Prepared By:

Stormwater Management Report

263512 Southgate Road 26, Southgate
Proposed Wilder Lake Subdivision
H. Bye Construction Ltd.

GMBP File: 218173

November 2019

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263512 SOUTHGATE ROAD 26, SOUTHGATE
H. BYE CONSTRUCTION LTD.

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1. INTRODUCTION AND BACKGROUND

H. Bye Construction Limited proposes to construct a new 20.8 ha residential subdivision on their property located at 263512 Southgate Road 26 in the Township of Southgate, as shown in Figure 1 – Site Location map. For the purposes of this report Southgate Road 26 is assumed to travel in an east-west direction and the subject property is therefore located on the southerly side of the Southgate Road 26 roadway.

The subject property is approximately 50 ha and is currently developed as Homestead Golf Course and Winter Resort, an 18 hole golf course with a clubhouse and restaurant, as well as rental cottages along the shore of Wilder Lake. The subject property is bound by Wilder Lake to the east, forested and agricultural land to the south, agricultural land to the west, and residential and forested agricultural land to the north. Camp Creek Tributary is the outlet of Wilder Lake and flows through the northern portion of the property.

The lands associated with the proposed subdivision consist of an approximately 20 ha portion of the east side of the property. The main roadway through the proposed subdivision is accessed from Southgate Road 26 and follows the existing roadway to the existing Clubhouse, and then loops eastward, south parallel to the shore of Wilder Lake, west parallel with the property boundary, and north back to join with the entrance road just west of the Clubhouse. It includes parcels on both sides of the roadway.

Development is proposed to be completed in two phases. Phase 1 of development includes the roadway and lots up to and along Wilder Lake along with all stormwater management features, and Phase 2 is the completion of the looped roadway and the remainder of the lots.

2. EXISTING CONDITIONS AND DRAINAGE

Under existing conditions, the majority of the golf course is maintained grass, with some small treed areas and some forest land near Wilder Lake and Camp Creek Tributary. Impervious areas include gravel road ways, golf cart paths, rental cottages and shed roofs.

Under existing conditions, drainage is generally overland flow to one of four (4) outlets:

1. Wilder Lake
2. Camp Creek Tributary
3. South Off-site Overland Flow
4. Infiltration in low areas

Due to the undulating topography, areas with no visible outlet were identified and infiltration is believed to occur as the primary outlet. A portion of the property also drains off-site to the treed area to the south of the property.

Local soils are known to be quite pervious. A recently conducted Geotechnical Investigation prepared by CMT Engineering Inc. provided calculations of the infiltration rate. Six (6) boreholes were drilled across the subject property, a sample was taken from each at around 1.5 to 2 m below the surface, and grain size distributions were completed for each sample. Other than topsoil encountered in the top 0.3 m of the boreholes, the remaining approximately 6.0 m of the boreholes typically consisted of gravel and sand. The average hydraulic conductivity of the samples was estimated to be 3.62×10^{-3} cm/s. This is approximately equivalent to 2.2 L/min/m^2. The Geotechnical Investigation (Dec. 2018) prepared by CMT Engineering Inc. is included as Appendix G.

2.1 Stormwater Management Criteria

Based on the existing drainage conditions and the requirements of the Saugeen Valley Conservation Authority, the Stormwater Management (SWM) criteria used to develop the appropriate SWM approach for the proposed development are as follows:

1. Total post-development peak flow rates discharging from the subject property to each of the drainage outlets as well as the property as a whole, are to be attenuated to less than, or equal to, the total existing conditions peak flow rates.

2. Existing drainage outlets from the property should be used as much as possible

3. An "Enhanced" level of water quality treatment (80% TSS Removal) is to be provided for runoff draining from the subject property prior to discharging from the site.

3. POST-DEVELOPMENT CONDITIONS AND DRAINAGE

The post-development drainage conditions of the subdivision are generally maintained from existing conditions with runoff to each of the four (4) outlets. The majority of the developed portion of the subdivision ultimately drains to one of three SWM ponds within the subdivision. Each of the SWM ponds encourages infiltration prior to draining to the surface outlets, Wilder Lake or Camp Creek Tributary.

The subdivision development includes approximately 1.4 km of two-lane paved road way, and 29 lots. To be conservative when establishing the impervious area post-development, each lot is assumed to have approximately 300 m^2 of rooftop area and 550 m^2 of driveway and sheds for modelling purposes. The remainder of the property including the back portion of the majority of the lots are proposed to drain uncontrolled to their pre-development outlets.

Three (3) Stormwater Management Ponds are proposed to provide stormwater runoff attenuation of peak flows and quality treatment of runoff draining to it. Two of the SWM Ponds ultimately discharge to Wilder Lake and one discharges to Camp Creek Tributary.

The proposed SWM facilities in Block 30 and Block 31 are designed as infiltration basins with overflow outlets to Wilder Lake. The proposed top of grate elevation (low side) of the outlet ditch inlet catchbasins (DICB) are designed to achieve the required infiltration volume for storm event water quality treatment purposes as well as to infiltrate the majority of the 2 year return frequency storm. The outlets are proposed to be 150 mm Ø and 300 mm Ø respectively, outletting from the DICB with an orifice plate. The outlet diameter of the orifice plate are 100 mm Ø and 125 mm Ø respectively.

The proposed SWM facility in Block 32 utilizes an existing wet ponding area for quantity control, with quality treatment provided upstream of the wet pond. The proposed top of grate elevation of the outlet DICB is designed to allow existing water levels and flooding areas to be maintained as well as meet the required storm water quantity control. The outlet elevation was determined in consultation with the Environmental Consultant preparing the Environmental Impact Study (EIS). Stormwater quality treatment is proposed to be provided by Enhanced Grassed Swales along both sides of the roadway for the entire catchment area upstream of the wet pond. The outlet from the wet pond is proposed to be a 250 mm Ø HDPE pipe and to outlet to an existing watercourse.

Post-development drainage conditions of the undeveloped portions of the subject property are expected to remain unchanged from existing drainage conditions.

3.1 Phased Construction

The subdivision is proposed to be constructed in two phases. Phase 1 of construction includes the roadway along lots 1 to 13 and 26 to 29 and from Southgate Road 26 in to the site. All Stormwater Management Ponds are to be constructed as part of Phase 1. Therefore both quality and quantity treatment will be fully provided at the conclusion of Phase 1 development.

4. QUANTITY CONTROL CRITERIA, PARAMETERS AND MODELLING

4.1 Design Rainfall Events

Rainfall data collected by Environment Canada for the years 1962-2016, 54 years total, was used to prepare Intensity-Duration-Frequency (IDF) statistical data for Mount Forest and the surrounding area. The IDF data was used to determine the total rainfall depth for various storm events. The rainfall intensity was calculated using MIDUSS and the SCS 6 hour Type II curve, as requested by the Saugeen Valley Conservation Authority (SVCA). The maximum rainfall intensity was identified by MIDUSS and is recorded below.

Table 1: Design Rainfall Events – Mount Forest IDF 6-hour SCS Type-II Parameters

COEFFICIENT	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Duration (min)	360	360	360	360	360	360
Total Depth (mm)	38.8	49.4	56.4	65.3	71.9	78.4
Max. Intensity (mm/hr)	61.9	78.9	90.0	104.3	114.8	125.2

The Hurricane Hazel Regional Storm is the Regional design storm event for lands within the jurisdiction of the Saugeen Valley Conservation Authority. As per Ontario Regulation 169/06, the rainfall depths for the Hurricane Hazel Regional Storm are summarized in Table 2 below.

Table 2: Regional Design Storm Event – Hurricane Hazel Regional Storm

Hour	First 36 hours		37	38	39	40	41
Rainfall Depth (mm)	73		6	4	6	13	17
Hour	**42**	**43**	**44**	**45**	**46**	**47**	**48**
Rainfall Depth (mm)	13	23	13	13	53	38	13

4.2 Site Soil Conditions

The soil type within the developed subject property is generally characterized as Pike Lake Loam, as per the Grey County Soils Map (Ontario Soil Survey Report No. 17) published by the Department of Agriculture. Pike Lake Loam is known to be of the Hydrological Soil Group 'B'.

