"
"             Runoff depth            23.262     55.315     39.288     mm"
"             Runoff volume           97.70      232.32     330.02     c.m"
"             Runoff coefficient      0.379      0.901      0.640      "
"             Maximum flow            0.038      0.121      0.137      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.137     0.174     0.000     0.000"
" 33          CATCHMENT 1600"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1600   Catchment 1600"
"       50.000   % Impervious"
"        0.360   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.180   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.180   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

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                                    Post__10yr
"       98.000   Impervious SCS Curve No."
"        0.898   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.060     0.174     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   11.018     1.355      4.226      minutes"
"             Time to Centroid        108.801    86.227     92.933     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         110.45     110.45     220.89     c.m"
"             Rainfall losses         38.068     6.251      22.159     mm"
"             Runoff depth            23.291     55.108     39.200     mm"
"             Runoff volume           41.92      99.19      141.12     c.m"
"             Runoff coefficient      0.380      0.898      0.639      "
"             Maximum flow            0.017      0.053      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.060     0.234     0.000     0.000"
" 54          POND DESIGN"
"        0.234   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        556.6   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.127    c.m/sec"
"             Maximum level               413.660    metre"
"             Maximum storage             302.552    c.m"
"             Centroidal lag               75.584   hours"
"                  0.060     0.234     0.127     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.127    c.m/sec"
"             Hydrograph volume           485.153    c.m"
"                    0.060     0.234     0.127     0.127"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.060     0.000     0.127     0.127"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.900   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.056     0.000     0.127     0.127 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   16.700     2.054      11.252     minutes"
"             Time to Centroid        115.361    87.160     104.869    minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         304.34     76.09      380.43     c.m"
"             Rainfall losses         38.059     6.144      31.676     mm"
"             Runoff depth            23.300     55.215     29.683     mm"
"             Runoff volume           115.57     68.47      184.04     c.m"
"             Runoff coefficient      0.380      0.900      0.484      "
"             Maximum flow            0.040      0.036      0.056      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.056     0.056     0.127     0.127"
" 54          POND DESIGN"
"        0.056   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        184.0   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
```

```
                                    Post__10yr
"               415.520     1.909   382.150"
"             Peak outflow                 0.001    c.m/sec"
"             Maximum level              414.420    metre"
"             Maximum storage            138.498    c.m"
"             Centroidal lag              29.934   hours"
"                  0.056     0.056     0.001     0.127 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.056     0.001     0.001     0.127"
" 33          CATCHMENT 1500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.897   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.174     0.001     0.001     0.127 c.m/sec"
"             Catchment 1500          Pervious   Impervious Total Area "
"             Surface Area            0.555      0.555      1.110      hectare"
"             Time of concentration   19.847     2.441      7.618      minutes"
"             Time to Centroid        118.992    87.742     97.037     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         340.54     340.54     681.09     c.m"
"             Rainfall losses         38.054     6.310      22.182     mm"
"             Runoff depth            23.305     55.050     39.177     mm"
"             Runoff volume           129.34     305.52     434.87     c.m"
"             Runoff coefficient      0.380      0.897      0.638      "
"             Maximum flow            0.041      0.162      0.174      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.174     0.175     0.001     0.127"
" 56          DIVERSION"
"         1500   Node number"
"        0.146   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.029    c.m/sec"
"             Volume of diverted flow      11.178    c.m"
"             DIV01500.010hyd"
"             Major flow at 1500"
"                  0.174     0.175     0.146     0.127 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.174     0.146     0.146     0.127"
" 33          CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.905   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.059     0.146     0.146     0.127 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   34.392     4.230      13.155     minutes"
"             Time to Centroid        135.773    90.174     103.666    minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         2073.94    2073.94    4147.88    c.m"
"             Rainfall losses         38.029     5.843      21.936     mm"
"             Runoff depth            23.330     55.517     39.424     mm"
"             Runoff volume           788.57     1876.46    2665.03    c.m"
"             Runoff coefficient      0.380      0.905      0.643      "
"             Maximum flow            0.182      1.031      1.059      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.059     1.205     0.146     0.127"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

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                                    Post__10yr
"        0.518   Impervious Initial abstraction"
"                     0.043     1.205     0.146     0.127 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   13.094     1.611      13.094     minutes"
"             Time to Centroid        111.234    86.563     111.234    minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         294.52     0.00       294.52     c.m"
"             Rainfall losses         38.098     6.044      38.097     mm"
"             Runoff depth            23.262     55.315     23.262     mm"
"             Runoff volume           111.66     0.00       111.66     c.m"
"             Runoff coefficient      0.379      0.000      0.379      "
"             Maximum flow            0.043      0.000      0.043      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.043     1.226     0.146     0.127"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.043     1.226     1.226     0.127"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.226    c.m/sec"
"             Hydrograph volume            3869.559    c.m"
"                     0.043     1.226     1.226     1.226"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.226    c.m/sec"
"             Hydrograph volume            3869.559    c.m"
"                     0.043     1.226     1.226     0.000"
" 54          POND DESIGN"
"         1.226   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        3869.6   Hydrograph volume    c.m"
"          11.    Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.214    c.m/sec"
"             Maximum level                 411.443    metre"
"             Maximum storage              2228.205    c.m"
"             Centroidal lag                 12.150   hours"
"                  0.043     1.226     0.214     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.043     0.214     0.214     0.000"
" 47          FILEI_O Read/Open DIV01500.010hyd"
```

```
                                    Post__10yr
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.010hyd"
"             Major flow at 1500"
"             Total volume                 11.178    c.m"
"             Maximum flow                  0.029    c.m/sec"
"                  0.029     0.214     0.214     0.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.029     0.214     0.214     0.000"
" 33          CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.073   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.050     0.214     0.214     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   57.122     3.114      57.121     minutes"
"             Time to Centroid        167.459    88.727     167.458    minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         4497.63    0.00       4497.63    c.m"
"             Rainfall losses         56.901     6.470      56.901     mm"
"             Runoff depth            4.458      54.890     4.458      mm"
"             Runoff volume           326.76     0.00       326.77     c.m"
"             Runoff coefficient      0.073      0.000      0.073      "
"             Maximum flow            0.050      0.000      0.050      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.050     0.263     0.214     0.000"
" 54          POND DESIGN"
"        0.263   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       4204.5   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   405.300"
```

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"               410.000     3.601  2191.000"
"               410.250     7.811  5322.000"
"               410.500    12.984  9645.400"
"               410.750    18.965  15230.80"
"            Peak outflow                  0.256    c.m/sec"
"            Maximum level               409.676    metre"
"            Maximum storage             156.065    c.m"
"            Centroidal lag               11.563   hours"
"                 0.050     0.263     0.256     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                   0.050     0.256     0.256     0.000"
" 52         CHANNEL DESIGN"
"       0.256   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.235    metre"
"            Velocity                      0.693    m/sec"
"            Channel capacity             10.655    c.m/sec"
"            Critical depth                0.197    metre"
" 53         ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.442   X-factor <= 0.5"
"      78.331   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      75.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                  0.256    c.m/sec"
"                   0.050     0.256     0.256     0.000 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                   0.050     0.256     0.256     0.000"
" 52         CHANNEL DESIGN"
"       0.256   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       2.000   Basewidth    metre"
"       2.950   Left bank slope"
"       3.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.146    metre"
"            Velocity                      0.718    m/sec"
"            Channel capacity              9.246    c.m/sec"
"            Critical depth                0.112    metre"
" 53         ROUTE    Channel Route 40"
"       39.80      Channel Route 40 Reach length   ( metre)"
"       0.399   X-factor <= 0.5"
"      41.601   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      42.857   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
```

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                                    Post__10yr
"             Peak outflow                  0.255    c.m/sec"
"                    0.050     0.256     0.255     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.255    c.m/sec"
"             Hydrograph volume          4204.214    c.m"
"                    0.050     0.256     0.255     0.255"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.050     0.000     0.255     0.255"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"      60.000   % Impervious"
"       1.960   Total Area"
"      40.000   Flow length"
"       2.000   Overland Slope"
"       0.784   Pervious Area"
"      40.000   Pervious length"
"       2.000   Pervious slope"
"       1.176   Impervious Area"
"      40.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      78.000   Pervious SCS Curve No."
"       0.380   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       7.164   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.897   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.359     0.000     0.255     0.255 c.m/sec"
"             Catchment 2100          Pervious   Impervious Total Area "
"             Surface Area            0.784      1.176      1.960      hectare"
"             Time of concentration   19.847     2.441      6.272      minutes"
"             Time to Centroid        118.992    87.742     94.620     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         481.06     721.58     1202.64    c.m"
"             Rainfall losses         38.054     6.310      19.008     mm"
"             Runoff depth            23.305     55.050     42.352     mm"
"             Runoff volume           182.71     647.38     830.09     c.m"
"             Runoff coefficient      0.380      0.897      0.690      "
"             Maximum flow            0.058      0.342      0.359      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.359     0.359     0.255     0.255"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"      90.000   % Impervious"
"       0.790   Total Area"
"      20.000   Flow length"
"       2.000   Overland Slope"
"       0.079   Pervious Area"
"      20.000   Pervious length"
```

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"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.205     0.359     0.255     0.255 c.m/sec"
"             Catchment 2400          Pervious   Impervious Total Area "
"             Surface Area            0.079      0.711      0.790      hectare"
"             Time of concentration   13.094     1.611      2.123      minutes"
"             Time to Centroid        111.234    86.563     87.664     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         48.47      436.26     484.74     c.m"
"             Rainfall losses         38.098     6.044      9.250      mm"
"             Runoff depth            23.262     55.315     52.110     mm"
"             Runoff volume           18.38      393.29     411.67     c.m"
"             Runoff coefficient      0.379      0.901      0.849      "
"             Maximum flow            0.007      0.204      0.205      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.205     0.565     0.255     0.255"
" 54          POND DESIGN"
"        0.565   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"       1241.8   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  410.650     0.000     0.000"
"                  410.700   0.00600    42.000"
"                  410.800   0.01300   130.000"
"                  410.900   0.02000   225.000"
"                  411.000   0.02500   328.000"
"                  411.100   0.02900   439.000"
"                  411.200    0.1260   558.000"
"                  411.300    0.1390   686.000"
"                  411.400    0.1510   822.000"
"                  411.500    0.1630   967.000"
"                  411.600    0.1730  1121.000"
"                  411.650    0.1780  1202.000"
"                  411.950     2.575  1742.000"
"             Peak outflow                  0.139    c.m/sec"
"             Maximum level               411.304    metre"
"             Maximum storage             690.969    c.m"
"             Centroidal lag                3.683   hours"
"                  0.205     0.565     0.139     0.255 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.205     0.139     0.139     0.255"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.379   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.045     0.139     0.139     0.255 c.m/sec"
"             Catchment 2300          Pervious   Impervious Total Area "
"             Surface Area            0.432      0.048      0.480      hectare"
"             Time of concentration   13.094     1.611      10.694     minutes"
"             Time to Centroid        111.234    86.563     106.078    minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         265.07     29.45      294.52     c.m"
"             Rainfall losses         38.098     6.044      34.892     mm"
"             Runoff depth            23.262     55.315     26.467     mm"
"             Runoff volume           100.49     26.55      127.04     c.m"
"             Runoff coefficient      0.379      0.901      0.431      "
"             Maximum flow            0.039      0.014      0.045      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.045     0.177     0.139     0.255"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.045     0.177     0.177     0.255"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.177    c.m/sec"
"             Hydrograph volume          1368.391    c.m"
"                    0.045     0.177     0.177     0.177"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.045     0.000     0.177     0.177"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
```

```
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.897   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.206     0.000     0.177     0.177 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  19.847     2.441      4.594      minutes"
"             Time to Centroid       118.992    87.742     91.606     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        141.13     423.38     564.51     c.m"
"             Rainfall losses        38.054     6.310      14.246     mm"
"             Runoff depth           23.305     55.050     47.113     mm"
"             Runoff volume          53.60      379.84     433.44     c.m"
"             Runoff coefficient     0.380      0.897      0.768      "
"             Maximum flow           0.017      0.201      0.206      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.206     0.206     0.177     0.177"
" 54          POND DESIGN"
"        0.206   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        433.4   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.014    c.m/sec"
"             Maximum level               414.033    metre"
"             Maximum storage             338.951    c.m"
"             Centroidal lag                7.231   hours"
"                  0.206     0.206     0.014     0.177 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.189    c.m/sec"
"             Hydrograph volume          1801.834    c.m"
"                    0.206     0.206     0.014     0.189"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

```
"                    0.206     0.000     0.014     0.189"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.380   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.895   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.098     0.000     0.014     0.189 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   24.434     3.005      7.732      minutes"
"              Time to Centroid        124.292    88.564     96.444     minutes"
"              Rainfall depth          61.359     61.359     61.359     mm"
"              Rainfall volume         130.08     195.12     325.20     c.m"
"              Rainfall losses         38.047     6.437      19.081     mm"
"              Runoff depth            23.312     54.922     42.278     mm"
"              Runoff volume           49.42      174.65     224.07     c.m"
"              Runoff coefficient      0.380      0.895      0.689      "
"              Maximum flow            0.014      0.095      0.098      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.098     0.098     0.014     0.189"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.379   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
```

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                                  Post__10yr
"        0.901   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.045     0.098     0.014     0.189 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  13.094     1.611      4.125      minutes"
"             Time to Centroid       111.234    86.563     91.965     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        58.90      88.36      147.26     c.m"
"             Rainfall losses        38.097     6.044      18.866     mm"
"             Runoff depth           23.262     55.315     42.494     mm"
"             Runoff volume          22.33      79.65      101.98     c.m"
"             Runoff coefficient     0.379      0.901      0.693      "
"             Maximum flow           0.009      0.041      0.045      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.045     0.143     0.014     0.189"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.045     0.143     0.143     0.189"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                  0.143    c.m/sec"
"             Hydrograph volume           326.058    c.m"
"                    0.045     0.143     0.143     0.143"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                  0.143    c.m/sec"
"             Hydrograph volume           326.058    c.m"
"                    0.045     0.143     0.143     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.045     0.143     0.143     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.268    c.m/sec"
"             Hydrograph volume          4530.272    c.m"
"                    0.045     0.143     0.143     0.268"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.268    c.m/sec"
"             Hydrograph volume          4530.272    c.m"
"                    0.045     0.268     0.143     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.045     0.268     0.268     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                  0.414    c.m/sec"
"             Hydrograph volume          6332.119    c.m"
"                    0.045     0.268     0.268     0.414"
" 40          HYDROGRAPH   Confluence    200"
```

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                                    Post__10yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  0.414    c.m/sec"
"              Hydrograph volume          6332.119    c.m"
"                     0.045     0.414     0.268     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                    Post__25yr.out"
"                Licensee name:                                                gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 3:54:57 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3701.648   Coefficient A"
"       25.500   Constant B"
"        0.937   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           143.371    mm/hr"
"             Total depth                  75.581    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.440   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.047     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  7.622      1.005      3.181      minutes"
"             Time to Centroid       103.628    85.398     91.394     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        83.14      83.14      166.28     c.m"
"             Rainfall losses        42.296     7.669      24.982     mm"
"             Runoff depth           33.285     67.912     50.598     mm"
"             Runoff volume          36.61      74.70      111.32     c.m"
"             Runoff coefficient     0.440      0.899      0.669      "
"             Maximum flow           0.018      0.038      0.047      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                    0.047     0.047     0.000     0.000"
" 33          CATCHMENT 1300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1300   Catchment 1300"
"       50.000   % Impervious"
"        0.840   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.420   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.420   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.173     0.047     0.000     0.000 c.m/sec"
"             Catchment 1300          Pervious   Impervious Total Area "
"             Surface Area            0.420      0.420      0.840      hectare"
"             Time of concentration   11.553     1.523      4.782      minutes"
"             Time to Centroid        108.042    85.984     93.151     minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         317.44     317.44     634.88     c.m"
"             Rainfall losses         42.253     6.330      24.292     mm"
"             Runoff depth            33.328     69.250     51.289     mm"
"             Runoff volume           139.98     290.85     430.83     c.m"
"             Runoff coefficient      0.441      0.916      0.679      "
"             Maximum flow            0.057      0.142      0.173      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.173     0.220     0.000     0.000"
" 33          CATCHMENT 1600"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1600   Catchment 1600"
"       50.000   % Impervious"
"        0.360   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.180   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.180   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.439   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