With consideration of the developed portion of the site's existing and post-development pervious ground cover, which could be defined as "Crop and Other Improved Lands", a Group B soil is represented with an SCS Curve Number of 74, as per the MTO Drainage Manual's Design Chart 1.09.

The impervious areas within the subject property are associated with an SCS Curve Number of 98.

A recently conducted Geotechnical Investigation prepared by CMT Engineering Inc. determined that the soil between 0.25 m and 7.0 m below the ground surface consisted mainly of sand and gravel with an average hydraulic conductivity of 3.62 x 10^{-3} cm/s. The Geotechnical Investigation (Dec 2018) prepared by CMT Engineering Inc. is included as Appendix G To be conservative when calculating the expected drawdown time of the infiltration ponds, a hydraulic conductivity of 1.0 x 10^{-3} cm/s will be used.

4.3 Existing Catchment Areas

For existing analysis purposes, the subdivision area is modelled as eight (8) drainage catchments, described in Table 2 below and as shown on Figure 2 – Existing Drainage Conditions. The existing conditions MIDUSS computer modelling is attached as Appendix A.

Table 2: Existing Conditions Catchments

Catchment	Outlet	Description	Area (ha)	Impervious Level (%)
10	Outlet 1 – Wilder Lake	Overland Flow – grass and trees, includes rental cottages	5.26	3
20	Outlet 2 – Camp Creek Tributary	Overland Flow – grass and trees, includes roadway	5.50	6
30	Outlet 3 – Infiltration On-Site	Infiltration Area – East Section	3.06	0
40	Outlet 4 – South Off-Site	Overland Flow Off-Site, South East Section – grassed, some trees	1.07	0
41	Outlet 4 – South Off-Site	Overland Flow Off-Site – South West Section – grassed area	3.18	0
42	Outlet 4 – South Off-Site	Overland Flow Off-Site – West Section – grassed, some trees	0.69	0
50	Outlet 3 – Infiltration On-Site	West Section – grassed area, includes Clubhouse and parking lot	2.01	7
60	Outlet 2/3 – Infiltration On-Site / Spill to Camp Creek Tributary	Overland Flow to Wet Pond on Golf Course	0.55	0

The results of the existing conditions routing analysis are summarized in Section 4.5.

4.4 Post-Development Catchment Areas

For post-development analysis purposes, the subdivision area is modelled as nine (9) drainage catchments described in Table 3 below and as shown on Figure 3 – Post-Development Drainage Conditions. The post-development conditions MIDUSS computer modelling is attached as Appendix B.

Table 3: Post-Development Conditions Catchments

Catchment	Outlet	Description	Area (ha)	Impervious Level (%)
100	Outlet 1 – Wilder Lake	Overland flow directly to Wilder Lake	4.25	10
101	Outlet 1 – Wilder Lake	South developed portion of the subdivision, directed to Block 30 SWM Facility	4.89	30
102	Outlet 1 – Wilder Lake	Northeast developed portion of the subdivision, directed to Block 31 SWM Facility	0.90	30
200	Outlet 2 – Camp Creek Tributary	Uncontrolled overland flow to Camp Creek Tributary, including one lot	4.21	11
201	Outlet 2 – Camp Creek Tributary	Northwest developed portion of the subdivision, directed to SWM Facility 600	2.15	20
400	Outlet 4 – South Off-Site	Uncontrolled overland flow off-site – Southeast portion	0.99	8
401	Outlet 4 – South Off-Site	Uncontrolled overland flow off-site – Southwest portion	1.69	8
500	Outlet 2 – Camp Creek Tributary	West developed portion of the subdivision, directed to SWM Facility 600	1.69	25
600	Outlet 2/3 – Camp Creek Tributary /Infiltrate on site	Overland flow to SWM Facility 600.	0.55	0

The results of the post-development conditions routing analysis are summarized in Section 4.5.

4.5 MIDUSS Quantity Control Modelling Results

MIDUSS modelling software was used to model the expected existing conditions and post-development conditions stormwater runoff from the subject property under the various design storms. Results from the models are summarized in the following Tables, and the modelling is provided for reference in Appendix A and B. The stage-storage-discharge calculations for the SWM facilities under existing and proposed conditions are included as Appendix C.

Table 4 below provides the total peak flow rates discharging from the subject property under existing and post-development conditions from the modelled catchments.

Table 4: Summary of Peak Runoff Flow Results

Catchments		Return Storm Frequency (yr)						
		2	5	10	25	50	100	Regional
Total to Wilder Lake (m^3/s)	Existing Condition	0.068	0.139	0.196	0.278	0.349	0.429	0.737
	Post-development	**0.065**	**0.125**	**0.178**	**0.260**	**0.339**	**0.411**	**1.380**
Total to Camp Creek Tributary (m^3/s)	Existing Condition	0.081	0.163	0.220	0.321	0.402	0.487	0.754
	Post-development	**0.081**	**0.152**	**0.197**	**0.275**	**0.339**	**0.405**	**1.148**
Total Infiltrating on-site (m^3/s)	Existing Condition	0.078	0.154	0.212	0.312	0.395	0.482	0.774
	Post-development	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
Total Off-site to South (m^3/s)	Existing Condition	0.047	0.097	0.144	0.204	0.261	0.325	0.677
	Post-development	**0.035**	**0.069**	**0.097**	**0.136**	**0.170**	**0.209**	**0.372**
Total From Site (m^3/s)	Existing Condition	0.274	0.553	0.772	1.115	1.407	1.723	2.942
	Post-development	**0.181**	**0.346**	**0.472**	**0.671**	**0.848**	**1.025**	**2.900**

Under existing conditions, a large portion of the site fully infiltrates in low-lying areas on the golf course. Under post-development conditions, no undrained low-lying areas will exist on site, so all runoff is directed to either the Wilder Lake outlet or the Camp Creek Tributary outlet, while maintaining pre-development peak flow rates. However, the proposed SWM Ponds are designed to provide infiltration for all or most of the 2 year design storm events.

As shown in Table 4 above, under post-development conditions, the peak flow rates to be directed each of the four outlets as well as the total from the site, are expected to be less than, or equal to, existing conditions for all design storm events up to, and including, the 100 year return period.

Table 5 below summarizes the capacity available at the various stages in the Block 31 SWM Facility and provides a comparison to the capacity that is expected to be used during the various design storm events.

Table 5: Conceptual Stage-Storage-Discharge Capacities for Block 31 SWM Facility (Catchment 101)

	Available Capacity in SWM Facility Design				Capacity Used During Various Design Storm Events			
	Peak Flow (m^3/s)	Available Storage Volume		Storage Elevation (m)	Peak Flow (m^3/s)	Infiltration Storage Volume (m^3)	Active Storage Volume (m^3)	Storage Elevation (m)
		Infiltration (m^3)	Active (m^3)					
Inv. 125 mm Ø Orifice	0.00	0	0	423.25	---	---		---
Bottom of Pond	0.00	0	0	423.00	---	---		---
T/G Outlet DICB	0.00	625	0	424.50	---	---		---
2 year Design Storm	---	---	---	---	0.008	625	49	424.56
5 year Design Storm	---	---	---	---	0.028	625	171	424.69
10 year Design Storm	---	---	---	---	0.036	625	290	424.81
25 year Design Storm	---	---	---	---	0.040	625	517	425.03
50 year Design Storm	---	---	---	---	0.042	625	707	425.20
100 year Design Storm	---	---	---	---	0.044	625	906	425.35
Overflow Weir	0.048	625	1106	425.50	---	---	---	---
Regional Storm	---	---	---	---	0.686	625	1333	425.65
Top of Bank	1.117	625	1483	425.75	---	---	---	---

As shown in Table 5 above, the first 625 m^3 of runoff will drain via infiltration. During all design storm events up to, and including, the 100 year return period, runoff draining to the proposed SWM facility is expected to discharge from the proposed SWM facility solely via infiltration or the 125 mm Ø orifice with a 300 mm Ø outlet pipe from the outlet DICB. For design storm events greater than the 100 year return period, runoff draining to the SWM facility is expected to discharge via a combination of infiltration, the 125 mm Ø orifice and the overflow weir, with all runoff that is not infiltrated draining via the treed area to Wilder Lake.

The storage volume for infiltration of the Block 31 SWM Pond is 625 m^3. As noted earlier, the conservative hydraulic conductivity of the on-site soil is $1x10^{-3}$ cm/s. As such, the 625 m^3 stormwater volume would be expected to infiltrate in 21.4 hours when the active pond area (at the top of grate – low side of the DICB) of 812 m^2 is considered to allow for infiltration.

Given the density of the sand and gravel material in the area of the Block 31 SWM Pond, compaction is not considered to be a concern for the facility to infiltrate the minor storm events.

Table 6 below summarizes the capacity available at the various stages in the Block 30 SWM Facility and provides a comparison to the capacity that is expected to be used during the various design storm events.

Table 6: Conceptual Stage-Storage-Discharge Capacities for Block 30 SWM Facility (Catchment 102)

	Available Capacity in SWM Facility Design				Capacity Used During Various Design Storm Events			
	Peak Flow (m^3/s)	Available Storage Volume		Storage Elevation (m)	Peak Flow (m^3/s)	Infiltration Storage Volume (m^3)	Active Storage Volume (m^3)	Storage Elevation (m)
		Infiltration (m^3)	Active (m^3)					
Inv. 250 mm Ø Outlet Pipe	0.00	0	0	423.95	---	---	---	---
Bottom of Pond	0.00	0	0	423.35	---	---	---	---
2 year Design Storm	---	---	---	---	0.000	134	0	424.21
T/G Outlet DICB	0.00	146	0	424.25	---	---	---	---
5 year Design Storm	---	---	---	---	0.004	146	15	424.30
10 year Design Storm	---	---	---	---	0.008	146	27	424.34
25 year Design Storm	---	---	---	---	0.013	146	49	424.40
50 year Design Storm	---	---	---	---	0.014	146	74	424.47
100 year Design Storm	---	---	---	---	0.015	146	101	424.55
Overflow Weir	0.017	146	312	424.70	---	---	---	--
Regional Storm	---	---	---	---	0.124	146	182	424.73
Top of Bank	0.514	146	384	424.85	---	---	---	---

As shown in Table 6 above, during a 2 year design storm event, all runoff from the SWM Facility will drain via infiltration. During design storm events greater than a 2 year design storm, up to, and including, the 100 year return period, runoff draining to the proposed SWM facility is expected to discharge from the proposed SWM facility solely via infiltration and the 100 mm Ø orifice with a 250 mm Ø outlet pipe from the outlet DICB. For design storm events greater than the 100 year return period, runoff draining to the SWM facility is expected to discharge via a combination of infiltration, the 100 mm Ø orifice and the overflow weir, with all runoff that is not infiltrated draining via the low-lying wet area to Wilder Lake.

The storage volume for infiltration of the Block 30 SWM Pond is 146 m^3. As noted earlier, the conservative hydraulic conductivity of the on-site soil is $1x10^{-3}$ cm/s. As such, the 146 m^3 stormwater volume would be expected to infiltrate in 13.9 hours when the active pond area (at the top of grate – low side of the DICB) of 292 m^2 is considered to allow for infiltration.

Given the density of the sand and gravel material in the area of the Block 31 SWM Pond, compaction is not considered to be a concern for the facility to infiltrate the minor storm events.

Table 7 below summarizes the capacity available at the various stages in SWM Facility 600 and provides a comparison to the capacity that is expected to be used during the various design storm events. SWM Facility 600 is an existing pond on site and the inlets and outlets are designed to allow it to act as a wet pond for quantity control only. Pond configuration and side slopes are to remain as existing.

Table 7: Conceptual Stage-Storage-Discharge Capacities for Block 32 SWM Facility (Catchment 600)

	Available Capacity in SWM Facility Design				Capacity Used During Various Design Storm Events			
	Peak Flow (m^3/s)	Available Storage Volume		Storage Elevation (m)	Peak Flow (m^3/s)	Permanent Pool Volume (m^3)	Active Storage Volume (m^3)	Storage Elevation (m)
		Permanent Pool (m^3)	Active Storage (m^3)					
Bottom of Pond	0.000	0	0	422.71	---	---	---	---
Inv. 200 mm Ø Outlet Pipe	0.000	703	0	423.30	---	---	---	---
2 year Design Storm	---	---	---	---	0.023	703	307	423.48
5 year Design Storm	---	---	---	---	0.033	703	465	423.56
10 year Design Storm	---	---	---	---	0.039	703	586	423.62
25 year Design Storm	---	---	---	---	0.046	703	759	423.71
50 year Design Storm	---	---	---	---	0.051	703	898	423.77
100 year Design Storm	---	---	---	---	0.055	703	1043	423.84
Overflow Weir	0.059	703	1170	423.90	---	---	---	---
Regional Storm	---	---	---	---	0.584	703	1518	424.05
Top of Bank	0.832	703	1636	424.10	---	---	---	---

As shown in Table 7 above, during all design storm events up to, and including, the 100 year return period, runoff draining to the proposed SWM facility is expected to discharge from the proposed SWM facility solely via the 200 mm Ø outlet pipe from the outlet DICB, with all runoff draining via the existing pond to Camp Creek Tributary.

4.6 Major Flow Routes

Overland flow during a major storm such as a 100 year or design storm event can be conveyed via the ditches to the SWM facilities. The driveway culverts are designed to convey the 10 year storm. The driveways are designed to have low points above the culverts to allow storms up to the 100 year design storm event to be conveyed over the driveways and in the ditches without ponding on private property. The storm sewers have been designed to convey the 100 year storm event. A summary of the conveyance calculations and the storm sewer design sheet is included as Appendix F.

The road profiles have been designed to ensure that during a major storm event, stormwater will spill toward the appropriate outlet.

5. STORMWATER QUALITY TREATMENT

Stormwater quality treatment is proposed to be provided in a variety of ways, including Enhanced Grassed Swales, infiltration facilities, or directing runoff over grassed surfaces.

It is also worth noting that this a rural subdivision with low imperviousness. The highest imperviousness in any catchment is 30%, and much of that is rooftop area, which yields clean runoff.

Runoff from the developed portions of the subdivision are directed to grass surfaces where possible to allow sediment to settle out as runoff is conveyed overland to the proposed grassed ditches and ultimately to the SWM ponds.

Stormwater quality treatment for runoff from Catchments 101 and 102 is provided by the proposed SWM facilities generally designed as infiltration basins. The Ministry of Environment and Parks (MOEP) guidelines recommend that, for infiltration ponds to provide 80% TSS removal, the infiltration pond should provide 24 m^3/ha of storage for catchments with 30% imperviousness. The required infiltration storage volumes to provide 80% TSS removal for ponds 101 and 102, as well as provided storage volumes, are listed in Table 8.

Table 8: Summary Table of Infiltration Pond Water Quality Design

Catchment	Area (ha)	Imp. Level	Required Storage Volume Ratio	Required Storage Volume	Provided Storage Volume
101	4.89	30%	24 m^3/ha	117 m^3	625 m^3
102	0.90	30%	24 m^3/ha	22 m^3	146 m^3

Overall, given the stormwater quality treatment provided by directing runoff along the grassed surfaces where possible, and the further polishing provided by the infiltration ponds' infiltration volume, it is expected that the proposed SWM system will provide an Enhanced water quality treatment level (80% TSS removal) prior to discharging from the SWM facilities to Wilder Lake.