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                                  Post__25yr
"       98.000   Impervious SCS Curve No."
"        0.912   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.076     0.220     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   9.721      1.281      4.026      minutes"
"             Time to Centroid        106.001    85.673     92.284     minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         136.05     136.05     272.09     c.m"
"             Rainfall losses         42.377     6.681      24.529     mm"
"             Runoff depth            33.204     68.900     51.052     mm"
"             Runoff volume           59.77      124.02     183.79     c.m"
"             Runoff coefficient      0.439      0.912      0.675      "
"             Maximum flow            0.026      0.061      0.076      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.076     0.296     0.000     0.000"
" 54          POND DESIGN"
"        0.296   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        725.9   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.254    c.m/sec"
"             Maximum level               413.850    metre"
"             Maximum storage             303.535    c.m"
"             Centroidal lag               42.727   hours"
"                  0.076     0.296     0.254     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.254    c.m/sec"
"             Hydrograph volume           699.254    c.m"
"                    0.076     0.296     0.254     0.254"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.076     0.000     0.254     0.254"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

```
                                    Post__25yr
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.082     0.000     0.254     0.254 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   14.734     1.942      10.366     minutes"
"             Time to Centroid        111.700    86.497     103.093    minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         374.88     93.72      468.60     c.m"
"             Rainfall losses         42.213     6.364      35.043     mm"
"             Runoff depth            33.368     69.217     40.538     mm"
"             Runoff volume           165.50     85.83      251.33     c.m"
"             Runoff coefficient      0.441      0.916      0.536      "
"             Maximum flow            0.061      0.042      0.082      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.082     0.082     0.254     0.254"
" 54          POND DESIGN"
"        0.082   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        251.3   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
```

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                                    Post__25yr
"               415.520     1.909   382.150"
"             Peak outflow                 0.017    c.m/sec"
"             Maximum level              414.825    metre"
"             Maximum storage            191.904    c.m"
"             Centroidal lag              26.818   hours"
"                  0.082     0.082     0.017     0.254 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.082     0.017     0.017     0.254"
" 33          CATCHMENT 1500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.442   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.213     0.017     0.017     0.254 c.m/sec"
"             Catchment 1500          Pervious   Impervious Total Area "
"             Surface Area            0.555      0.555      1.110      hectare"
"             Time of concentration   17.510     2.308      7.265      minutes"
"             Time to Centroid        114.842    87.059     96.118     minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         419.47     419.47     838.95     c.m"
"             Rainfall losses         42.200     6.593      24.396     mm"
"             Runoff depth            33.381     68.988     51.185     mm"
"             Runoff volume           185.27     382.88     568.15     c.m"
"             Runoff coefficient      0.442      0.913      0.677      "
"             Maximum flow            0.064      0.190      0.213      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.213     0.214     0.017     0.254"
" 56          DIVERSION"
"         1500   Node number"
"        0.146   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.068    c.m/sec"
"             Volume of diverted flow      47.127    c.m"
"             DIV01500.025hyd"
"             Major flow at 1500"
"                  0.213     0.214     0.146     0.254 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.213     0.146     0.146     0.254"
" 33          CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.442   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.251     0.146     0.146     0.254 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   30.343     4.000      12.568     minutes"
"             Time to Centroid        129.499    89.355     102.412    minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         2554.63    2554.63    5109.27    c.m"
"             Rainfall losses         42.180     6.290      24.235     mm"
"             Runoff depth            33.401     69.291     51.346     mm"
"             Runoff volume           1128.94    2342.03    3470.97    c.m"
"             Runoff coefficient      0.442      0.917      0.679      "
"             Maximum flow            0.289      1.196      1.251      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.251     1.397     0.146     0.254"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

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                                    Post__25yr
"        0.518   Impervious Initial abstraction"
"                     0.065     1.397     0.146     0.254 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   11.553     1.523      11.553     minutes"
"             Time to Centroid        108.042    85.984     108.042    minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         362.79     0.00       362.79     c.m"
"             Rainfall losses         42.253     6.330      42.253     mm"
"             Runoff depth            33.328     69.250     33.328     mm"
"             Runoff volume           159.97     0.00       159.98     c.m"
"             Runoff coefficient      0.441      0.000      0.441      "
"             Maximum flow            0.065      0.000      0.065      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.065     1.435     0.146     0.254"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.065     1.435     1.435     0.254"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.436    c.m/sec"
"             Hydrograph volume            5100.042    c.m"
"                     0.065     1.435     1.435     1.436"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.436    c.m/sec"
"             Hydrograph volume            5100.043    c.m"
"                     0.065     1.436     1.435     0.000"
" 54          POND DESIGN"
"         1.436   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        5100.0   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.337    c.m/sec"
"             Maximum level                 411.553    metre"
"             Maximum storage              2841.060    c.m"
"             Centroidal lag                 10.225   hours"
"                  0.065     1.436     0.337     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.065     0.337     0.337     0.000"
" 47          FILEI_O Read/Open DIV01500.025hyd"
                                    Page 7
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                                    Post__25yr
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.025hyd"
"             Major flow at 1500"
"             Total volume                 47.127    c.m"
"             Maximum flow                  0.068    c.m/sec"
"                  0.068     0.337     0.337     0.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.068     0.337     0.337     0.000"
" 33          CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.109   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.114     0.337     0.337     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   43.720     2.944      43.719     minutes"
"             Time to Centroid        151.037    87.974     151.037    minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         5540.07    0.01       5540.08    c.m"
"             Rainfall losses         67.305     6.942      67.305     mm"
"             Runoff depth            8.276      68.639     8.276      mm"
"             Runoff volume           606.62     0.01       606.62     c.m"
"             Runoff coefficient      0.109      0.000      0.109      "
"             Maximum flow            0.114      0.000      0.114      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.114     0.449     0.337     0.000"
" 54          POND DESIGN"
"        0.449   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       5750.0   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   402.200"
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"              410.000     3.601  2187.900"
"              410.250     7.811  5318.900"
"              410.500    12.984  9642.300"
"              410.750    18.965  15227.70"
"           Peak outflow                  0.437    c.m/sec"
"           Maximum level               409.709    metre"
"           Maximum storage             264.461    c.m"
"           Centroidal lag                9.500   hours"
"                0.114     0.449     0.437     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                   0.114     0.437     0.437     0.000"
" 52        CHANNEL DESIGN"
"       0.437   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.287    metre"
"            Velocity                      0.792    m/sec"
"            Channel capacity             10.655    c.m/sec"
"            Critical depth                0.244    metre"
" 53        ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.429   X-factor <= 0.5"
"      68.529   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      75.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                  0.437    c.m/sec"
"                   0.114     0.437     0.437     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                   0.114     0.437     0.437     0.000"
" 52        CHANNEL DESIGN"
"       0.437   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       2.000   Basewidth    metre"
"       2.950   Left bank slope"
"       3.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.198    metre"
"            Velocity                      0.852    m/sec"
"            Channel capacity              9.246    c.m/sec"
"            Critical depth                0.156    metre"
" 53        ROUTE    Channel Route 40"
"       39.80      Channel Route 40 Reach length   ( metre)"
"       0.366   X-factor <= 0.5"
"      35.033   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      42.857   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
```

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                                    Post__25yr
"             Peak outflow                  0.437    c.m/sec"
"                    0.114     0.437     0.437     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.437    c.m/sec"
"             Hydrograph volume          5749.782    c.m"
"                    0.114     0.437     0.437     0.437"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.114     0.000     0.437     0.437"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"       60.000   % Impervious"
"        1.960   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.784   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        1.176   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.442   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.435     0.000     0.437     0.437 c.m/sec"
"             Catchment 2100         Pervious   Impervious Total Area "
"             Surface Area           0.784      1.176      1.960      hectare"
"             Time of concentration  17.510     2.308      6.016      minutes"
"             Time to Centroid       114.842    87.059     93.835     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        592.55     888.83     1481.38    c.m"
"             Rainfall losses        42.200     6.593      20.835     mm"
"             Runoff depth           33.381     68.988     54.745     mm"
"             Runoff volume          261.71     811.30     1073.01    c.m"
"             Runoff coefficient     0.442      0.913      0.724      "
"             Maximum flow           0.090      0.402      0.435      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.435     0.435     0.437     0.437"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"       90.000   % Impervious"
"        0.790   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.079   Pervious Area"
"       20.000   Pervious length"
```

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"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.242     0.435     0.437     0.437 c.m/sec"
"             Catchment 2400         Pervious   Impervious Total Area "
"             Surface Area           0.079      0.711      0.790      hectare"
"             Time of concentration  11.553     1.523      2.032      minutes"
"             Time to Centroid       108.042    85.984     87.103     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        59.71      537.38     597.09     c.m"
"             Rainfall losses        42.253     6.330      9.923      mm"
"             Runoff depth           33.328     69.250     65.658     mm"
"             Runoff volume          26.33      492.37     518.70     c.m"
"             Runoff coefficient     0.441      0.916      0.869      "
"             Maximum flow           0.011      0.240      0.242      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.242     0.677     0.437     0.437"
" 54          POND DESIGN"
"        0.677   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"       1591.7   Hydrograph volume    c.m"
"         13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                410.650     0.000     0.000"
"                410.700   0.00600    42.000"
"                410.800   0.01300   130.000"
"                410.900   0.02000   225.000"
"                411.000   0.02500   328.000"
"                411.100   0.02900   439.000"
"                411.200    0.1260   558.000"
"                411.300    0.1390   686.000"
"                411.400    0.1510   822.000"
"                411.500    0.1630   967.000"
"                411.600    0.1730  1121.000"
"                411.650    0.1780  1202.000"
"                411.950     2.575  1742.000"
"             Peak outflow                  0.158    c.m/sec"
"             Maximum level               411.461    metre"
"             Maximum storage             910.360    c.m"
"             Centroidal lag                3.533   hours"
"                  0.242     0.677     0.158     0.437 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.242     0.158     0.158     0.437"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
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"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.441   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.067     0.158     0.158     0.437 c.m/sec"
"             Catchment 2300          Pervious   Impervious Total Area "
"             Surface Area            0.432      0.048      0.480      hectare"
"             Time of concentration   11.553     1.523      9.671      minutes"
"             Time to Centroid        108.042    85.984     103.905    minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         326.51     36.28      362.79     c.m"
"             Rainfall losses         42.253     6.330      38.660     mm"
"             Runoff depth            33.328     69.250     36.920     mm"
"             Runoff volume           143.98     33.24      177.22     c.m"
"             Runoff coefficient      0.441      0.916      0.488      "
"             Maximum flow            0.059      0.016      0.067      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.067     0.212     0.158     0.437"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.067     0.212     0.212     0.437"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.212    c.m/sec"
"             Hydrograph volume          1770.218    c.m"
"                    0.067     0.212     0.212     0.212"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.067     0.000     0.212     0.212"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
```

```
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.442   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.245     0.000     0.212     0.212 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  17.510     2.308      4.420      minutes"
"             Time to Centroid       114.842    87.059     90.917     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        173.84     521.51     695.34     c.m"
"             Rainfall losses        42.200     6.593      15.494     mm"
"             Runoff depth           33.381     68.988     60.086     mm"
"             Runoff volume          76.78      476.02     552.80     c.m"
"             Runoff coefficient     0.442      0.913      0.795      "
"             Maximum flow           0.026      0.236      0.245      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.245     0.245     0.212     0.212"
" 54          POND DESIGN"
"        0.245   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        552.8   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.026    c.m/sec"
"             Maximum level               414.105    metre"
"             Maximum storage             429.582    c.m"
"             Centroidal lag                7.443   hours"
"                  0.245     0.245     0.026     0.212 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                  0.225    c.m/sec"
"             Hydrograph volume          2322.927    c.m"
"                    0.245     0.245     0.026     0.225"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

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"                    0.245     0.000     0.026     0.225"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.442   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.908   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.115     0.000     0.026     0.225 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   21.558     2.842      7.426      minutes"
"              Time to Centroid        119.480    87.822     95.576     minutes"
"              Rainfall depth          75.581     75.581     75.581     mm"
"              Rainfall volume         160.23     240.35     400.58     c.m"
"              Rainfall losses         42.201     6.986      21.072     mm"
"              Runoff depth            33.380     68.594     54.509     mm"
"              Runoff volume           70.77      218.13     288.90     c.m"
"              Runoff coefficient      0.442      0.908      0.721      "
"              Maximum flow            0.022      0.108      0.115      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.115     0.115     0.026     0.225"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.441   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
```

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"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.055     0.115     0.026     0.225 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  11.553     1.523      3.959      minutes"
"             Time to Centroid       108.042    85.984     91.342     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        72.56      108.84     181.39     c.m"
"             Rainfall losses        42.253     6.330      20.699     mm"
"             Runoff depth           33.328     69.250     54.881     mm"
"             Runoff volume          31.99      99.72      131.72     c.m"
"             Runoff coefficient     0.441      0.916      0.726      "
"             Maximum flow           0.013      0.049      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.055     0.170     0.026     0.225"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.055     0.170     0.170     0.225"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.170    c.m/sec"
"             Hydrograph volume          420.612    c.m"
"                0.055     0.170     0.170     0.170"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.170    c.m/sec"
"             Hydrograph volume          420.612    c.m"
"                0.055     0.170     0.170     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.055     0.170     0.170     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.458    c.m/sec"
"             Hydrograph volume         6170.393    c.m"
"                0.055     0.170     0.170     0.458"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.458    c.m/sec"
"             Hydrograph volume         6170.394    c.m"
"                0.055     0.458     0.170     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.055     0.458     0.458     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                 0.648    c.m/sec"
"             Hydrograph volume         8493.319    c.m"
"                0.055     0.458     0.458     0.648"
" 40          HYDROGRAPH   Confluence    200"
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                                    Post__25yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  0.648    c.m/sec"
"              Hydrograph volume          8493.319    c.m"
"                     0.055     0.648     0.458     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                    Post__50yr.out"
"                Licensee name:                                                gmbp"
"                Company                                    Hewlett-Packard Company"
"                Date & Time last used:                     2/15/2019 at 3:57:45 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     5089.418   Coefficient A"
"       30.000   Constant B"
"        0.967   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           156.350    mm/hr"
"             Total depth                  86.737    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.479   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.904   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.055     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  7.056      0.968      3.076      minutes"
"             Time to Centroid       102.283    85.178     91.100     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        95.41      95.41      190.82     c.m"
"             Rainfall losses        45.201     8.296      26.748     mm"
"             Runoff depth           41.536     78.441     59.988     mm"
"             Runoff volume          45.69      86.28      131.97     c.m"
"             Runoff coefficient     0.479      0.904      0.692      "
"             Maximum flow           0.021      0.041      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"             4   Add Runoff "
"                     0.055     0.055     0.000     0.000"
" 33           CATCHMENT 1300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          1300   Catchment 1300"
"        50.000   % Impervious"
"         0.840   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.420   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.420   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.481   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.924   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.203     0.055     0.000     0.000 c.m/sec"
"              Catchment 1300          Pervious   Impervious Total Area "
"              Surface Area            0.420      0.420      0.840      hectare"
"              Time of concentration   10.695     1.467      4.627      minutes"
"              Time to Centroid        106.283    85.675     92.731     minutes"
"              Rainfall depth          86.737     86.737     86.737     mm"
"              Rainfall volume         364.29     364.29     728.59     c.m"
"              Rainfall losses         44.994     6.561      25.777     mm"
"              Runoff depth            41.743     80.176     60.959     mm"
"              Runoff volume           175.32     336.74     512.06     c.m"
"              Runoff coefficient      0.481      0.924      0.703      "
"              Maximum flow            0.072      0.158      0.203      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.203     0.258     0.000     0.000"
" 33           CATCHMENT 1600"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          1600   Catchment 1600"
"        50.000   % Impervious"
"         0.360   Total Area"
"        15.000   Flow length"
"         2.000   Overland Slope"
"         0.180   Pervious Area"
"        15.000   Pervious length"
"         2.000   Pervious slope"
"         0.180   Impervious Area"
"        15.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.480   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
```

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                                    Post__50yr
"       98.000   Impervious SCS Curve No."
"        0.919   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.089     0.258     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   9.000      1.235      3.900      minutes"
"             Time to Centroid        104.357    85.382     91.895     minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         156.13     156.13     312.25     c.m"
"             Rainfall losses         45.077     7.038      26.057     mm"
"             Runoff depth            41.660     79.699     60.679     mm"
"             Runoff volume           74.99      143.46     218.45     c.m"
"             Runoff coefficient      0.480      0.919      0.700      "
"             Maximum flow            0.033      0.068      0.089      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.089     0.347     0.000     0.000"
" 54          POND DESIGN"
"        0.347   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        862.5   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.313    c.m/sec"
"             Maximum level               413.950    metre"
"             Maximum storage             304.205    c.m"
"             Centroidal lag               32.242   hours"
"                  0.089     0.347     0.313     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.313    c.m/sec"
"             Hydrograph volume           789.084    c.m"
"                    0.089     0.347     0.313     0.313"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.089     0.000     0.313     0.313"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

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"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.482   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.925   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.105     0.000     0.313     0.313 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   13.641     1.872      9.825      minutes"
"             Time to Centroid        109.632    86.148     102.018    minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         430.21     107.55     537.77     c.m"
"             Rainfall losses         44.941     6.526      37.258     mm"
"             Runoff depth            41.796     80.211     49.479     mm"
"             Runoff volume           207.31     99.46      306.77     c.m"
"             Runoff coefficient      0.482      0.925      0.570      "
"             Maximum flow            0.079      0.047      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.105     0.105     0.313     0.313"
" 54          POND DESIGN"
"        0.105   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        306.8   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
```

```
                                    Post__50yr
"               415.520     1.909   382.150"
"             Peak outflow                 0.046    c.m/sec"
"             Maximum level              415.121    metre"
"             Maximum storage            192.241    c.m"
"             Centroidal lag              22.249   hours"
"                  0.105     0.105     0.046     0.313 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.105     0.046     0.046     0.313"
" 33          CATCHMENT 1500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.922   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.242     0.046     0.046     0.313 c.m/sec"
"             Catchment 1500          Pervious   Impervious Total Area "
"             Surface Area            0.555      0.555      1.110      hectare"
"             Time of concentration   16.211     2.224      7.023      minutes"
"             Time to Centroid        112.570    86.667     95.554     minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         481.39     481.39     962.78     c.m"
"             Rainfall losses         44.974     6.774      25.874     mm"
"             Runoff depth            41.763     79.963     60.863     mm"
"             Runoff volume           231.78     443.80     675.58     c.m"
"             Runoff coefficient      0.481      0.922      0.702      "
"             Maximum flow            0.084      0.210      0.242      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.242     0.243     0.046     0.313"
" 56          DIVERSION"
"         1500   Node number"
"        0.146   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.097    c.m/sec"
"             Volume of diverted flow      92.143    c.m"
"             DIV01500.050hyd"
"             Major flow at 1500"
"                  0.242     0.243     0.146     0.313 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.242     0.146     0.146     0.313"
" 33          CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.482   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.406     0.146     0.146     0.313 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   28.092     3.854      12.172     minutes"
"             Time to Centroid        125.992    88.892     101.624    minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         2931.70    2931.70    5863.41    c.m"
"             Rainfall losses         44.916     6.695      25.806     mm"
"             Runoff depth            41.821     80.042     60.931     mm"
"             Runoff volume           1413.54    2705.42    4118.95    c.m"
"             Runoff coefficient      0.482      0.923      0.702      "
"             Maximum flow            0.381      1.324      1.406      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.406     1.552     0.146     0.313"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

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                                    Post__50yr
"        0.518   Impervious Initial abstraction"
"                     0.082     1.552     0.146     0.313 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   10.695     1.467      10.695     minutes"
"             Time to Centroid        106.283    85.675     106.283    minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         416.34     0.00       416.34     c.m"
"             Rainfall losses         44.994     6.561      44.994     mm"
"             Runoff depth            41.743     80.176     41.743     mm"
"             Runoff volume           200.37     0.00       200.37     c.m"
"             Runoff coefficient      0.481      0.000      0.481      "
"             Maximum flow            0.082      0.000      0.082      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.082     1.608     0.146     0.313"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.082     1.608     1.608     0.313"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.652    c.m/sec"
"             Hydrograph volume            5996.520    c.m"
"                     0.082     1.608     1.608     1.652"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    1.652    c.m/sec"
"             Hydrograph volume            5996.521    c.m"
"                     0.082     1.652     1.608     0.000"
" 54          POND DESIGN"
"         1.652   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        5996.5   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.368    c.m/sec"
"             Maximum level                 411.663    metre"
"             Maximum storage              3461.072    c.m"
"             Centroidal lag                  9.347   hours"
"                  0.082     1.652     0.368     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.082     0.368     0.368     0.000"
" 47          FILEI_O Read/Open DIV01500.050hyd"
```

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                                    Post__50yr
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.050hyd"
"             Major flow at 1500"
"             Total volume                 92.143    c.m"
"             Maximum flow                  0.097    c.m/sec"
"                  0.097     0.368     0.368     0.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.097     0.368     0.368     0.000"
" 33          CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.137   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.183     0.368     0.368     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   37.472     2.837      37.472     minutes"
"             Time to Centroid        142.983    87.552     142.982    minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         6357.80    0.01       6357.80    c.m"
"             Rainfall losses         74.812     7.307      74.812     mm"
"             Runoff depth            11.925     79.429     11.925     mm"
"             Runoff volume           874.09     0.01       874.10     c.m"
"             Runoff coefficient      0.137      0.000      0.137      "
"             Maximum flow            0.183      0.000      0.183      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.183     0.543     0.368     0.000"
" 54          POND DESIGN"
"        0.543   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       6957.4   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   402.200"
                                    Page 8
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"              410.000     3.601  2187.900"
"              410.250     7.811  5318.900"
"              410.500    12.984  9642.300"
"              410.750    18.965  15227.70"
"           Peak outflow                  0.525    c.m/sec"
"           Maximum level               409.725    metre"
"           Maximum storage             317.508    c.m"
"           Centroidal lag                8.528   hours"
"                0.183     0.543     0.525     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                  0.183     0.525     0.525     0.000"
" 52        CHANNEL DESIGN"
"       0.525   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.307    metre"
"            Velocity                      0.830    m/sec"
"            Channel capacity             10.655    c.m/sec"
"            Critical depth                0.263    metre"
" 53        ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.423   X-factor <= 0.5"
"      65.457   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      75.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                  0.524    c.m/sec"
"                  0.183     0.525     0.524     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                  0.183     0.524     0.524     0.000"
" 52        CHANNEL DESIGN"
"       0.524   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       2.000   Basewidth    metre"
"       2.950   Left bank slope"
"       3.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.219    metre"
"            Velocity                      0.902    m/sec"
"            Channel capacity              9.246    c.m/sec"
"            Critical depth                0.175    metre"
" 53        ROUTE    Channel Route 40"
"       39.80      Channel Route 40 Reach length   ( metre)"
"       0.353   X-factor <= 0.5"
"      33.104   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      37.500   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
```