Enhanced Grass Swales (EGS) are proposed to provide stormwater quality treatment in catchments 201 and 500, for storm water draining to the Block 32 SWM Pond. They are designed as per the Low Impact Development Stormwater Management Planning and Design Guide (LIDSWMP Design Guide) published by the Credit Valley Conservation Authority (CVCA) and the Toronto and Regional Conservation Authority (TRCA). Table 15 below compares the flow characteristics through the Enhanced Grass Swales during a 4 hour, 25 mm Chicago storm event in comparison with the requirements set by the LIDSWMP Design Guide; MIDUSS modelling for the results are attached as Appendix D.

Table 9: Summary Table of Enhanced Grassed Swales Water Quality Design

Characteristics		During a 4 hour, 25mm Chicago Storm Event			
Sub-Catchment	Bottom Width	Maximum Designed Flow Velocity	Required Maximum Flow Velocity	Maximum Designed Flow Depth	Required Maximum Flow Depth
201 – North Side	0.75 m	0.437 m/s	0.50 m/s	0.075 m	0.10 m
201 – South Side	0.75 m	0.453 m/s	0.50 m/s	0.080 m	0.10 m
500 – West Side	1.25 m	0.484 m/s	0.50 m/s	0.028 m	0.10 m
500 – East Side	1.50 m	0.482 m/s	0.50 m/s	0.028 m	0.10 m
Parking Lot	0.75 m	0.409 m/s	0.50 m/s	0.067 m	0.10 m

As shown in Table 9, the maximum design depth of flow through the EGS facilities during a 4 hour, 25 mm Chicago storm event is less than the maximum permitted depth. In addition, the design flow velocities through the SWM facilities would be less than the maximum permitted velocity.

According to the CVCA and TRCA's LIDSWMP Design Guide, an Enhanced Grass Swale provides a median TSS removal rate of 76%.

From the analysis of five soil samples taken from the near-surface as part of the geotechnical investigation completed by CMT Engineering Inc, the infiltration rate was determined to be in the range of 40 mm/h to 75 mm/hr. the CVCA and TRCA's LIDSWMP Design Gide assumes an infiltration rate around 15 mm/hr. Therefore, it is expected that the higher infiltration rate in the EGS will provide above the median TSS removal rate.

The flow from the EGS is conveyed to the wet pond by catchbasins and storm sewers. The 600 mm sump in the catchbasins will provide some additional TSS removal.

Overall, given the low imperviousness of the development, higher infiltration rate of the native soils and the proposed EGS design, it is expected that the proposed SWM system will provide an Enhanced water quality treatment level (80% TSS Removal) to runoff draining from the proposed development, prior to discharging to the wet pond.

Catchments 100, 200, 400, 401 and 600 are areas consisting of grassed or rooftop areas, which are generally considered clean runoff. As such, stormwater quality treatment does not need to be provided for these catchments.

6. OPERATIONS AND MAINTENANCE PLAN

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed by the owner on an annual basis. A checklist of the items noted below is provided as Appendix E for use during inspections and to keep record of the maintenance that has been completed.

1. Is there any noticeable damage to the facility structures (i.e. catchbasins, overflow weirs)? If yes, complete the necessary repairs and/or installation of replacement structures.
2. Inspect on-site catchbasins. Remove and dispose of accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.) as needed.
3. Is there any indication of a spill (i.e. Frothy water, oily sheen on sump water)? If yes, investigate, inform the appropriate agencies, and complete the necessary clean-up, restoration and disposal.
4. Inspect the water level in the SWM pond. Has the pond completely drained within 48 hours after a storm? If not, inspect the downstream structures and remove and dispose of any accumulated sediment, trash/litter and debris.

Please note that any components of the structures identified during the annual inspection to be missing or damaged should be repaired or replaced in a timely manner.

7. SUMMARY

H. Bye Construction Limited proposes to construct a new 20.8 ha residential subdivision at their property located at 263512 Southgate Road 26 in the Township of Southgate.

Upon completion of the proposed development;

1. An approximately 20.8 ha portion of the Wilder Lake Resort and Golf Course will be developed into a subdivision with 29 lots. The subdivision will have two infiltration ponds and one wet pond with five enhanced grass swales to provide stormwater management in the form of quality and quantity controls.

2. Full stormwater quantity and quality treatment will be provided at the completion of Phase 1 of the development.

3. Total post-development peak flow rates discharging from the subject property to each of the drainage outlets, as well as the property as a whole, are expected to be attenuated to less than, or equal to, the total existing conditions peak flow rates.

4. An "Enhanced" level of water quality treatment (80% TSS Removal) is expected to be provided for runoff draining from the developed portion of the subdivision via the SWM facilities prior to discharging from the site.

All of which is respectfully submitted,

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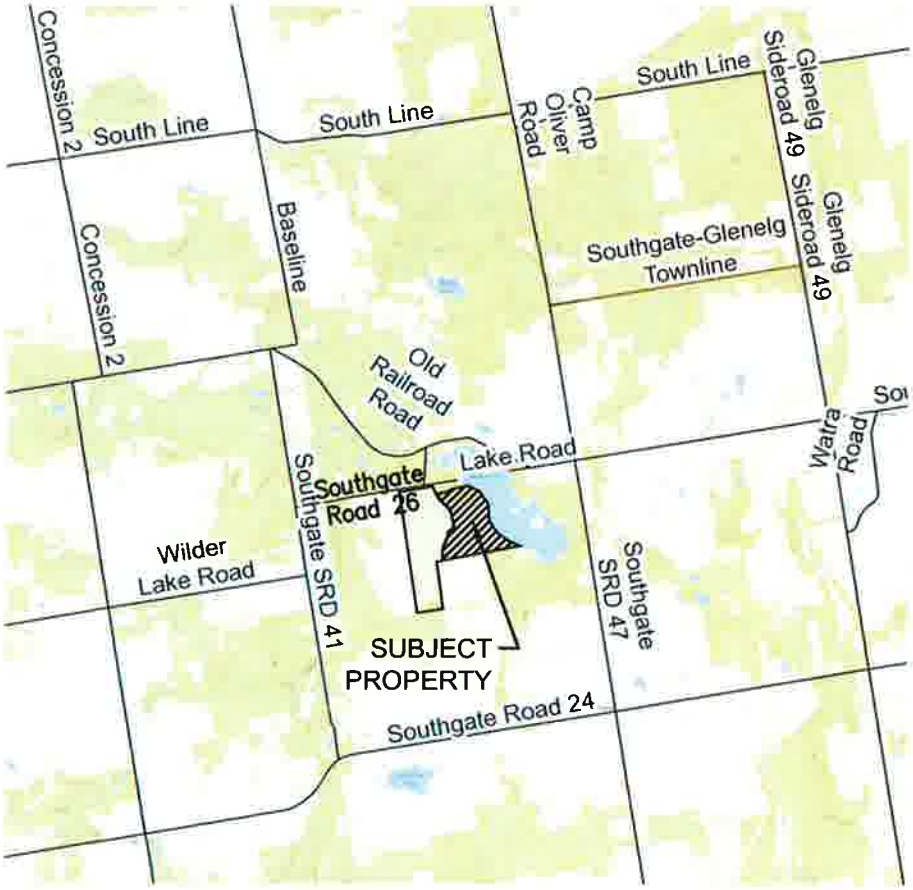
FIGURES:

218173
Wilder Lake Subdivision
263512 Southgate Road 26
Township of Southgate



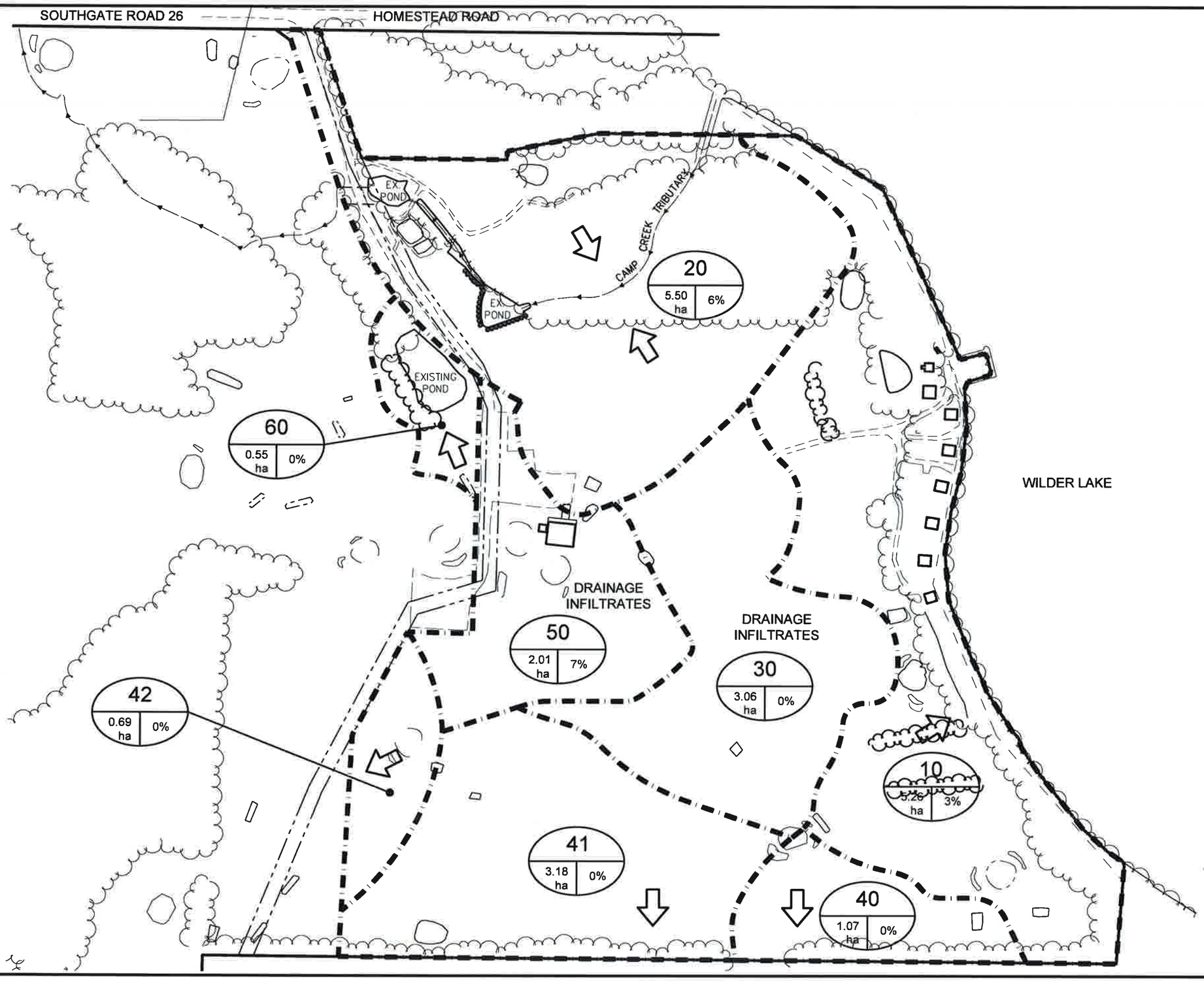
NOT TO SCALE
NOVEMBER 2019

SITE LOCATION PLAN

WILDER LAKE SUBDIVISION
H. BYE CONSTRUCTION LIMITED

Figure No. 1

BluePlan ENGINEERING



218173
Wilder Lake Subdivision
263512 Southgate Road 26
Township of Southgate

N

LEGEND

DRAINAGE BOUNDARY

20 — DRAINAGE AREA No.

5.50 ha — DRAINAGE AREA SIZE (Hectares)

5% — IMPERVIOUS PERCENTAGE

MAIN DRAINAGE OUTLET

30 15 0 25 50 100
1:2500 (m)

SCALE = 1:2500
NOVEMBER 2019

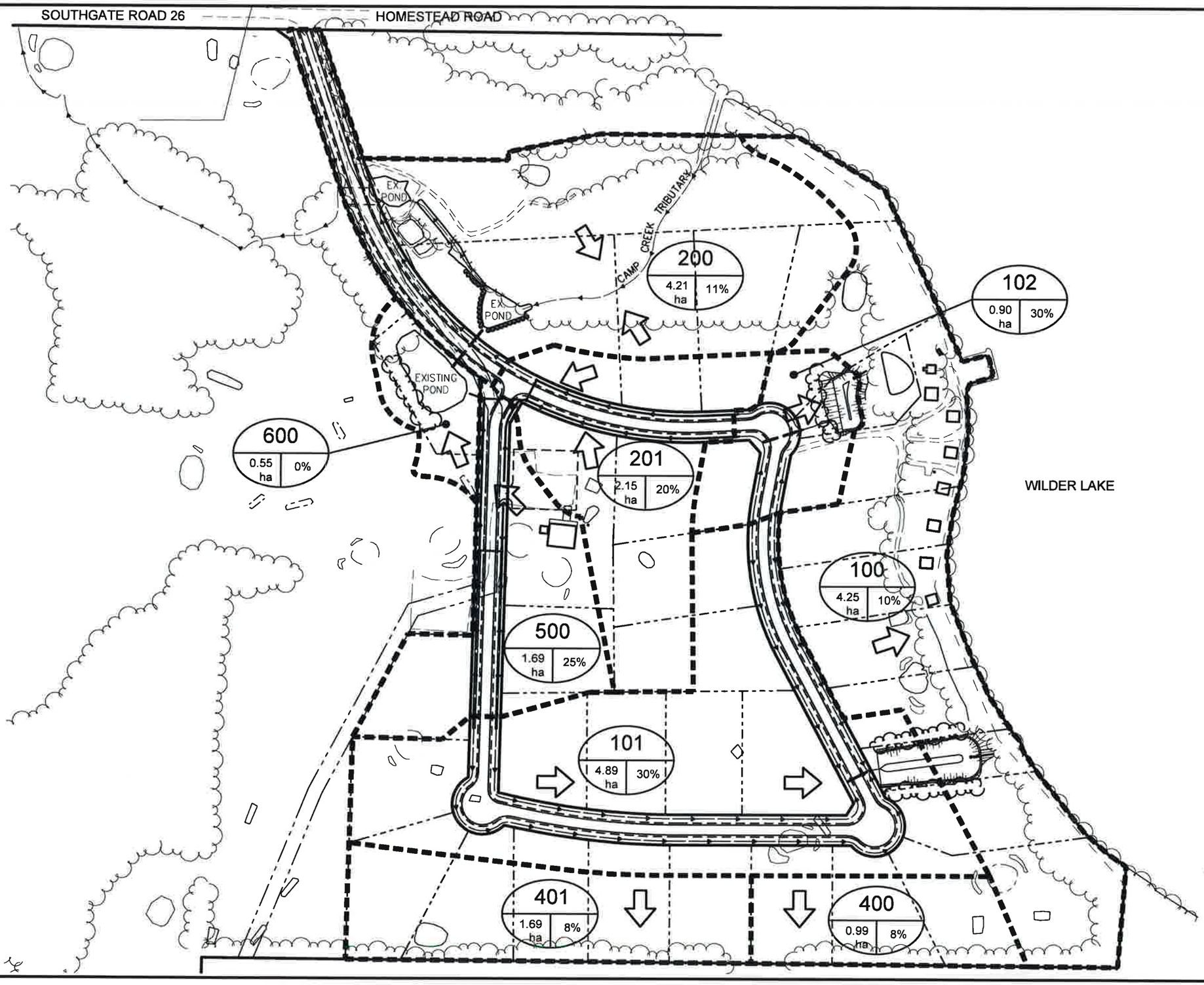
EXISTING CONDITIONS
DRAINAGE AREA PLAN

WILDER LAKE SUBDIVISION
H. BYE CONSTRUCTION
LIMITED

Figure No. 2

BluePlan
ENGINEERING

FILE:C:\Civil 3D Projects\218173 GP-K New Concept.dwg LAYOUT:Ex Drainage Areas (11x17)
LAST SAVED BY:Kboers, 10/28/2019 4:14:48 PM PLOTTED BY:Ken Boers - GM BluePlan 11/14/2019 3:51:20 PM



218173
Wilder Lake Subdivision
263512 Southgate Road 26
Township of Southgate

LEGEND

DRAINAGE BOUNDARY

200 — DRAINAGE AREA No.