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                                    Post__50yr
"             Peak outflow                    0.524    c.m/sec"
"                     0.183     0.524     0.524     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                    0.524    c.m/sec"
"             Hydrograph volume            6957.213    c.m"
"                     0.183     0.524     0.524     0.524"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.183     0.000     0.524     0.524"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"       60.000   % Impervious"
"        1.960   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.784   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        1.176   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.922   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.491     0.000     0.524     0.524 c.m/sec"
"             Catchment 2100          Pervious   Impervious Total Area "
"             Surface Area            0.784      1.176      1.960      hectare"
"             Time of concentration   16.211     2.224      5.836      minutes"
"             Time to Centroid        112.570    86.667     93.357     minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         680.02     1020.02    1700.04    c.m"
"             Rainfall losses         44.974     6.773      22.054     mm"
"             Runoff depth            41.763     79.963     64.683     mm"
"             Runoff volume           327.42     940.37     1267.79    c.m"
"             Runoff coefficient      0.481      0.922      0.746      "
"             Maximum flow            0.119      0.446      0.491      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.491     0.491     0.524     0.524"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"       90.000   % Impervious"
"        0.790   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.079   Pervious Area"
"       20.000   Pervious length"
```

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"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.270     0.491     0.524     0.524 c.m/sec"
"             Catchment 2400         Pervious   Impervious Total Area "
"             Surface Area           0.079      0.711      0.790      hectare"
"             Time of concentration  10.695     1.467      1.972      minutes"
"             Time to Centroid       106.283    85.675     86.802     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        68.52      616.70     685.22     c.m"
"             Rainfall losses        44.994     6.561      10.404     mm"
"             Runoff depth           41.743     80.176     76.332     mm"
"             Runoff volume          32.98      570.05     603.03     c.m"
"             Runoff coefficient     0.481      0.924      0.880      "
"             Maximum flow           0.014      0.267      0.270      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.270     0.760     0.524     0.524"
" 54          POND DESIGN"
"        0.760   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"       1870.8   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                410.650     0.000     0.000"
"                410.700   0.00600    42.000"
"                410.800   0.01300   130.000"
"                410.900   0.02000   225.000"
"                411.000   0.02500   328.000"
"                411.100   0.02900   439.000"
"                411.200    0.1260   558.000"
"                411.300    0.1390   686.000"
"                411.400    0.1510   822.000"
"                411.500    0.1630   967.000"
"                411.600    0.1730  1121.000"
"                411.650    0.1780  1202.000"
"                411.950     2.575  1742.000"
"             Peak outflow                  0.171    c.m/sec"
"             Maximum level               411.583    metre"
"             Maximum storage            1094.508    c.m"
"             Centroidal lag                3.522   hours"
"                  0.270     0.760     0.171     0.524 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.270     0.171     0.171     0.524"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
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```
"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.086     0.171     0.171     0.524 c.m/sec"
"             Catchment 2300          Pervious   Impervious Total Area "
"             Surface Area            0.432      0.048      0.480      hectare"
"             Time of concentration   10.695     1.467      9.072      minutes"
"             Time to Centroid        106.283    85.675     102.658    minutes"
"             Rainfall depth          86.737     86.737     86.737     mm"
"             Rainfall volume         374.70     41.63      416.34     c.m"
"             Rainfall losses         44.994     6.561      41.150     mm"
"             Runoff depth            41.743     80.176     45.586     mm"
"             Runoff volume           180.33     38.48      218.81     c.m"
"             Runoff coefficient      0.481      0.924      0.526      "
"             Maximum flow            0.074      0.018      0.086      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.086     0.240     0.171     0.524"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.086     0.240     0.240     0.524"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.240    c.m/sec"
"             Hydrograph volume          2090.359    c.m"
"                    0.086     0.240     0.240     0.240"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.086     0.000     0.240     0.240"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
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"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.481   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.922   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.275     0.000     0.240     0.240 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  16.211     2.224      4.298      minutes"
"             Time to Centroid       112.570    86.667     90.508     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        199.49     598.48     797.98     c.m"
"             Rainfall losses        44.974     6.774      16.324     mm"
"             Runoff depth           41.763     79.963     70.413     mm"
"             Runoff volume          96.05      551.75     647.80     c.m"
"             Runoff coefficient     0.481      0.922      0.812      "
"             Maximum flow           0.035      0.262      0.275      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.275     0.275     0.240     0.240"
" 54          POND DESIGN"
"        0.275   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        647.8   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.058    c.m/sec"
"             Maximum level               414.121    metre"
"             Maximum storage             450.749    c.m"
"             Centroidal lag                6.675   hours"
"                  0.275     0.275     0.058     0.240 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                  0.260    c.m/sec"
"             Hydrograph volume          2737.636    c.m"
"                    0.275     0.275     0.058     0.260"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
                                    Post__50yr
"                     0.275     0.000     0.058     0.260"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.482   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.917   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.129     0.000     0.058     0.260 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   19.958     2.738      7.208      minutes"
"              Time to Centroid        116.779    87.402     95.027     minutes"
"              Rainfall depth          86.737     86.737     86.737     mm"
"              Rainfall volume         183.88     275.82     459.70     c.m"
"              Rainfall losses         44.916     7.204      22.289     mm"
"              Runoff depth            41.821     79.533     64.448     mm"
"              Runoff volume           88.66      252.91     341.57     c.m"
"              Runoff coefficient      0.482      0.917      0.743      "
"              Maximum flow            0.029      0.120      0.129      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.129     0.129     0.058     0.260"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.481   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
```

```
                                  Post__50yr
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.064     0.129     0.058     0.260 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  10.695     1.467      3.845      minutes"
"             Time to Centroid       106.283    85.675     90.985     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        83.27      124.90     208.17     c.m"
"             Rainfall losses        44.994     6.561      21.934     mm"
"             Runoff depth           41.743     80.176     64.803     mm"
"             Runoff volume          40.07      115.45     155.53     c.m"
"             Runoff coefficient     0.481      0.924      0.747      "
"             Maximum flow           0.016      0.054      0.064      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.064     0.193     0.058     0.260"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.064     0.193     0.193     0.260"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                  0.193    c.m/sec"
"             Hydrograph volume           497.101    c.m"
"                    0.064     0.193     0.193     0.193"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                  0.193    c.m/sec"
"             Hydrograph volume           497.100    c.m"
"                    0.064     0.193     0.193     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.064     0.193     0.193     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.553    c.m/sec"
"             Hydrograph volume          7454.313    c.m"
"                    0.064     0.193     0.193     0.553"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.553    c.m/sec"
"             Hydrograph volume          7454.313    c.m"
"                    0.064     0.553     0.193     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.064     0.553     0.553     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                  0.790    c.m/sec"
"             Hydrograph volume         10191.979    c.m"
"                    0.064     0.553     0.553     0.790"
" 40          HYDROGRAPH   Confluence    200"
```

```
                                    Post__50yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  0.790    c.m/sec"
"              Hydrograph volume         10191.980    c.m"
"                     0.064     0.790     0.553     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                              Version 2.25  rev. 473"
"                MIDUSS created                           Sunday, February 07, 2010"
"           10   Units used:                                                ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                        Modelling Files\2019-02-15"
"                Output filename:                                    Post__100yr.out"
"                Licensee name:                                                gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 4:01:17 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     6933.019   Coefficient A"
"       34.699   Constant B"
"        0.998   Exponent C"
"        0.380   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           168.777    mm/hr"
"             Total depth                  97.921    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.511   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.908   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.063     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  6.616      0.937      2.983      minutes"
"             Time to Centroid       101.199    85.009     90.841     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        107.71     107.71     215.43     c.m"
"             Rainfall losses        47.838     8.977      28.408     mm"
"             Runoff depth           50.084     88.944     69.514     mm"
"             Runoff volume          55.09      97.84      152.93     c.m"
"             Runoff coefficient     0.511      0.908      0.710      "
"             Maximum flow           0.026      0.045      0.063      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"             4   Add Runoff "
"                     0.063     0.063     0.000     0.000"
" 33           CATCHMENT 1300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          1300   Catchment 1300"
"        50.000   % Impervious"
"         0.840   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.420   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.420   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.515   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.931   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.233     0.063     0.000     0.000 c.m/sec"
"              Catchment 1300          Pervious   Impervious Total Area "
"              Surface Area            0.420      0.420      0.840      hectare"
"              Time of concentration   10.027     1.421      4.487      minutes"
"              Time to Centroid        104.871    85.423     92.351     minutes"
"              Rainfall depth          97.921     97.921     97.921     mm"
"              Rainfall volume         411.27     411.27     822.54     c.m"
"              Rainfall losses         47.483     6.787      27.135     mm"
"              Runoff depth            50.438     91.134     70.786     mm"
"              Runoff volume           211.84     382.76     594.60     c.m"
"              Runoff coefficient      0.515      0.931      0.723      "
"              Maximum flow            0.088      0.173      0.233      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.233     0.296     0.000     0.000"
" 33           CATCHMENT 1600"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          1600   Catchment 1600"
"        50.000   % Impervious"
"         0.360   Total Area"
"        15.000   Flow length"
"         2.000   Overland Slope"
"         0.180   Pervious Area"
"        15.000   Pervious length"
"         2.000   Pervious slope"
"         0.180   Impervious Area"
"        15.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.516   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.102     0.296     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   8.438      1.196      3.791      minutes"
"             Time to Centroid        103.033    85.162     91.567     minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         176.26     176.26     352.52     c.m"
"             Rainfall losses         47.375     7.430      27.402     mm"
"             Runoff depth            50.546     90.491     70.519     mm"
"             Runoff volume           90.98      162.88     253.87     c.m"
"             Runoff coefficient      0.516      0.924      0.720      "
"             Maximum flow            0.041      0.074      0.102      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.102     0.398     0.000     0.000"
" 54          POND DESIGN"
"        0.398   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       1001.4   Hydrograph volume    c.m"
"          16.   Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.378    c.m/sec"
"             Maximum level               414.041    metre"
"             Maximum storage             304.833    c.m"
"             Centroidal lag               26.012   hours"
"                  0.102     0.398     0.378     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  0.378    c.m/sec"
"             Hydrograph volume           989.368    c.m"
"                    0.102     0.398     0.378     0.378"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.102     0.000     0.378     0.378"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
```

```
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.516   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.932   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.129     0.000     0.378     0.378 c.m/sec"
"             Catchment 1400          Pervious   Impervious Total Area "
"             Surface Area            0.496      0.124      0.620      hectare"
"             Time of concentration   12.789     1.812      9.373      minutes"
"             Time to Centroid        107.990    85.865     101.105    minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         485.69     121.42     607.11     c.m"
"             Rainfall losses         47.421     6.662      39.270     mm"
"             Runoff depth            50.500     91.259     58.652     mm"
"             Runoff volume           250.48     113.16     363.64     c.m"
"             Runoff coefficient      0.516      0.932      0.599      "
"             Maximum flow            0.098      0.051      0.129      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.129     0.129     0.378     0.378"
" 54          POND DESIGN"
"        0.129   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"        363.6   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
"                414.920   0.03734   191.970"
"                415.020   0.04573   192.040"
"                415.120   0.05281   192.120"
"                415.220    0.2777   201.400"
"                415.320    0.6941   238.900"
"                415.420     1.244   304.650"
```

```
                                    Post__100yr
"                415.520     1.909   382.150"
"             Peak outflow                  0.090    c.m/sec"
"             Maximum level               415.136    metre"
"             Maximum storage             193.651    c.m"
"             Centroidal lag               18.597   hours"
"                  0.129     0.129     0.090     0.378 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.129     0.090     0.090     0.378"
" 33          CATCHMENT 1500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          1500   Catchment 1500"
"        50.000   % Impervious"
"         1.110   Total Area"
"        40.000   Flow length"
"         2.000   Overland Slope"
"         0.555   Pervious Area"
"        40.000   Pervious length"
"         2.000   Pervious slope"
"         0.555   Impervious Area"
"        40.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.517   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.929   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.277     0.090     0.090     0.378 c.m/sec"
"             Catchment 1500          Pervious   Impervious Total Area "
"             Surface Area            0.555      0.555      1.110      hectare"
"             Time of concentration   15.199     2.153      6.817      minutes"
"             Time to Centroid        110.688    86.345     95.048     minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         543.46     543.46     1086.93    c.m"
"             Rainfall losses         47.301     6.948      27.124     mm"
"             Runoff depth            50.621     90.973     70.797     mm"
"             Runoff volume           280.94     504.90     785.85     c.m"
"             Runoff coefficient      0.517      0.929      0.723      "
"             Maximum flow            0.105      0.230      0.277      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.277     0.278     0.090     0.378"
" 56          DIVERSION"
"          1500   Node number"
"         0.146   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.132    c.m/sec"
"             Volume of diverted flow     191.312    c.m"
"             DIV01500.100hyd"
"             Major flow at 1500"
"                     0.277     0.278     0.146     0.378 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.277     0.146     0.146     0.378"
" 33          CATCHMENT 1000"
```

```
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.517   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.926   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     1.559     0.146     0.146     0.378 c.m/sec"
"             Catchment 1000          Pervious   Impervious Total Area "
"             Surface Area            3.380      3.380      6.760      hectare"
"             Time of concentration   26.337     3.732      11.833     minutes"
"             Time to Centroid        123.197    88.516     100.945    minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         3309.74    3309.74    6619.48    c.m"
"             Rainfall losses         47.249     7.203      27.226     mm"
"             Runoff depth            50.672     90.719     70.695     mm"
"             Runoff volume           1712.72    3066.29    4779.01    c.m"
"             Runoff coefficient      0.517      0.926      0.722      "
"             Maximum flow            0.482      1.442      1.559      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     1.559     1.705     0.146     0.378"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.515   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.101     1.705     0.146     0.378 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   10.027     1.421      10.027     minutes"
"             Time to Centroid        104.871    85.423     104.871    minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         470.02     0.00       470.02     c.m"
"             Rainfall losses         47.483     6.787      47.483     mm"
"             Runoff depth            50.438     91.134     50.438     mm"
"             Runoff volume           242.10     0.00       242.10     c.m"
"             Runoff coefficient      0.515      0.000      0.515      "
"             Maximum flow            0.101      0.000      0.101      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.101     1.779     0.146     0.378"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.101     1.779     1.779     0.378"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    2.157    c.m/sec"
"             Hydrograph volume            6975.535    c.m"
"                    0.101     1.779     1.779     2.157"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                    2.157    c.m/sec"
"             Hydrograph volume            6975.535    c.m"
"                    0.101     2.157     1.779     0.000"
" 54          POND DESIGN"
"         2.157   Current peak flow    c.m/sec"
"         0.250   Target outflow    c.m/sec"
"        6975.5   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                  411.000     0.000     0.000"
"                  411.100   0.05100   425.000"
"                  411.200    0.1030   936.000"
"                  411.300    0.1190  1459.000"
"                  411.400    0.1330  1994.000"
"                  411.500    0.3220  2542.000"
"                  411.600    0.3510  3101.000"
"                  411.700    0.3780  3673.000"
"                  411.800    0.4030  4258.000"
"                  411.850    0.4150  4554.000"
"                  412.000     2.088  5464.000"
"             Peak outflow                    0.399    c.m/sec"
"             Maximum level                 411.786    metre"
"             Maximum storage              4174.798    c.m"
"             Centroidal lag                  8.702   hours"
"                  0.101     2.157     0.399     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.101     0.399     0.399     0.000"
" 47          FILEI_O Read/Open DIV01500.100hyd"
```

```
                                    Post__100yr
"            1   1=read/open; 2=write/save"
"            2   1=rainfall; 2=hydrograph"
"            1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV01500.100hyd"
"             Major flow at 1500"
"             Total volume                191.312    c.m"
"             Maximum flow                  0.132    c.m/sec"
"                  0.132     0.399     0.399     0.000 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.132     0.455     0.399     0.000"
" 33          CATCHMENT 4000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         4000   Catchment 4000"
"        0.000   % Impervious"
"        7.330   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        7.330   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       60.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       50.000   Pervious SCS Curve No."
"        0.164   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       25.400   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.268     0.455     0.399     0.000 c.m/sec"
"             Catchment 4000          Pervious   Impervious Total Area "
"             Surface Area            7.330      0.000      7.330      hectare"
"             Time of concentration   32.980     2.747      32.980     minutes"
"             Time to Centroid        137.344    87.189     137.344    minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         7177.62    0.01       7177.63    c.m"
"             Rainfall losses         81.821     7.496      81.821     mm"
"             Runoff depth            16.100     90.426     16.100     mm"
"             Runoff volume           1180.13    0.01       1180.14    c.m"
"             Runoff coefficient      0.164      0.000      0.164      "
"             Maximum flow            0.268      0.000      0.268      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.268     0.671     0.399     0.000"
" 54          POND DESIGN"
"        0.671   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       8342.3   Hydrograph volume    c.m"
"           6.   Number of stages"
"      409.630   Minimum water level    metre"
"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   402.200"
```

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"              410.000     3.601  2187.900"
"              410.250     7.811  5318.900"
"              410.500    12.984  9642.300"
"              410.750    18.965  15227.70"
"           Peak outflow                  0.633    c.m/sec"
"           Maximum level               409.744    metre"
"           Maximum storage             382.968    c.m"
"           Centroidal lag                7.790   hours"
"                0.268     0.671     0.633     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                  0.268     0.633     0.633     0.000"
" 52        CHANNEL DESIGN"
"       0.633   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       0.000   Basewidth    metre"
"       7.410   Left bank slope"
"       6.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.330    metre"
"            Velocity                      0.869    m/sec"
"            Channel capacity             10.655    c.m/sec"
"            Critical depth                0.283    metre"
" 53        ROUTE    Channel Route 72"
"       72.40      Channel Route 72 Reach length   ( metre)"
"       0.418   X-factor <= 0.5"
"      62.466   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      60.000   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
"            Peak outflow                  0.632    c.m/sec"
"                  0.268     0.633     0.632     0.000 c.m/sec"
" 40        HYDROGRAPH Next link "
"          5   Next link "
"                  0.268     0.632     0.632     0.000"
" 52        CHANNEL DESIGN"
"       0.632   Current peak flow    c.m/sec"
"       0.035   Manning 'n'"
"          0.   Cross-section type: 0=trapezoidal; 1=general"
"       2.000   Basewidth    metre"
"       2.950   Left bank slope"
"       3.000   Right bank slope"
"       0.950   Channel depth    metre"
"       1.040   Gradient   %"
"            Depth of flow                 0.243    metre"
"            Velocity                      0.955    m/sec"
"            Channel capacity              9.246    c.m/sec"
"            Critical depth                0.196    metre"
" 53        ROUTE    Channel Route 40"
"       39.80      Channel Route 40 Reach length   ( metre)"
"       0.339   X-factor <= 0.5"
"      31.251   K-lag   ( seconds)"
"       0.000   Default(0) or user spec.(1) values used"
"       0.500   X-factor <= 0.5"
"      30.000   K-lag   ( seconds)"
"       0.500   Beta weighting factor"
"      37.500   Routing time step   ( seconds)"
"           1   No. of sub-reaches"
```

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                                    Post__100yr
"             Peak outflow                  0.632    c.m/sec"
"                    0.268     0.632     0.632     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                  0.632    c.m/sec"
"             Hydrograph volume          8342.053    c.m"
"                    0.268     0.632     0.632     0.632"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.268     0.000     0.632     0.632"
" 33          CATCHMENT 2100"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2100   Catchment 2100"
"       60.000   % Impervious"
"        1.960   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.784   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        1.176   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.517   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.554     0.000     0.632     0.632 c.m/sec"
"             Catchment 2100          Pervious   Impervious Total Area "
"             Surface Area            0.784      1.176      1.960      hectare"
"             Time of concentration   15.199     2.153      5.683      minutes"
"             Time to Centroid        110.688    86.345     92.932     minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         767.70     1151.55    1919.26    c.m"
"             Rainfall losses         47.301     6.948      23.089     mm"
"             Runoff depth            50.621     90.973     74.832     mm"
"             Runoff volume           396.87     1069.84    1466.71    c.m"
"             Runoff coefficient      0.517      0.929      0.764      "
"             Maximum flow            0.148      0.488      0.554      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.554     0.554     0.632     0.632"
" 33          CATCHMENT 2400"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2400   Catchment 2400"
"       90.000   % Impervious"
"        0.790   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.079   Pervious Area"
"       20.000   Pervious length"
```

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"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.515   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.931   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.297     0.554     0.632     0.632 c.m/sec"
"             Catchment 2400         Pervious   Impervious Total Area "
"             Surface Area           0.079      0.711      0.790      hectare"
"             Time of concentration  10.027     1.421      1.919      minutes"
"             Time to Centroid       104.871    85.423     86.549     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        77.36      696.22     773.58     c.m"
"             Rainfall losses        47.483     6.787      10.857     mm"
"             Runoff depth           50.438     91.134     87.065     mm"
"             Runoff volume          39.85      647.96     687.81     c.m"
"             Runoff coefficient     0.515      0.931      0.889      "
"             Maximum flow           0.017      0.292      0.297      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.297     0.850     0.632     0.632"
" 54          POND DESIGN"
"        0.850   Current peak flow    c.m/sec"
"        0.020   Target outflow    c.m/sec"
"       2154.5   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                  410.650     0.000     0.000"
"                  410.700   0.00600    42.000"
"                  410.800   0.01300   130.000"
"                  410.900   0.02000   225.000"
"                  411.000   0.02500   328.000"
"                  411.100   0.02900   439.000"
"                  411.200    0.1260   558.000"
"                  411.300    0.1390   686.000"
"                  411.400    0.1510   822.000"
"                  411.500    0.1630   967.000"
"                  411.600    0.1730  1121.000"
"                  411.650    0.1780  1202.000"
"                  411.950     2.575  1742.000"
"             Peak outflow                   0.289    c.m/sec"
"             Maximum level                411.664    metre"
"             Maximum storage             1227.028    c.m"
"             Centroidal lag                 3.461   hours"
"                  0.297     0.850     0.289     0.632 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.297     0.289     0.289     0.632"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
```

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"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.515   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.931   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.105     0.289     0.289     0.632 c.m/sec"
"             Catchment 2300          Pervious   Impervious Total Area "
"             Surface Area            0.432      0.048      0.480      hectare"
"             Time of concentration   10.027     1.421      8.588      minutes"
"             Time to Centroid        104.871    85.423     101.619    minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         423.02     47.00      470.02     c.m"
"             Rainfall losses         47.483     6.787      43.413     mm"
"             Runoff depth            50.438     91.134     54.508     mm"
"             Runoff volume           217.89     43.74      261.64     c.m"
"             Runoff coefficient      0.515      0.931      0.557      "
"             Maximum flow            0.091      0.020      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.105     0.338     0.289     0.632"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.105     0.338     0.338     0.632"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.338    c.m/sec"
"             Hydrograph volume          2407.782    c.m"
"                    0.105     0.338     0.338     0.338"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.105     0.000     0.338     0.338"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
```