4.21 ha — DRAINAGE AREA SIZE (Hectares)

11% — IMPERVIOUS PERCENTAGE

MAIN DRAINAGE OUTLET

30 15 0 25 50 100
1:2500 (m)

SCALE = 1:2500
NOVEMBER 2019

POST CONSTRUCTION
DRAINAGE AREA PLAN

WILDER LAKE SUBDIVISION
H. BYE CONSTRUCTION
LIMITED

Figure No. 3

BluePlan
ENGINEERING

FILE:C:\Civil 3D Projects\218173 GP-K New Concept.dwg LAYOUT:Drainage Areas (11x17)
LAST SAVED BY:Kboers, 10/28/2019 4:14:48 PM PLOTTED BY:Ken Boers - GM BluePlan 11/14/2019 3:51:22 PM

APPENDIX A:
MIDUSS MODELLING – EXISTING CONDITIONS

```
"              MIDUSS Output ----------------------------------------------->"
"              MIDUSS version                          Version 2.25  rev. 473"
"              MIDUSS created                       Sunday, February 07, 2010"
"         10   Units used:                                        ie METRIC"
"              Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                     MIDUSS"
"              Output filename:               218173-PreDev-Oct01-2yr-SCS.out"
"              Licensee name:                                           GMBP"
"              Company                              Hewlett-Packard Company"
"              Date & Time last used:               10/1/2019 at 11:37:43 AM"
" 31         TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32         STORM Mass Curve"
"          3   Mass Curve"
"     38.800   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            61.945    mm/hr"
"            Total depth                  38.800    mm"
"          6   002hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 10"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         10   10- Wilder Lake South"
"      3.000   % Impervious"
"      5.260   Total Area"
"    100.000   Flow length"
"      5.000   Overland Slope"
"      5.102   Pervious Area"
"    100.000   Pervious length"
"      5.000   Pervious slope"
"      0.158   Impervious Area"
"      3.093   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.193   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."
"      0.758   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.068     0.000     0.000     0.000 c.m/sec"
"            Catchment 10          Pervious   Impervious Total Area "
"            Surface Area          5.102      0.158      5.260      hectare"
"            Time of concentration 45.566     0.534      40.688     minutes"
"            Time to Centroid      278.435    195.256    269.424    minutes"
"            Rainfall depth        38.800     38.800     38.800     mm"
"            Rainfall volume       1979.65    61.23      2040.88    c.m"
"            Rainfall losses       31.317     9.405      30.660     mm"
"            Runoff depth          7.483      29.395     8.140      mm"
"            Runoff volume         381.79     46.39      428.17     c.m"
"            Runoff coefficient    0.193      0.758      0.210      "
"            Maximum flow          0.067      0.022      0.068      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.068     0.068     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.068     0.068     0.068     0.000"
" 40         HYDROGRAPH   Combine    1"
"          6   Combine "
"          1   Node #"
"              Wilder Lake Final"
"            Maximum flow                 0.068    c.m/sec"
"            Hydrograph volume          428.173    c.m"
"                 0.068     0.068     0.068     0.068"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                 0.068     0.000     0.068     0.068"
" 33         CATCHMENT 20"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         20   20 - Creek"
"      6.000   % Impervious"
"      5.500   Total Area"
"     75.000   Flow length"
"      5.000   Overland Slope"
"      5.170   Pervious Area"
"     75.000   Pervious length"
"      5.000   Pervious slope"
"      0.330   Impervious Area"
"      4.787   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.192   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."
"      0.765   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.081     0.000     0.068     0.068 c.m/sec"
"            Catchment 20          Pervious   Impervious Total Area "
"            Surface Area          5.170      0.330      5.500      hectare"
"            Time of concentration 38.342     0.694      30.723     minutes"
"            Time to Centroid      269.564    196.135    254.702    minutes"
"            Rainfall depth        38.800     38.800     38.800     mm"
"            Rainfall volume       2005.96    128.04     2134.00    c.m"
"            Rainfall losses       31.332     9.111      29.999     mm"
"            Runoff depth          7.468      29.689     8.801      mm"
"            Runoff volume         386.10     97.97      484.08     c.m"
"            Runoff coefficient    0.192      0.765      0.227      "
"            Maximum flow          0.076      0.046      0.081      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.081     0.081     0.068     0.068"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.081     0.081     0.081     0.068"
" 40         HYDROGRAPH   Combine    2"
"          6   Combine "
"          2   Node #"
"              Total to Creek"
"            Maximum flow                 0.081    c.m/sec"
"            Hydrograph volume          484.078    c.m"
"                 0.081     0.081     0.081     0.081"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.081     0.000     0.081     0.081"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.081     0.000     0.081     0.081"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.193   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     0.081     0.081 c.m/sec"
"             Catchment 30            Pervious   Impervious Total Area "
"             Surface Area            3.060      0.000      3.060      hectare"
"             Time of concentration   48.721     0.001      48.721     minutes"
"             Time to Centroid        282.315    194.149    282.315    minutes"
"             Rainfall depth          38.800     38.800     38.800     mm"
"             Rainfall volume         1187.28    0.00       1187.28    c.m"
"             Rainfall losses         31.310     8.461      31.310     mm"
"             Runoff depth            7.490      30.339     7.490      mm"
"             Runoff volume           229.19     0.00       229.19     c.m"
"             Runoff coefficient      0.193      0.000      0.193      "
"             Maximum flow            0.039      0.000      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.039     0.039     0.081     0.081"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.039     0.039     0.039     0.081"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Total to Infiltration"
"             Maximum flow                  0.039    c.m/sec"
"             Hydrograph volume           229.189    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 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