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"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.517   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.306     0.000     0.338     0.338 c.m/sec"
"             Catchment 2200         Pervious   Impervious Total Area "
"             Surface Area           0.230      0.690      0.920      hectare"
"             Time of concentration  15.199     2.153      4.194      minutes"
"             Time to Centroid       110.688    86.345     90.153     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        225.22     675.66     900.88     c.m"
"             Rainfall losses        47.301     6.948      17.036     mm"
"             Runoff depth           50.621     90.973     80.885     mm"
"             Runoff volume          116.43     627.71     744.14     c.m"
"             Runoff coefficient     0.517      0.929      0.826      "
"             Maximum flow           0.043      0.286      0.306      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.306     0.306     0.338     0.338"
" 54          POND DESIGN"
"        0.306   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"        744.1   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.093    c.m/sec"
"             Maximum level               414.138    metre"
"             Maximum storage             473.926    c.m"
"             Centroidal lag                6.054   hours"
"                  0.306     0.306     0.093     0.338 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                  0.431    c.m/sec"
"             Hydrograph volume          3153.250    c.m"
"                    0.306     0.306     0.093     0.431"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
"                    0.306     0.000     0.093     0.431"
" 33          CATCHMENT 3200"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.212   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.318   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.517   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.924   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.144     0.000     0.093     0.431 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   18.712     2.651      7.014      minutes"
"              Time to Centroid        114.625    87.045     94.538     minutes"
"              Rainfall depth          97.921     97.921     97.921     mm"
"              Rainfall volume         207.59     311.39     518.98     c.m"
"              Rainfall losses         47.295     7.442      23.384     mm"
"              Runoff depth            50.626     90.479     74.538     mm"
"              Runoff volume           107.33     287.72     395.05     c.m"
"              Runoff coefficient      0.517      0.924      0.761      "
"              Maximum flow            0.036      0.131      0.144      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.144     0.144     0.093     0.431"
" 33          CATCHMENT 3300"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.515   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
```

```
"        0.931   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.072     0.144     0.093     0.431 c.m/sec"
"             Catchment 3300         Pervious   Impervious Total Area "
"             Surface Area           0.096      0.144      0.240      hectare"
"             Time of concentration  10.027     1.421      3.740      minutes"
"             Time to Centroid       104.871    85.423     90.664     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        94.00      141.01     235.01     c.m"
"             Rainfall losses        47.483     6.787      23.065     mm"
"             Runoff depth           50.438     91.134     74.856     mm"
"             Runoff volume          48.42      131.23     179.65     c.m"
"             Runoff coefficient     0.515      0.931      0.764      "
"             Maximum flow           0.020      0.059      0.072      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.072     0.217     0.093     0.431"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.072     0.217     0.217     0.431"
" 40          HYDROGRAPH   Combine    300"
"           6   Combine "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.217    c.m/sec"
"             Hydrograph volume          574.704    c.m"
"                0.072     0.217     0.217     0.217"
" 40          HYDROGRAPH   Confluence    300"
"           7   Confluence "
"         300   Node #"
"               To Walser Street"
"             Maximum flow                 0.217    c.m/sec"
"             Hydrograph volume          574.704    c.m"
"                0.072     0.217     0.217     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.072     0.217     0.217     0.000"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.675    c.m/sec"
"             Hydrograph volume         8916.757    c.m"
"                0.072     0.217     0.217     0.675"
" 40          HYDROGRAPH   Confluence    100"
"           7   Confluence "
"         100   Node #"
"               Existing Wetland"
"             Maximum flow                 0.675    c.m/sec"
"             Hydrograph volume         8916.757    c.m"
"                0.072     0.675     0.217     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.072     0.675     0.675     0.000"
" 40          HYDROGRAPH   Combine    200"
"           6   Combine "
"         200   Node #"
"               To Trib. of Grand River"
"             Maximum flow                 1.046    c.m/sec"
"             Hydrograph volume        12070.033    c.m"
"                0.072     0.675     0.675     1.046"
" 40          HYDROGRAPH   Confluence    200"
```

```
                                    Post__100yr
"            7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"              Maximum flow                  1.046    c.m/sec"
"              Hydrograph volume         12070.033    c.m"
"                     0.072     1.046     0.675     0.000"
" 38           START/RE-START TOTALS 200"
"              3   Runoff Totals on EXIT"
"              Total Catchment area                      22.640    hectare"
"              Total Impervious area                      7.856    hectare"
"              Total % impervious                        34.700"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 07, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:          W:\Kitchener\411-2011\411009\Design Data\"
"                                                      Modelling Files\2019-02-15"
"                Output filename:                                    Post__REG.out"
"                Licensee name:                                                gmbp"
"                Company                                   Hewlett-Packard Company"
"                Date & Time last used:                    2/15/2019 at 4:05:13 PM"
" 31          TIME PARAMETERS"
"       60.000   Time Step"
"     2880.000   Max. Storm length"
"    12000.000   Max. Hydrograph"
" 32          STORM Historic"
"            5   Historic"
"     2880.000   Duration"
"       48.000   Rainfall intensity values"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.028     2.028     2.028     2.028"
"                  2.028     2.026     2.026     2.026     2.028"
"                  2.026     6.000     4.000     6.000    13.000"
"                 17.000    13.000    23.000    13.000    13.000"
"                 53.000    38.000    13.000"
"             Maximum intensity            53.000    mm/hr"
"             Total depth                 285.000    mm"
"            6   000hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 1200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1200   Catchment 1200"
"       50.000   % Impervious"
"        0.220   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.110   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.719   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.027     0.000     0.000     0.000 c.m/sec"
"             Catchment 1200         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.110      0.220      hectare"
"             Time of concentration  8.237      1.480      4.583      minutes"
"             Time to Centroid       2489.666   2307.003   2390.883   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        313.50     313.50     627.00     c.m"
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"             Rainfall losses        80.153     43.756     61.955     mm"
"             Runoff depth           204.847    241.244    223.045    mm"
"             Runoff volume          225.33     265.37     490.70     c.m"
"             Runoff coefficient     0.719      0.846      0.783      "
"             Maximum flow           0.013      0.014      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.027     0.027     0.000     0.000"
" 33          CATCHMENT 1300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          1300   Catchment 1300"
"        50.000   % Impervious"
"         0.840   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.420   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.420   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.754   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.846   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                  0.102     0.027     0.000     0.000 c.m/sec"
"             Catchment 1300         Pervious   Impervious Total Area "
"             Surface Area           0.420      0.420      0.840      hectare"
"             Time of concentration  12.485     2.243      7.071      minutes"
"             Time to Centroid       2505.276   2290.972   2391.991   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1197.00    1197.00    2394.00    c.m"
"             Rainfall losses        70.073     43.972     57.023     mm"
"             Runoff depth           214.927    241.028    227.977    mm"
"             Runoff volume          902.69     1012.32    1915.01    c.m"
"             Runoff coefficient     0.754      0.846      0.800      "
"             Maximum flow           0.048      0.054      0.102      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.102     0.129     0.000     0.000"
" 33          CATCHMENT 1600"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          1600   Catchment 1600"
"        50.000   % Impervious"
"         0.360   Total Area"
"        15.000   Flow length"
"         2.000   Overland Slope"
"         0.180   Pervious Area"
"        15.000   Pervious length"
"         2.000   Pervious slope"
"         0.180   Impervious Area"
"        15.000   Impervious length"
"         2.000   Impervious slope"
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"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.739   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.844   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.044     0.129     0.000     0.000 c.m/sec"
"             Catchment 1600          Pervious   Impervious Total Area "
"             Surface Area            0.180      0.180      0.360      hectare"
"             Time of concentration   10.506     1.887      5.911      minutes"
"             Time to Centroid        2500.832   2301.045   2394.332   minutes"
"             Rainfall depth          285.000    285.000    285.000    mm"
"             Rainfall volume         513.00     513.00     1026.00    c.m"
"             Rainfall losses         74.380     44.546     59.463     mm"
"             Runoff depth            210.620    240.454    225.537    mm"
"             Runoff volume           379.12     432.82     811.93     c.m"
"             Runoff coefficient      0.739      0.844      0.791      "
"             Maximum flow            0.021      0.023      0.044      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.044     0.173     0.000     0.000"
" 54          POND DESIGN"
"        0.173   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       3217.6   Hydrograph volume    c.m"
"         16.    Number of stages"
"      411.830   Minimum water level    metre"
"      414.490   Maximum water level    metre"
"      411.830   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                411.830   0.00033     0.000"
"                411.930   0.00033    19.920"
"                412.230   0.00034   143.570"
"                412.530   0.00035   267.220"
"                412.630   0.00035   287.130"
"                412.700   0.00035   301.070"
"                412.800   0.00035   301.140"
"                413.000   0.00035   301.260"
"                413.230   0.00035   301.400"
"                413.430   0.04510   301.740"
"                413.630    0.1310   302.400"
"                413.830    0.2461   303.400"
"                414.030    0.3862   304.740"
"                414.090    0.4327   305.240"
"                414.290    0.6461   307.240"
"                414.490    0.9189   309.570"
"             Peak outflow                  0.173    c.m/sec"
"             Maximum level               413.703    metre"
"             Maximum storage             302.764    c.m"
"             Centroidal lag               55.069    hours"
"                  0.044     0.173     0.173     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Outlets to SWMF No. 1"
"             Maximum flow                  0.173    c.m/sec"
"             Hydrograph volume          3104.678    c.m"
"                    0.044     0.173     0.173     0.173"
```

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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.044     0.000     0.173     0.173"
" 33          CATCHMENT 1400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1400   Catchment 1400"
"       20.000   % Impervious"
"        0.620   Total Area"
"       30.000   Flow length"
"        2.000   Overland Slope"
"        0.496   Pervious Area"
"       30.000   Pervious length"
"        2.000   Pervious slope"
"        0.124   Impervious Area"
"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.764   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.849   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.071     0.000     0.173     0.173 c.m/sec"
"             Catchment 1400         Pervious   Impervious Total Area "
"             Surface Area           0.496      0.124      0.620      hectare"
"             Time of concentration  15.924     2.860      13.084     minutes"
"             Time to Centroid       2515.051   2276.456   2463.191   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1413.60    353.40     1767.00    c.m"
"             Rainfall losses        67.258     43.116     62.430     mm"
"             Runoff depth           217.742    241.884    222.570    mm"
"             Runoff volume          1080.00    299.94     1379.93    c.m"
"             Runoff coefficient     0.764      0.849      0.781      "
"             Maximum flow           0.055      0.016      0.071      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.071     0.071     0.173     0.173"
" 54          POND DESIGN"
"        0.071   Current peak flow    c.m/sec"
"        0.250   Target outflow    c.m/sec"
"       1379.9   Hydrograph volume    c.m"
"          17.   Number of stages"
"      413.920   Minimum water level    metre"
"      415.520   Maximum water level    metre"
"      413.920   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.920   0.00089     0.000"
"                414.020   0.00089    26.670"
"                414.120   0.00090    54.610"
"                414.220   0.00090    82.540"
"                414.320   0.00090   110.480"
"                414.420   0.00091   138.420"
"                414.520   0.00091   165.090"
"                414.620   0.00091   191.760"
"                414.720   0.00091   191.830"
"                414.820   0.02640   191.900"
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"               414.920   0.03734   191.970"
"               415.020   0.04573   192.040"
"               415.120   0.05281   192.120"
"               415.220    0.2777   201.400"
"               415.320    0.6941   238.900"
"               415.420     1.244   304.650"
"               415.520     1.909   382.150"
"             Peak outflow                  0.070    c.m/sec"
"             Maximum level               415.128    metre"
"             Maximum storage             192.847    c.m"
"             Centroidal lag               48.357   hours"
"                  0.071     0.071     0.070     0.173 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                  0.071     0.070     0.070     0.173"
" 33          CATCHMENT 1500"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1500   Catchment 1500"
"       50.000   % Impervious"
"        1.110   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.555   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.555   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.765   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.129     0.070     0.070     0.173 c.m/sec"
"             Catchment 1500         Pervious   Impervious Total Area "
"             Surface Area           0.555      0.555      1.110      hectare"
"             Time of concentration  18.924     3.399      10.752     minutes"
"             Time to Centroid       2520.774   2266.333   2386.847   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1581.75    1581.75    3163.50    c.m"
"             Rainfall losses        66.918     42.646     54.782     mm"
"             Runoff depth           218.082    242.354    230.218    mm"
"             Runoff volume          1210.36    1345.07    2555.42    c.m"
"             Runoff coefficient     0.765      0.850      0.808      "
"             Maximum flow           0.060      0.070      0.129      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.129     0.199     0.070     0.173"
" 56          DIVERSION"
"          1500   Node number"
"         0.146   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.053    c.m/sec"
"             Volume of diverted flow     288.514    c.m"
"             DIV01500.000hyd"
```

```
"             Major flow at 1500"
"                     0.129     0.199     0.146     0.173 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.129     0.146     0.146     0.173"
" 33          CATCHMENT 1000"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1000   Catchment 1000"
"       50.000   % Impervious"
"        6.760   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        3.380   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        3.380   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.764   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.744     0.146     0.146     0.173 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           3.380      3.380      6.760      hectare"
"             Time of concentration  32.793     5.891      18.359     minutes"
"             Time to Centroid       2537.301   2260.661   2388.880   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        0.9633     0.9633     1.9266     ha-m"
"             Rainfall losses        67.335     33.040     50.188     mm"
"             Runoff depth           217.665    251.960    234.812    mm"
"             Runoff volume          0.7357     0.8516     1.5873     ha-m"
"             Runoff coefficient     0.764      0.884      0.824      "
"             Maximum flow           0.394      0.428      0.744      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.744     0.890     0.146     0.173"
" 33          CATCHMENT 1100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         1100   Catchment 1100"
"        0.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.480   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.754   Pervious Runoff coefficient"
```

```
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.055     0.890     0.146     0.173 c.m/sec"
"             Catchment 1100          Pervious   Impervious Total Area "
"             Surface Area            0.480      0.000      0.480      hectare"
"             Time of concentration   12.485     2.243      12.485     minutes"
"             Time to Centroid        2505.277   2290.972   2505.276   minutes"
"             Rainfall depth          285.000    285.000    285.000    mm"
"             Rainfall volume         1368.00    0.00       1368.00    c.m"
"             Rainfall losses         70.073     43.972     70.073     mm"
"             Runoff depth            214.927    241.028    214.927    mm"
"             Runoff volume           1031.65    0.00       1031.65    c.m"
"             Runoff coefficient      0.754      0.000      0.754      "
"             Maximum flow            0.055      0.000      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.055     0.945     0.146     0.173"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.055     0.945     0.945     0.173"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  1.118    c.m/sec"
"             Hydrograph volume         23654.564    c.m"
"                    0.055     0.945     0.945     1.118"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Outlets to SWMF No. 1"
"             Maximum flow                  1.118    c.m/sec"
"             Hydrograph volume         23654.564    c.m"
"                    0.055     1.118     0.945     0.000"
" 54          POND DESIGN"
"          1.118   Current peak flow    c.m/sec"
"          0.250   Target outflow    c.m/sec"
"       23654.6   Hydrograph volume    c.m"
"           11.   Number of stages"
"       411.000   Minimum water level    metre"
"       412.000   Maximum water level    metre"
"       411.000   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                   411.000     0.000     0.000"
"                   411.100   0.05100   425.000"
"                   411.200    0.1030   936.000"
"                   411.300    0.1190  1459.000"
"                   411.400    0.1330  1994.000"
"                   411.500    0.3220  2542.000"
"                   411.600    0.3510  3101.000"
"                   411.700    0.3780  3673.000"
"                   411.800    0.4030  4258.000"
"                   411.850    0.4150  4554.000"
"                   412.000     2.088  5464.000"
"             Peak outflow                  1.028    c.m/sec"
"             Maximum level               411.908    metre"
"             Maximum storage            4908.128    c.m"
```