```
"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.193   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     0.000     0.039     0.039 c.m/sec"
"             Catchment 40            Pervious   Impervious Total Area "
"             Surface Area            1.070      0.000      1.070      hectare"
"             Time of concentration   44.148     0.001      44.148     minutes"
"             Time to Centroid        276.688    194.149    276.687    minutes"
"             Rainfall depth          38.800     38.800     38.800     mm"
"             Rainfall volume         415.16     0.00       415.16     c.m"
"             Rainfall losses         31.324     8.461      31.324     mm"
"             Runoff depth            7.476      30.339     7.476      mm"
"             Runoff volume           79.99      0.00       79.99      c.m"
"             Runoff coefficient      0.193      0.000      0.193      "
"             Maximum flow            0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.014     0.014     0.039     0.039"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.014     0.014     0.014     0.039"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                Total to Off-Site"
"             Maximum flow                  0.014    c.m/sec"
"             Hydrograph volume            79.994    c.m"
"                  0.014     0.014     0.014     0.014"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.014     0.000     0.014     0.014"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.193   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"
                0.030     0.000     0.014     0.014 c.m/sec"
         Catchment 41            Pervious   Impervious Total Area "
         Surface Area            3.180      0.000      3.180      hectare"
         Time of concentration   70.472     0.002      70.472     minutes"
         Time to Centroid        308.949    194.149    308.949    minutes"
         Rainfall depth          38.800     38.800     38.800     mm"
         Rainfall volume         1233.84    0.00       1233.84    c.m"
         Rainfall losses         31.312     8.464      31.312     mm"
         Runoff depth            7.488      30.336     7.488      mm"
         Runoff volume           238.13     0.00       238.13     c.m"
         Runoff coefficient      0.193      0.000      0.193      "
         Maximum flow            0.030      0.000      0.030      c.m/sec"
" 40     HYDROGRAPH Add Runoff "
       4   Add Runoff "
                0.030     0.030     0.014     0.014"
" 40     HYDROGRAPH Copy to Outflow"
       8   Copy to Outflow"
                0.030     0.030     0.030     0.014"
" 40     HYDROGRAPH   Combine    4"
       6   Combine "
       4   Node #"
           Total to Off-Site"
         Maximum flow                0.042     c.m/sec"
         Hydrograph volume         318.126     c.m"
                0.030     0.030     0.030     0.042"
" 40     HYDROGRAPH Start - New Tributary"
       2   Start - New Tributary"
                0.030     0.000     0.030     0.042"
" 33     CATCHMENT 42"
       1   Triangular SCS"
       2   Proportional to %"
       1   SCS method"
      42   42 - West Flow Off Site"
      0.000   % Impervious"
      0.690   Total Area"
     20.000   Flow length"
      4.000   Overland Slope"
      0.690   Pervious Area"
     20.000   Pervious length"
      4.000   Pervious slope"
      0.000   Impervious Area"
      0.000   Impervious length"
      4.000   Impervious slope"
      0.250   Pervious Manning 'n'"
     74.000   Pervious SCS Curve No."
      0.192   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     0.030     0.042 c.m/sec"
         Catchment 42            Pervious   Impervious Total Area "
         Surface Area            0.690      0.000      0.690      hectare"
         Time of concentration   18.550     0.000      18.550     minutes"
         Time to Centroid        245.304    194.150    245.304    minutes"
         Rainfall depth          38.800     38.800     38.800     mm"
         Rainfall volume         267.72     0.00       267.72     c.m"
         Rainfall losses         31.347     8.458      31.347     mm"
         Runoff depth            7.453      30.342     7.453      mm"
         Runoff volume           51.43      0.00       51.43      c.m"
         Runoff coefficient      0.192      0.000      0.192      "
         Maximum flow            0.015      0.000      0.015      c.m/sec"
" 40     HYDROGRAPH Add Runoff "
       4   Add Runoff "
                0.015     0.015     0.030     0.042"
" 40     HYDROGRAPH Copy to Outflow"
       8   Copy to Outflow"
                0.015     0.015     0.015     0.042"
" 40     HYDROGRAPH   Combine    4"
       6   Combine "
       4   Node #"
           Total to Off-Site"
         Maximum flow                0.047     c.m/sec"
         Hydrograph volume         369.554     c.m"
                0.015     0.015     0.015     0.047"
" 40     HYDROGRAPH Start - New Tributary"
       2   Start - New Tributary"
                0.015     0.000     0.015     0.047"
" 33     CATCHMENT 50"
       1   Triangular SCS"
       2   Proportional to %"
       1   SCS method"
      50   50 - Flow to Golf Course"
      7.000   % Impervious"
      2.010   Total Area"
     45.000   Flow length"
      3.000   Overland Slope"
      1.869   Pervious Area"
     45.000   Pervious length"
      3.000   Pervious slope"
      0.141   Impervious Area"
      3.387   Impervious length"
      3.000   Impervious slope"
      0.250   Pervious Manning 'n'"
     74.000   Pervious SCS Curve No."
      0.193   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."
      0.764   Impervious Runoff coefficient"
      0.100   Impervious Ia/S coefficient"
      0.518   Impervious Initial abstraction"
                0.034     0.000     0.015     0.047 c.m/sec"
         Catchment 50            Pervious   Impervious Total Area "
         Surface Area            1.869      0.141      2.010      hectare"
         Time of concentration   32.895     0.657      25.482     minutes"
         Time to Centroid        263.000    195.956    247.584    minutes"
         Rainfall depth          38.800     38.800     38.800     mm"
         Rainfall volume         725.29     54.59      779.88     c.m"
         Rainfall losses         31.328     9.160      29.776     mm"
         Runoff depth            7.472      29.640     9.024      mm"
```

```
"          Runoff volume          139.67     41.70      181.38     c.m"
"          Runoff coefficient     0.193      0.764      0.233      "
"          Maximum flow           0.032      0.019      0.034      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
                 0.034     0.034     0.015     0.047"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
                 0.034     0.034     0.034     0.047"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                 0.069    c.m/sec"
"          Hydrograph volume          410.566    c.m"
                 0.034     0.034     0.034     0.069"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
                 0.034     0.000     0.034     0.069"
" 33       CATCHMENT 60"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
       60   60-Infiltration on Golf Course"
     0.000   % Impervious"
     0.550   Total Area"
    45.000   Flow length"
     3.000   Overland Slope"
     0.550   Pervious Area"
    45.000   Pervious length"
     3.000   Pervious slope"
     0.000   Impervious Area"
     0.000   Impervious length"
     3.000   Impervious slope"
     0.250   Pervious Manning 'n'"
    74.000   Pervious SCS Curve No."
     0.193   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     0.034     0.069 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  32.895     0.001      32.895     minutes"
"          Time to Centroid       263.000    194.150    262.999    minutes"
"          Rainfall depth         38.800     38.800     38.800     mm"
"          Rainfall volume        213.40     0.00       213.40     c.m"
"          Rainfall losses        31.328     8.459      31.328     mm"
"          Runoff depth           7.472      30.341     7.472      mm"
"          Runoff volume          41.10      0.00       41.10      c.m"
"          Runoff coefficient     0.193      0.000      0.193      "
"          Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
                 0.009     0.009     0.034     0.069"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
                 0.009     0.009     0.009     0.069"
" 40       HYDROGRAPH   Combine    3"
```



```
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                 0.078    c.m/sec"
"          Hydrograph volume          451.663    c.m"
                 0.009     0.009     0.009     0.078"
" 38       START/RE-START TOTALS 60"
"        3   Runoff Totals on EXIT"
"          Total Catchment area                      21.320    hectare"
"          Total Impervious area                      0.629    hectare"
"          Total % impervious                         2.948"
" 19       EXIT"
```