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"             Centroidal lag                43.521   hours"
"                  0.055     1.118     1.028     0.000 c.m/sec"
" 40           HYDROGRAPH Next link "
"             5   Next link "
"                      0.055     1.028     1.028     0.000"
" 47           FILEI_O Read/Open DIV01500.000hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"              DIV01500.000hyd"
"              Major flow at 1500"
"              Total volume                  288.514    c.m"
"              Maximum flow                    0.053    c.m/sec"
"                   0.053     1.028     1.028     0.000 c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                      0.053     1.055     1.028     0.000"
" 33           CATCHMENT 4000"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           4000   Catchment 4000"
"          0.000   % Impervious"
"          7.330   Total Area"
"         60.000   Flow length"
"          2.000   Overland Slope"
"          7.330   Pervious Area"
"         60.000   Pervious length"
"          2.000   Pervious slope"
"          0.000   Impervious Area"
"         60.000   Impervious length"
"          2.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         50.000   Pervious SCS Curve No."
"          0.453   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"         25.400   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.000   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                      0.619     1.055     1.028     0.000 c.m/sec"
"               Catchment 4000          Pervious   Impervious Total Area "
"               Surface Area            7.330      0.000      7.330      hectare"
"               Time of concentration   27.692     4.336      27.692     minutes"
"               Time to Centroid        2672.198   2258.968   2672.197   minutes"
"               Rainfall depth          285.000    285.000    285.000    mm"
"               Rainfall volume         2.0890     0.0000     2.0891     ha-m"
"               Rainfall losses         155.800    39.404     155.800    mm"
"               Runoff depth            129.200    245.596    129.200    mm"
"               Runoff volume           9470.35    0.02       9470.37    c.m"
"               Runoff coefficient      0.453      0.000      0.453      "
"               Maximum flow            0.619      0.000      0.619      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                      0.619     1.674     1.028     0.000"
" 54           POND DESIGN"
"            1.674   Current peak flow    c.m/sec"
"            0.250   Target outflow    c.m/sec"
"         32588.7   Hydrograph volume    c.m"
"              6.   Number of stages"
"         409.630   Minimum water level    metre"
```

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"      410.750   Maximum water level    metre"
"      409.630   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                409.630     0.000     0.000"
"                409.750    0.6650   402.200"
"                410.000     3.601  2187.900"
"                410.250     7.811  5318.900"
"                410.500    12.984  9642.300"
"                410.750    18.965  15227.70"
"              Peak outflow                  1.555    c.m/sec"
"              Maximum level               409.826    metre"
"              Maximum storage             943.398    c.m"
"              Centroidal lag               44.008   hours"
"                   0.619     1.674     1.555     0.000 c.m/sec"
" 40           HYDROGRAPH Next link "
"             5   Next link "
"                   0.619     1.555     1.555     0.000"
" 52           CHANNEL DESIGN"
"         1.555   Current peak flow    c.m/sec"
"         0.035   Manning 'n'"
"            0.   Cross-section type: 0=trapezoidal; 1=general"
"         0.000   Basewidth    metre"
"         7.410   Left bank slope"
"         6.000   Right bank slope"
"         0.950   Channel depth    metre"
"         1.040   Gradient   %"
"              Depth of flow                 0.462    metre"
"              Velocity                      1.088    m/sec"
"              Channel capacity             10.655    c.m/sec"
"              Critical depth                0.406    metre"
" 53           ROUTE    Channel Route 72"
"         72.40      Channel Route 72 Reach length   ( metre)"
"         0.385   X-factor <= 0.5"
"        49.895   K-lag   ( seconds)"
"         0.000   Default(0) or user spec.(1) values used"
"         0.500   X-factor <= 0.5"
"        30.000   K-lag   ( seconds)"
"         0.500   Beta weighting factor"
"        61.017   Routing time step   ( seconds)"
"             1   No. of sub-reaches"
"              Peak outflow                  1.546    c.m/sec"
"                   0.619     1.555     1.546     0.000 c.m/sec"
" 40           HYDROGRAPH Next link "
"             5   Next link "
"                   0.619     1.546     1.546     0.000"
" 52           CHANNEL DESIGN"
"         1.546   Current peak flow    c.m/sec"
"         0.035   Manning 'n'"
"            0.   Cross-section type: 0=trapezoidal; 1=general"
"         2.000   Basewidth    metre"
"         2.950   Left bank slope"
"         3.000   Right bank slope"
"         0.950   Channel depth    metre"
"         1.040   Gradient   %"
"              Depth of flow                 0.393    metre"
"              Velocity                      1.243    m/sec"
"              Channel capacity              9.246    c.m/sec"
"              Critical depth                0.331    metre"
" 53           ROUTE    Channel Route 40"
"         39.80      Channel Route 40 Reach length   ( metre)"
"         0.252   X-factor <= 0.5"
"        24.016   K-lag   ( seconds)"
```

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"        0.000   Default(0) or user spec.(1) values used"
"        0.500   X-factor <= 0.5"
"       30.000   K-lag   ( seconds)"
"        0.500   Beta weighting factor"
"       35.644   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                  1.541    c.m/sec"
"                    0.619     1.546     1.541     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"            6   Combine "
"          100   Node #"
"                Existing Wetland"
"             Maximum flow                  1.541    c.m/sec"
"             Hydrograph volume         32587.465    c.m"
"                    0.619     1.546     1.541     1.541"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.619     0.000     1.541     1.541"
" 33          CATCHMENT 2100"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2100   Catchment 2100"
"       60.000   % Impervious"
"        1.960   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.784   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        1.176   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.765   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.232     0.000     1.541     1.541 c.m/sec"
"             Catchment 2100         Pervious   Impervious Total Area "
"             Surface Area           0.784      1.176      1.960      hectare"
"             Time of concentration  18.924     3.399      9.220      minutes"
"             Time to Centroid       2520.773   2266.333   2361.739   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2234.40    3351.60    5586.00    c.m"
"             Rainfall losses        66.918     42.646     52.354     mm"
"             Runoff depth           218.082    242.354    232.646    mm"
"             Runoff volume          1709.77    2850.09    4559.85    c.m"
"             Runoff coefficient     0.765      0.850      0.816      "
"             Maximum flow           0.085      0.148      0.232      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.232     0.232     1.541     1.541"
" 33          CATCHMENT 2400"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2400   Catchment 2400"
```

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"       90.000   % Impervious"
"        0.790   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.079   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.711   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.754   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.100     0.232     1.541     1.541 c.m/sec"
"             Catchment 2400          Pervious   Impervious Total Area "
"             Surface Area            0.079      0.711      0.790      hectare"
"             Time of concentration   12.485     2.243      3.166      minutes"
"             Time to Centroid        2505.277   2290.972   2310.291   minutes"
"             Rainfall depth          285.000    285.000    285.000    mm"
"             Rainfall volume         225.15     2026.35    2251.50    c.m"
"             Rainfall losses         70.073     43.972     46.582     mm"
"             Runoff depth            214.927    241.028    238.418    mm"
"             Runoff volume           169.79     1713.71    1883.50    c.m"
"             Runoff coefficient      0.754      0.846      0.837      "
"             Maximum flow            0.009      0.091      0.100      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.100     0.332     1.541     1.541"
" 54          POND DESIGN"
"        0.332   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"       6443.4   Hydrograph volume    c.m"
"          13.   Number of stages"
"      410.650   Minimum water level    metre"
"      411.950   Maximum water level    metre"
"      410.650   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                410.650     0.000     0.000"
"                410.700   0.00600    42.000"
"                410.800   0.01300   130.000"
"                410.900   0.02000   225.000"
"                411.000   0.02500   328.000"
"                411.100   0.02900   439.000"
"                411.200    0.1260   558.000"
"                411.300    0.1390   686.000"
"                411.400    0.1510   822.000"
"                411.500    0.1630   967.000"
"                411.600    0.1730  1121.000"
"                411.650    0.1780  1202.000"
"                411.950     2.575  1742.000"
"             Peak outflow                  0.268    c.m/sec"
"             Maximum level               411.661    metre"
"             Maximum storage            1222.588    c.m"
"             Centroidal lag               41.113   hours"
"                  0.100     0.332     0.268     1.541 c.m/sec"
```

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" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.100     0.268     0.268     1.541"
" 33          CATCHMENT 2300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2300   Catchment 2300"
"       10.000   % Impervious"
"        0.480   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.432   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.048   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.754   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.055     0.268     0.268     1.541 c.m/sec"
"             Catchment 2300         Pervious   Impervious Total Area "
"             Surface Area           0.432      0.048      0.480      hectare"
"             Time of concentration  12.485     2.243      11.350     minutes"
"             Time to Centroid       2505.277   2290.972   2481.532   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        1231.20    136.80     1368.00    c.m"
"             Rainfall losses        70.073     43.972     67.463     mm"
"             Runoff depth           214.927    241.028    217.537    mm"
"             Runoff volume          928.48     115.69     1044.18    c.m"
"             Runoff coefficient     0.754      0.846      0.763      "
"             Maximum flow           0.049      0.006      0.055      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.055     0.315     0.268     1.541"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.055     0.315     0.315     1.541"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  0.315    c.m/sec"
"             Hydrograph volume          7579.884    c.m"
"                    0.055     0.315     0.315     0.315"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.055     0.000     0.315     0.315"
" 33          CATCHMENT 2200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2200   Catchment 2200"
"       75.000   % Impervious"
"        0.920   Total Area"
```

```
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.230   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.690   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       78.000   Pervious SCS Curve No."
"        0.765   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.850   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.112     0.000     0.315     0.315 c.m/sec"
"             Catchment 2200          Pervious   Impervious Total Area "
"             Surface Area            0.230      0.690      0.920      hectare"
"             Time of concentration   18.924     3.399      6.981      minutes"
"             Time to Centroid        2520.774   2266.333   2325.042   minutes"
"             Rainfall depth          285.000    285.000    285.000    mm"
"             Rainfall volume         655.50     1966.50    2622.00    c.m"
"             Rainfall losses         66.918     42.646     48.714     mm"
"             Runoff depth            218.082    242.354    236.286    mm"
"             Runoff volume           501.59     1672.25    2173.83    c.m"
"             Runoff coefficient      0.765      0.850      0.829      "
"             Maximum flow            0.025      0.087      0.112      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.112     0.112     0.315     0.315"
" 54          POND DESIGN"
"        0.112   Current peak flow    c.m/sec"
"        0.756   Target outflow    c.m/sec"
"       2173.8   Hydrograph volume    c.m"
"          12.   Number of stages"
"      413.700   Minimum water level    metre"
"      415.000   Maximum water level    metre"
"      413.700   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                413.700     0.000     0.000"
"                413.800   0.00500    88.600"
"                413.900   0.01000   187.200"
"                414.000   0.01300   298.400"
"                414.100   0.01500   422.200"
"                414.200    0.2220   558.900"
"                414.300    0.2590   708.500"
"                414.400    0.2910   871.100"
"                414.500    0.3210  1046.900"
"                414.600    0.3470  1236.100"
"                414.700    0.3720  1438.700"
"                415.000     2.808  2087.400"
"             Peak outflow                  0.096    c.m/sec"
"             Maximum level               414.144    metre"
"             Maximum storage             481.835    c.m"
"             Centroidal lag               42.646   hours"
"                  0.112     0.112     0.096     0.315 c.m/sec"
" 40          HYDROGRAPH   Combine    200"
"            6   Combine "
"          200   Node #"
```

```
"                To Trib. of Grand River"
"             Maximum flow                  0.406    c.m/sec"
"             Hydrograph volume          9741.546    c.m"
"                    0.112     0.112     0.096     0.406"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.112     0.000     0.096     0.406"
" 33          CATCHMENT 3200"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          3200   Catchment 3200"
"        60.000   % Impervious"
"         0.530   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.212   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.318   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        78.000   Pervious SCS Curve No."
"         0.754   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         7.164   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.846   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.065     0.000     0.096     0.406 c.m/sec"
"              Catchment 3200          Pervious   Impervious Total Area "
"              Surface Area            0.212      0.318      0.530      hectare"
"              Time of concentration   12.485     2.243      6.061      minutes"
"              Time to Centroid        2505.277   2290.972   2370.872   minutes"
"              Rainfall depth          285.000    285.000    285.000    mm"
"              Rainfall volume         604.20     906.30     1510.50    c.m"
"              Rainfall losses         70.073     43.972     54.413     mm"
"              Runoff depth            214.927    241.028    230.587    mm"
"              Runoff volume           455.64     766.47     1222.11    c.m"
"              Runoff coefficient      0.754      0.846      0.809      "
"              Maximum flow            0.024      0.041      0.065      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.065     0.065     0.096     0.406"
" 33          CATCHMENT 3300"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          3300   Catchment 3300"
"        60.000   % Impervious"
"         0.240   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.096   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.144   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
```

```
"       78.000   Pervious SCS Curve No."
"        0.754   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.164   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.846   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.029     0.065     0.096     0.406 c.m/sec"
"            Catchment 3300          Pervious   Impervious Total Area "
"            Surface Area            0.096      0.144      0.240      hectare"
"            Time of concentration   12.485     2.243      6.061      minutes"
"            Time to Centroid        2505.277   2290.972   2370.872   minutes"
"            Rainfall depth          285.000    285.000    285.000    mm"
"            Rainfall volume         273.60     410.40     684.00     c.m"
"            Rainfall losses         70.073     43.972     54.413     mm"
"            Runoff depth            214.927    241.028    230.587    mm"
"            Runoff volume           206.33     347.08     553.41     c.m"
"            Runoff coefficient      0.754      0.846      0.809      "
"            Maximum flow            0.011      0.018      0.029      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.029     0.094     0.096     0.406"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.029     0.094     0.094     0.406"
" 40         HYDROGRAPH   Combine    300"
"           6   Combine "
"          300   Node #"
"               To Walser Street"
"            Maximum flow                  0.094    c.m/sec"
"            Hydrograph volume          1775.523    c.m"
"                    0.029     0.094     0.094     0.094"
" 40         HYDROGRAPH   Confluence    300"
"           7   Confluence "
"          300   Node #"
"               To Walser Street"
"            Maximum flow                  0.094    c.m/sec"
"            Hydrograph volume          1775.523    c.m"
"                    0.029     0.094     0.094     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.029     0.094     0.094     0.000"
" 40         HYDROGRAPH   Combine    100"
"           6   Combine "
"          100   Node #"
"               Existing Wetland"
"            Maximum flow                  1.614    c.m/sec"
"            Hydrograph volume         34362.984    c.m"
"                    0.029     0.094     0.094     1.614"
" 40         HYDROGRAPH   Confluence    100"
"           7   Confluence "
"          100   Node #"
"               Existing Wetland"
"            Maximum flow                  1.614    c.m/sec"
"            Hydrograph volume         34362.988    c.m"
"                    0.029     1.614     0.094     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.029     1.614     1.614     0.000"
" 40         HYDROGRAPH   Combine    200"
"           6   Combine "
```

```
                                    Post__REG
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  2.020    c.m/sec"
"             Hydrograph volume         44104.500    c.m"
"                    0.029     1.614     1.614     2.020"
" 40          HYDROGRAPH   Confluence    200"
"           7   Confluence "
"          200   Node #"
"                To Trib. of Grand River"
"             Maximum flow                  2.020    c.m/sec"
"             Hydrograph volume         44104.496    c.m"
"                    0.029     2.020     1.614     0.000"
" 38          START/RE-START TOTALS 200"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                      22.640    hectare"
"             Total Impervious area                      7.856    hectare"
"             Total % impervious                        34.700"
" 19          EXIT"
```

Brief Stormceptor Sizing Report - 1000 (southerly portion)

Project Information & Location			
Project Name	Ainley Farm	**Project Number**	411009
City		**State/ Province**	Ontario
Country	Canada	**Date**	2/12/2019
Designer Information		**EOR Information (optional)**	
Name	Patricia Wiebe	**Name**	
Company	GM BluePlan Engineering Ltd.	**Company**	
Phone #	519-748-1440	**Phone #**	
Email	patricia.wiebe@gmblueplan.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	1000 (southerly portion)
Target TSS Removal (%)	80
TSS Removal (%) Provided	
Recommended Stormceptor Model	STC 3000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	62	75
STC 750	73	87
STC 1000	74	87
STC 1500	75	87
STC 2000	78	92
STC 3000	80	92
STC 4000	84	96
STC 5000	85	96
STC 6000	87	98
STC 9000	90	99
STC 10000	90	99
STC 14000	92	99
StormceptorMAX	Custom	Custom

Sizing Details

Drainage Area	
Total Area (ha)	1.69
Imperviousness %	50.0

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	43°37'N
Longitude	79°23'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Brief Stormceptor Sizing Report - 1100, 1000 (easterly portion)

Project Information & Location			
Project Name	Ainley Farm	**Project Number**	411009
City		**State/ Province**	Ontario
Country	Canada	**Date**	2/12/2019
Designer Information		**EOR Information (optional)**	
Name	Patricia Wiebe	**Name**	
Company	GM BluePlan Engineering Ltd.	**Company**	
Phone #	519-748-1440	**Phone #**	
Email	patricia.wiebe@gmblueplan.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	1100, 1000 (easterly portion)
Target TSS Removal (%)	80
TSS Removal (%) Provided	
Recommended Stormceptor Model	STC 4000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	58	70
STC 750	70	84
STC 1000	71	84
STC 1500	72	84
STC 2000	76	90
STC 3000	77	90
STC 4000	81	94
STC 5000	82	94
STC 6000	85	96
STC 9000	88	98
STC 10000	88	98
STC 14000	91	99
StormceptorMAX	Custom	Custom

Sizing Details

Drainage Area	
Total Area (ha)	2.18
Imperviousness %	50.0

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	43°37'N
Longitude	79°23'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Brief Stormceptor Sizing Report - 1400, 1500, 1000 (northerly portion)

Project Information & Location			
Project Name	Ainley Farm	**Project Number**	411009
City		**State/ Province**	Ontario
Country	Canada	**Date**	2/12/2019
Designer Information		**EOR Information (optional)**	
Name	Patricia Wiebe	**Name**	
Company	GM BluePlan Engineering Ltd.	**Company**	
Phone #	519-748-1440	**Phone #**	
Email	patricia.wiebe@gmblueplan.ca	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	1400, 1500, 1000 (northerly portion)
Target TSS Removal (%)	80
TSS Removal (%) Provided	
Recommended Stormceptor Model	STC 6000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	50	57
STC 750	63	74
STC 1000	65	74
STC 1500	65	74
STC 2000	70	84
STC 3000	71	84
STC 4000	76	90
STC 5000	77	90
STC 6000	80	93
STC 9000	84	96
STC 10000	84	96
STC 14000	87	97
StormceptorMAX	Custom	Custom

Sizing Details

Drainage Area

Total Area (ha)	4
Imperviousness %	45.0

Rainfall

Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	43°37'N
Longitude	79°23'W

Water Quality Objective

TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage

Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion

Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution

Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

Brief Stormceptor Sizing Report - Catchment 2100 + 2400

Project Information & Location			
Project Name	Ainley Farm	**Project Number**	411009
City		**State/ Province**	Ontario
Country	Canada	**Date**	2/12/2019
Designer Information		**EOR Information (optional)**	
Name	Patricia Wiebe	**Name**	
Company	GM BluePlan Engineering Ltd.	**Company**	
Phone #	519-748-1440	**Phone #**	
Email	patricia.wiebe@gmblueplan.ca	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	Catchment 2100 + 2400
Target TSS Removal (%)	80
TSS Removal (%) Provided	81
Recommended Stormceptor Model	STC 6000

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	51	59
STC 750	64	76
STC 1000	66	76
STC 1500	66	76
STC 2000	71	85
STC 3000	72	85
STC 4000	77	91
STC 5000	78	91
STC 6000	81	94
STC 9000	85	96
STC 10000	85	96
STC 14000	88	98
StormceptorMAX	Custom	Custom

Sizing Details

Drainage Area	
Total Area (ha)	2.42
Imperviousness %	70.0

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	43°37'N
Longitude	79°23'W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

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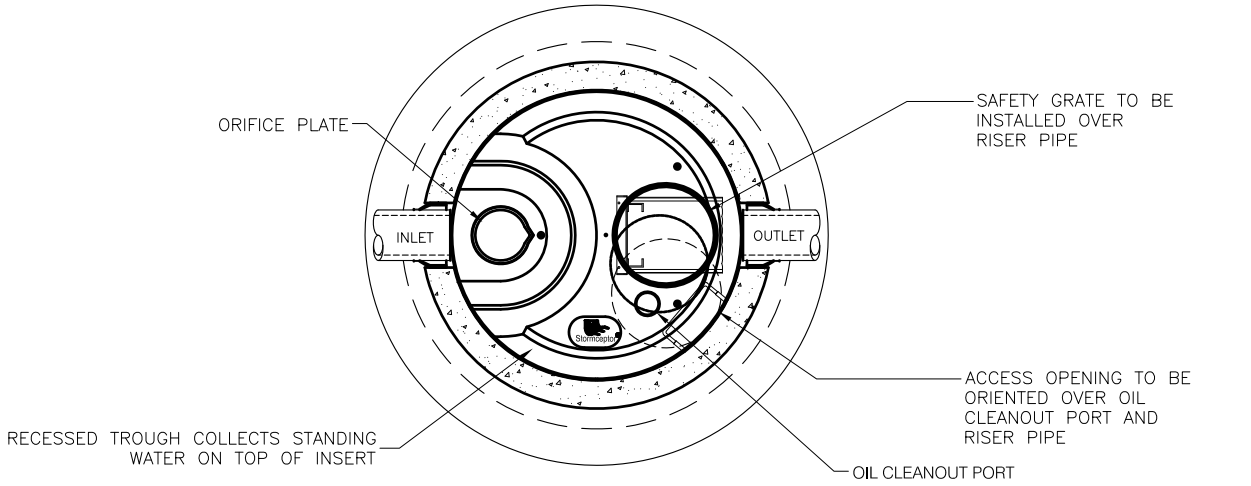

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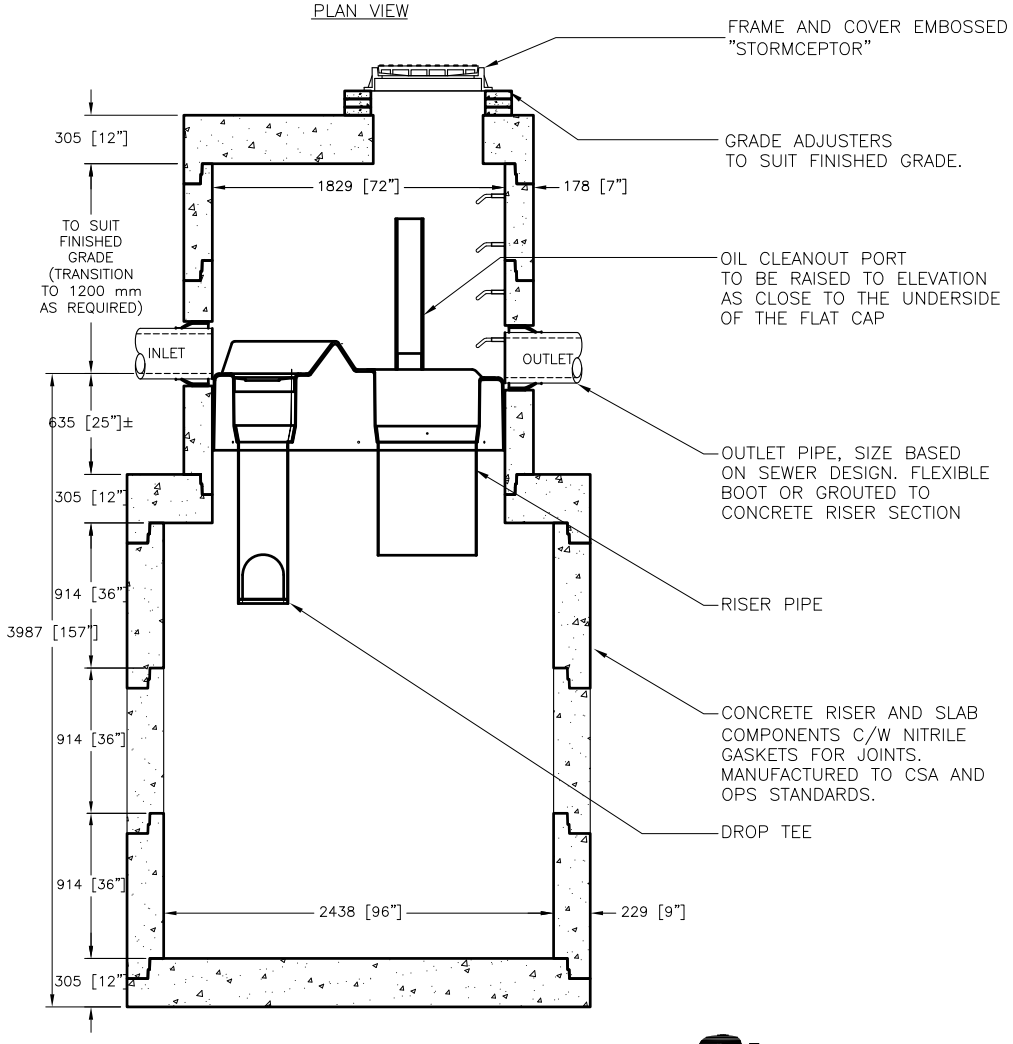

SECTION VIEW

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7037 Ridge Road, Suite 350, Hanover, MD 21076
866-740-3318 410-796-5505 866-376-8511 FAX

STC 3000
STANDARD MODEL

####

REV #	DATE	REVISION DESCRIPTION	BY

SHEET NUMBER 1 OF 1

DATE:######## | SCALE: 50 | PROJECT No.: ##### | DRAWN: ### | CHECKED: ###

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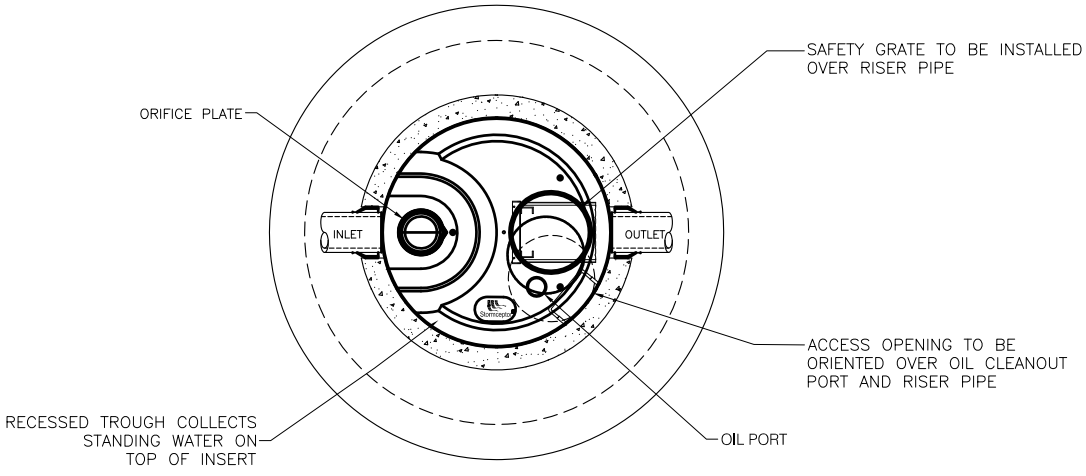

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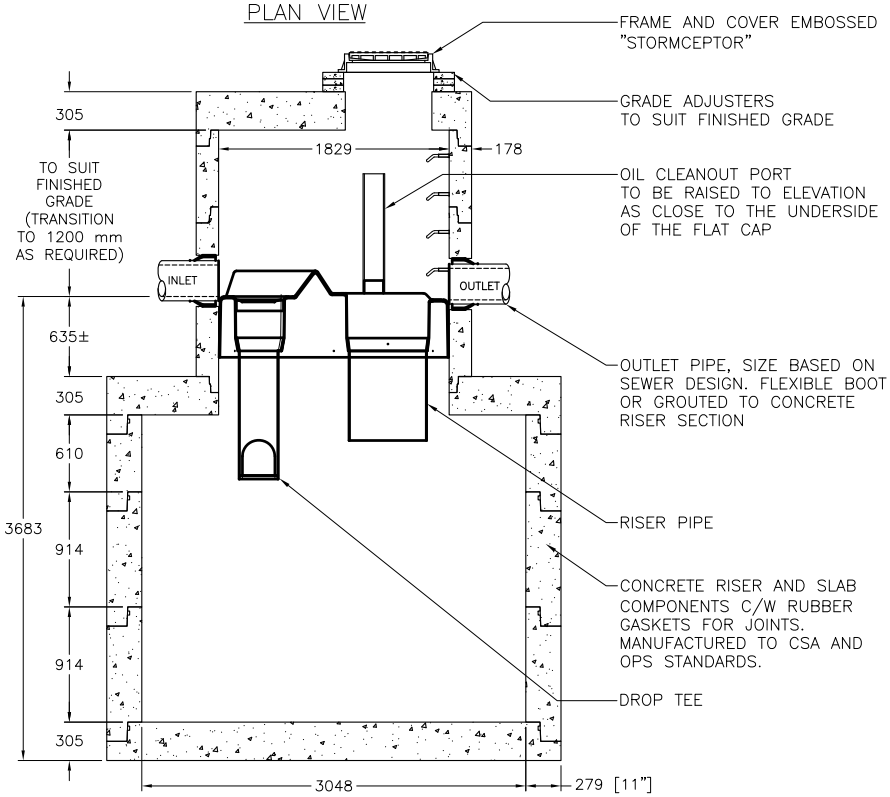

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imbrium®
WWW.IMBRIUMSYSTEMS.COM
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USA 888-279-8826 CA 800-565-4801 INTL +1-416-960-9900

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STANDARD MODEL
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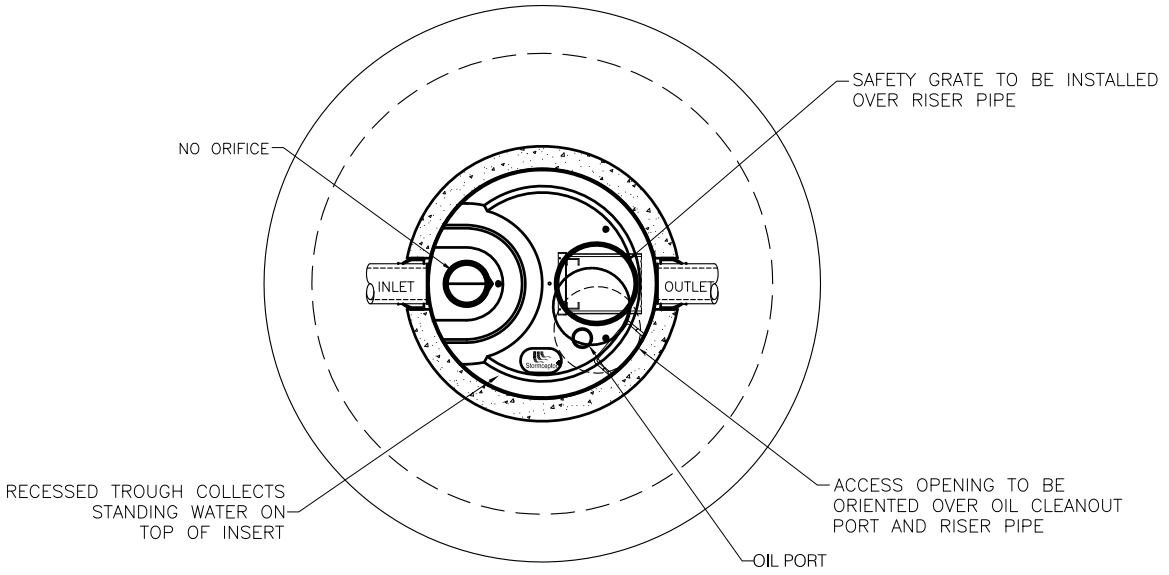

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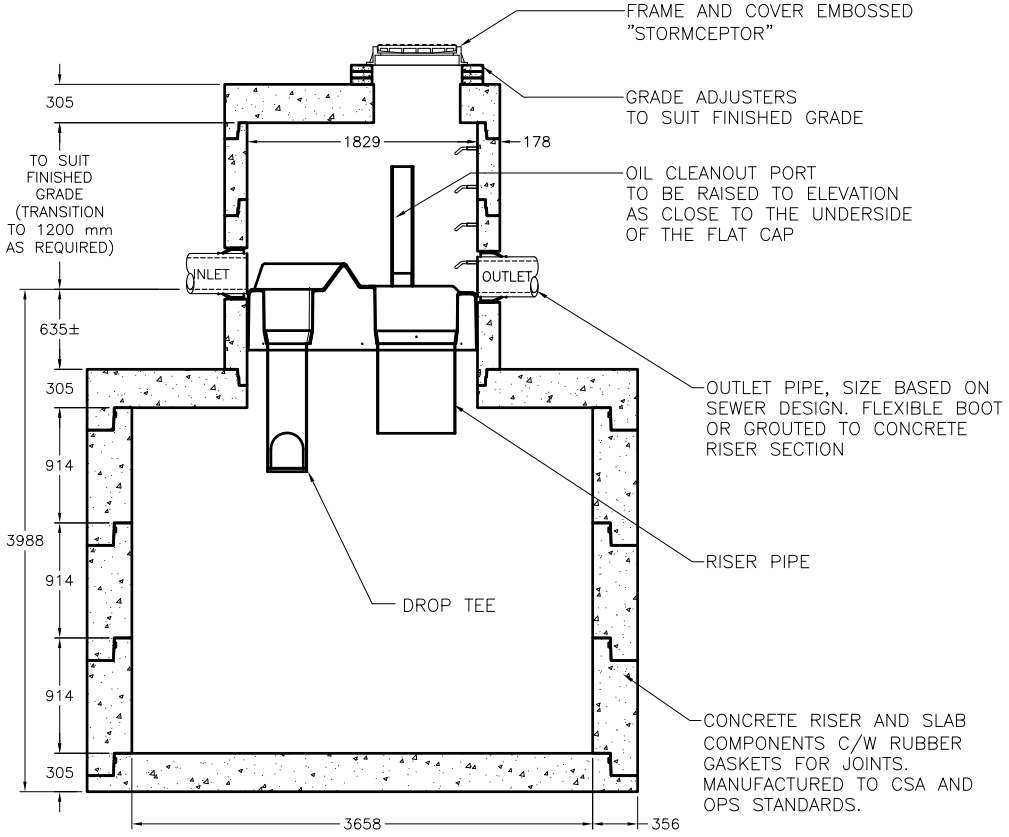

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APPENDIX D

WATER BUDGET ANALYSIS

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
Monthly Water Balance (Thornthwaite and Mather Method)
Date: February 2019

EXISTING CONDITION

Contributing Catchments: All
Contributing Area = 22.70 ha
Percent Impervious = 0% %
Soil Type: Clay Loam
Vegetation: Shallow-rooted crops
Root Zone Depth = 0.40m
Soil Moisture Retention Capacity = 100mm

Runoff Factor = 0.84
Evapotranspiration Factor for Impervious Surfaces = 0.36

Month	Daily Average Temperature (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET	Actual Evapotrans-piration (mm)	Pervious ET - Actual ET	Moisture Deficit (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.40	0.00	0.00	24.3	0.00	67.90	67.9		236.5	0.0		0.0	0.0	0.0	0.0	9.9	0.0	9.9	8.3	1,894	352
Feb	-6.30	0.00	0.00	24.6	0.00	55.90	55.9		292.4	0.0		0.0	0.0	0.0	0.0	4.9	0.0	4.9	4.2	947	176
Mar	-1.90	0.00	0.00	30.6	0.00	59.60	59.6		352.0	0.0		0.0	0.0	0.0	0.0	2.5	0.0	2.5	2.1	474	88
Apr	5.70	1.22	0.90	33.6	30.24	74.10	43.9		100.0	0.0	30.2	30.2	0.0	0.0	43.9	21.9	25.2	47.1	39.7	9,020	1,679
May	12.20	3.86	2.00	37.8	75.60	86.90	11.3		100.0	0.0	75.6	75.6	0.0	0.0	11.3	16.6	113.4	130.0	109.6	24,883	4,630
Jun	17.50	6.66	2.90	38.4	111.36	83.80	-27.6	-27.6	75.0	-25.0	108.8	108.8	0.0	2.6	-2.6	7.0	56.7	63.7	53.7	12,197	2,270
Jul	20.00	8.16	3.40	38.7	131.58	89.20	-42.4	-69.9	49.0	-26.0	115.2	115.2	0.0	16.4	-16.4	-4.7	28.4	23.7	20.0	4,531	843
Aug	19.00	7.55	3.20	36.0	115.20	96.60	-18.6	-88.5	40.0	-9.0	105.6	105.6	0.0	9.6	-9.6	-7.1	14.2	7.0	5.9	1,347	251
Sep	14.90	5.22	2.50	31.2	78.00	93.10	15.1		55.1	15.1	78.0	78.0	0.0	0.0	0.0	-3.6	7.7	4.1	3.5	791	147
Oct	8.30	2.15	1.30	28.5	37.05	77.20	40.2		95.3	40.2	37.1	37.1	0.0	0.0	0.0	-1.8	4.0	2.2	1.9	424	79
Nov	2.10	0.27	0.30	24.3	7.29	93.00	85.7		100.0	4.8	7.3	7.3	0.0	0.0	81.0	39.6	2.5	42.1	35.5	8,055	1,499
Dec	-3.90	0.00	0.00	23.1	0.00	68.60	68.6		168.6	0.0		0.0	0.0	0.0	0.0	19.8	0.0	19.8	16.7	3,788	705
Total		**35.1**				**945.9**	**359.6**				**557.8**	**557.8**		**28.5**	**107.6**	**105.1**	**252.0**	**357.1**	**301.1**	**68,350**	**12,719**

Notes: Precipitation and Temperature data from Environment Canada Climate Normals 1981-2010 for Fergus Shand Dam
Monthly water balance strategy as outlined in the document *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance (Thornthwaite and Mather, 1957)*
Monthy Heat Index (I) from Table 2 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Correction Factors from Table 6 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Evaporation Factor for Impervious Surfaces = Average Annual Evapotranspiration for Impervious Surfaces (200mm/year) / Average Annual Evapotranspiration for Pervious Surfaces (558mm/year) = 0.36
Runoff Factor = [(Impervious Percentage of Site x Average Annual Runoff for Impervious Surfaces (745.9mm/year)) + (Pervious Silt Till Percentage of Site x Average Annual Runoff for Pervious Silt Till Surfaces (301.1 mm/year))] / Total Annual Recharge

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
Monthly Water Balance (Thornthwaite and Mather Method)
Date: February 2019

POST-DEVELOPMENT CONDITIONS - TO WETLAND

Contributing Catchments: All
Contributing Area = 22.70 ha
Percent Impervious = 36%
Soil Type: Clay Loam
Vegetation: Shallow-rooted crops
Root Zone Depth = 0.40m
Soil Moisture Retention Capacity = 100mm

Runoff Factor = 0.95
Evapotranspiration Factor for Impervious = 0.36

Month	Daily Average Temperature (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factors	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accum. Pot. Water Loss (mm)	Storage (mm)	ΔS (mm)	Pervious ET	Actual Evapotrans-piration (mm)	Pervious ET - Actual ET	Moisture Deficit (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)	Enhanced Recharge (m^3)
Jan	-7.40	0.00	0.00	24.3	0.00	67.90	67.9		236.5	0.0		0.0	0.0	0.0	0.0	11.9	0.0	11.9	11.3	2,377	135	197
Feb	-6.30	0.00	0.00	24.6	0.00	55.90	55.9		292.4	0.0		0.0	0.0	0.0	0.0	6.0	0.0	6.0	5.7	1,189	68	98
Mar	-1.90	0.00	0.00	30.6	0.00	59.60	59.6		352.0	0.0		0.0	0.0	0.0	0.0	3.0	0.0	3.0	2.8	594	34	49
Apr	5.70	1.22	0.90	33.6	30.24	74.10	43.9		100.0	0.0	30.2	23.3	7.0	7.0	50.8	25.4	25.2	50.6	48.1	10,093	573	825
May	12.20	3.86	2.00	37.8	75.60	86.90	11.3		100.0	0.0	75.6	58.1	17.5	17.5	28.8	27.1	113.4	140.5	133.5	28,654	1,590	1,648
Jun	17.50	6.66	2.90	38.4	111.36	83.80	-27.6	-27.6	75.0	-25.0	108.8	83.7	25.1	27.7	22.6	24.8	56.7	81.5	77.5	16,234	922	1,351
Jul	20.00	8.16	3.40	38.7	131.58	89.20	-42.4	-69.9	49.0	-26.0	115.2	88.6	26.6	43.0	10.2	17.5	28.4	45.9	43.6	9,113	519	782
Aug	19.00	7.55	3.20	36.0	115.20	96.60	-18.6	-88.5	40.0	-9.0	105.6	81.2	24.4	34.0	14.8	16.2	14.2	30.3	28.8	6,009	343	532
Sep	14.90	5.22	2.50	31.2	78.00	93.10	15.1		55.1	15.1	78.0	60.0	18.0	18.0	18.0	17.1	7.7	24.8	23.5	4,908	280	438
Oct	8.30	2.15	1.30	28.5	37.05	77.20	40.2		95.3	40.2	37.1	28.5	8.6	8.6	8.6	12.8	4.0	16.8	16.0	3,330	190	298
Nov	2.10	0.27	0.30	24.3	7.29	93.00	85.7		100.0	4.8	7.3	5.6	1.7	1.7	82.6	47.7	2.5	50.2	47.7	10,007	568	827
Dec	-3.90	0.00	0.00	23.1	0.00	68.60	68.6		168.6	0.0		0.0	0.0	0.0	0.0	23.9	0.0	23.9	22.7	4,754	270	393
Total		**35.1**				**945.9**	**359.6**				**557.8**	**429.0**	**128.8**	**157.3**	**236.4**	**233.4**	**252.0**	**485.4**	**461.2**	**97,261**	**5,492**	**7,438**
																					Total Recharge Volume	**12,930**
																					Total Enhanced Recharge Surplus (post-development volume - pre-development volume)	**211**

Notes: Precipitation and Temperature data from Environment Canada Climate Normals 1981-2010 for Fergus Shand Dam
Monthly water balance strategy as outlined in the document *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance (Thornthwaite and Mather, 1957)*
Monthy Heat Index (I) from Table 2 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Correction Factors from Table 6 of *Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance*
Evaporation Factor for Impervious Surfaces = Average Annual Evapotranspiration for Impervious Surfaces (200mm/year) / Average Annual Evapotranspiration for Pervious Surfaces (558mm/year) = 0.36
Runoff Factor = [(Impervious Percentage of Site x Average Annual Runoff for Impervious Surfaces (745.9mm/year)) + (Pervious Silt Till Percentage of Site x Average Annual Runoff for Pervious Silt Till Surfaces (301.1 mm/year))] / Total

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
Monthly Water Balance (Thornthwaite and Mather Method)
Date: February 2019

Catchment 1200 - Design of Infiltration Structure

Infiltration Gallery No. 1

Length =	85.00	m
Width =	3.50	m
Depth=	0.87	m
Perforated Pipe Diameter=	0.60	m
No. of Pipes=	4.00	
Area of Material =	297.50	sq m
Volume of Perforated Pipe	93.31	
Volume of Clear Stone =	165.52	cu m
Clear Stone Void Ratio=	0.33	

Total Storage Volume of Structure = 147.93 cu m

Infiltration Gallery No. 2

Length =	60.00	m
Width =	5.00	m
Depth=	0.87	m
Perforated Pipe Diameter=	0.60	m
No. of Pipes=	6.00	
Area of Material =	300.00	sq m
Volume of Perforated Pipe	98.39	
Volume of Clear Stone =	162.61	cu m
Clear Stone Void Ratio=	0.33	

Total Storage Volume of Structure = 152.05 cu m

A = contact area of structure =	597.50	sq m		
V = runoff volume to be infiltrated =	299.98	cu m		
P = percolation rate of native soils =	4.00	mm/h		
n = porosity of storage media (weighted) =	0.68			
T = retention time =	Solve for T			
T = (1000 x V) / (P x n x A) =	183.47	hours or	7.6	day draindown perio

Contributing Area	1.32	ha		
Recharge Time	183.5	hours	7.6	days
Recharge Volume Potentia	299.98	m^3		

Month	Total Runoff from Contributing Area (mm)	No. of days	Max Potential Recharge (m^3)	Available Recharge (m^3)	Enhanced Recharge (m^3)
Jan	11.0	31	1,216	145	138
Feb	5.5	28	1,099	72	69
Mar	2.7	31	1,216	36	34
Apr	44.8	30	1,177	591	562
May	124.6	31	1,216	1,645	1,156
Jun	76.2	30	1,177	1,006	956
Jul	46.9	31	1,216	620	589
Aug	33.9	31	1,216	447	425
Sep	28.2	30	1,177	373	354
Oct	19.4	31	1,216	256	243
Nov	46.0	30	1,177	607	577
Dec	21.9	31	1,216	290	275
Total	**461.2**	**365**	**14,323**	**6,088**	**5,377**

Ainley Farm Subdivision
Township of Centre Wellington (Elora)
Monthly Water Balance (Thornthwaite and Mather Method)
Date: February 2019

Catchment 1400 - Design of Infiltration Structure

Infiltration Gallery No. 3

Length =	80.00	m
Width =	4.00	m
Depth=	0.70	m
Perforated Pipe Diameter=	0.60	m
No. of Pipes=	3.00	
Area of Material =	320.00	sq m
Volume of Perforated Pipe	71.59	
Volume of Clear Stone =	152.41	cu m
Clear Stone Void Ratio=	0.33	

Total Storage Volume of Structure = 122.39 cu m

A = contact area of structure =	320.00	sq m
V = runoff volume to be infiltrated =	122.39	cu m
P = percolation rate of native soils =	4.00	mm/h
n = porosity of storage media (weighted) =	0.54	
T = retention time =	Solve for T	

T = (1000 x V) / (P x n x A) = 175.73 hours or 7.3 day draindown perio

Contributing Area	0.62	ha		
Recharge Time	175.7	hours	/	7.3 days
Recharge Volume Potentia	122.39	m^3		

Month	Total Runoff from Contributing Area (mm)	No. of days	Max Potential Recharge (m^3)	Available Recharge (m^3)	Enhanced Recharge (m^3)
Jan	10.0	31	518	62	59
Feb	5.0	28	468	31	30
Mar	2.5	31	518	16	15
Apr	44.7	30	501	277	263
May	123.7	31	518	767	492
Jun	67.0	30	501	416	395
Jul	32.8	31	518	203	193
Aug	18.2	31	518	113	107
Sep	14.2	30	501	88	84
Oct	9.4	31	518	58	55
Nov	42.4	30	501	263	250
Dec	20.1	31	518	125	118
Total	**390.1**	**365**	**6,101**	**2,418**	**2,061**