```
"            MIDUSS Output ----------------------------------------------->"
"            MIDUSS version                          Version 2.25  rev. 473"
"            MIDUSS created                       Sunday, February 07, 2010"
"       10   Units used:                                        ie METRIC"
"            Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                    MIDUSS"
"            Output filename:               218173-PreDev-Oct01-5yr-SCS.out"
"            Licensee name:                                            GMBP"
"            Company                              Hewlett-Packard Company"
"            Date & Time last used:              10/1/2019 at 11:32:39 AM"
" 31       TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32       STORM Mass Curve"
"          3   Mass Curve"
"     49.400   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            78.868    mm/hr"
"            Total depth                  49.400    mm"
"          6   005hyd   Hydrograph extension used in this file"
" 33       CATCHMENT 10"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         10   10- Wilder Lake South"
"      3.000   % Impervious"
"      5.260   Total Area"
"    100.000   Flow length"
"      5.000   Overland Slope"
"      5.102   Pervious Area"
"    100.000   Pervious length"
"      5.000   Pervious slope"
"      0.158   Impervious Area"
"      3.093   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.255   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."
"      0.776   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.139     0.000     0.000     0.000 c.m/sec"
"            Catchment 10            Pervious   Impervious Total Area "
"            Surface Area            5.102      0.158      5.260      hectare"
"            Time of concentration   35.829     0.481      32.791     minutes"
"            Time to Centroid        264.327    193.423    258.232    minutes"
"            Rainfall depth          49.400     49.400     49.400     mm"
"            Rainfall volume         2520.49    77.95      2598.44    c.m"
"            Rainfall losses         36.787     11.048     36.015     mm"
"            Runoff depth            12.613     38.352     13.385     mm"
"            Runoff volume           643.54     60.52      704.06     c.m"
"            Runoff coefficient      0.255      0.776      0.271      "
"            Maximum flow            0.136      0.029      0.139      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
                 0.139     0.139     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
                 0.139     0.139     0.139     0.000"
" 40         HYDROGRAPH   Combine    1"
"          6   Combine "
"          1   Node #"
               Wilder Lake Final"
"            Maximum flow                 0.139    c.m/sec"
"            Hydrograph volume          704.058    c.m"
                 0.139     0.139     0.139     0.139"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
                 0.139     0.000     0.139     0.139"
" 33         CATCHMENT 20"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         20   20 - Creek"
"      6.000   % Impervious"
"      5.500   Total Area"
"     75.000   Flow length"
"      5.000   Overland Slope"
"      5.170   Pervious Area"
"     75.000   Pervious length"
"      5.000   Pervious slope"
"      0.330   Impervious Area"
"      4.787   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.255   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."
"      0.786   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.163     0.000     0.139     0.139 c.m/sec"
"            Catchment 20            Pervious   Impervious Total Area "
"            Surface Area            5.170      0.330      5.500      hectare"
"            Time of concentration   30.149     0.625      25.298     minutes"
"            Time to Centroid        257.210    194.244    246.864    minutes"
"            Rainfall depth          49.400     49.400     49.400     mm"
"            Rainfall volume         2553.98    163.02     2717.00    c.m"
"            Rainfall losses         36.801     10.594     35.229     mm"
"            Runoff depth            12.599     38.806     14.171     mm"
"            Runoff volume           651.36     128.06     779.42     c.m"
"            Runoff coefficient      0.255      0.786      0.287      "
"            Maximum flow            0.156      0.059      0.163      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
                 0.163     0.163     0.139     0.139"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
                 0.163     0.163     0.163     0.139"
" 40         HYDROGRAPH   Combine    2"
"          6   Combine "
"          2   Node #"
               Total to Creek"
"            Maximum flow                 0.163    c.m/sec"
"            Hydrograph volume          779.416    c.m"
                 0.163     0.163     0.163     0.163"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.163     0.000     0.163     0.163"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.163     0.000     0.163     0.163"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.255   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"
"                    0.077     0.000     0.163     0.163 c.m/sec"
"            Catchment 30            Pervious    Impervious Total Area "
"            Surface Area            3.060       0.000      3.060      hectare"
"            Time of concentration   38.310      0.001      38.310     minutes"
"            Time to Centroid        267.503     192.686    267.503    minutes"
"            Rainfall depth          49.400      49.400     49.400     mm"
"            Rainfall volume         1511.64     0.00       1511.64    c.m"
"            Rainfall losses         36.796      9.631      36.796     mm"
"            Runoff depth            12.604      39.769     12.604     mm"
"            Runoff volume           385.68      0.00       385.68     c.m"
"            Runoff coefficient      0.255       0.000      0.255      "
"            Maximum flow            0.077       0.000      0.077      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.077     0.077     0.163     0.163"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.077     0.077     0.077     0.163"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Total to Infiltration"
"            Maximum flow                  0.077     c.m/sec"
"            Hydrograph volume           385.677     c.m"
"                    0.077     0.077     0.077     0.077"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.077     0.000     0.077     0.077"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



```
"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.256   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"
"                    0.029     0.000     0.077     0.077 c.m/sec"
"            Catchment 40            Pervious    Impervious Total Area "
"            Surface Area            1.070       0.000      1.070      hectare"
"            Time of concentration   34.714      0.001      34.714     minutes"
"            Time to Centroid        262.923     192.686    262.923    minutes"
"            Rainfall depth          49.400      49.400     49.400     mm"
"            Rainfall volume         528.58      0.00       528.58     c.m"
"            Rainfall losses         36.778      9.631      36.778     mm"
"            Runoff depth            12.622      39.769     12.622     mm"
"            Runoff volume           135.05      0.00       135.05     c.m"
"            Runoff coefficient      0.256       0.000      0.256      "
"            Maximum flow            0.029       0.000      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.029     0.029     0.077     0.077"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.029     0.029     0.029     0.077"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                Total to Off-Site"
"            Maximum flow                  0.029     c.m/sec"
"            Hydrograph volume           135.054     c.m"
"                    0.029     0.029     0.029     0.029"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.029     0.000     0.029     0.029"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.256   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"
"                     0.061     0.000     0.029     0.029 c.m/sec"
"             Catchment 41            Pervious   Impervious Total Area "
"             Surface Area            3.180      0.000      3.180      hectare"
"             Time of concentration   55.413     0.002      55.413     minutes"
"             Time to Centroid        289.129    192.686    289.129    minutes"
"             Rainfall depth          49.400     49.400     49.400     mm"
"             Rainfall volume         1570.92    0.00       1570.92    c.m"
"             Rainfall losses         36.778     9.634      36.778     mm"
"             Runoff depth            12.622     39.766     12.622     mm"
"             Runoff volume           401.37     0.00       401.37     c.m"
"             Runoff coefficient      0.256      0.000      0.256      "
"             Maximum flow            0.061      0.000      0.061      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.061     0.061     0.029     0.029"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     0.061     0.061     0.061     0.029"
" 40          HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Total to Off-Site"
"             Maximum flow                  0.086    c.m/sec"
"             Hydrograph volume             536.427    c.m"
"                     0.061     0.061     0.061     0.086"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.061     0.000     0.061     0.086"
" 33          CATCHMENT 42"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"          42   42 - West Flow Off Site"
"        0.000   % Impervious"
"        0.690   Total Area"
"       20.000   Flow length"
"        4.000   Overland Slope"
"        0.690   Pervious Area"
"       20.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.254   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"
```



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"        0.518   Impervious Initial abstraction"
"                     0.030     0.000     0.061     0.086 c.m/sec"
"             Catchment 42            Pervious   Impervious Total Area "
"             Surface Area            0.690      0.000      0.690      hectare"
"             Time of concentration   14.586     0.000      14.586     minutes"
"             Time to Centroid        237.748    192.687    237.748    minutes"
"             Rainfall depth          49.400     49.400     49.400     mm"
"             Rainfall volume         340.86     0.00       340.86     c.m"
"             Rainfall losses         36.849     9.627      36.849     mm"
"             Runoff depth            12.551     39.773     12.551     mm"
"             Runoff volume           86.60      0.00       86.60      c.m"
"             Runoff coefficient      0.254      0.000      0.254      "
"             Maximum flow            0.030      0.000      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.030     0.030     0.061     0.086"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     0.030     0.030     0.030     0.086"
" 40          HYDROGRAPH   Combine    4"
"           6   Combine "
"           4   Node #"
"               Total to Off-Site"
"             Maximum flow                  0.097    c.m/sec"
"             Hydrograph volume             623.030    c.m"
"                     0.030     0.030     0.030     0.097"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.030     0.000     0.030     0.097"
" 33          CATCHMENT 50"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"          50   50 - Flow to Golf Course"
"        7.000   % Impervious"
"        2.010   Total Area"
"       45.000   Flow length"
"        3.000   Overland Slope"
"        1.869   Pervious Area"
"       45.000   Pervious length"
"        3.000   Pervious slope"
"        0.141   Impervious Area"
"        3.387   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.254   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."
"        0.784   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.063     0.000     0.030     0.097 c.m/sec"
"             Catchment 50            Pervious   Impervious Total Area "
"             Surface Area            1.869      0.141      2.010      hectare"
"             Time of concentration   25.865     0.592      21.108     minutes"
"             Time to Centroid        251.800    194.072    240.933    minutes"
"             Rainfall depth          49.400     49.400     49.400     mm"
"             Rainfall volume         923.43     69.51      992.94     c.m"
"             Rainfall losses         36.831     10.677     35.000     mm"
"             Runoff depth            12.569     38.723     14.400     mm"
```

```
"          Runoff volume          234.95     54.48      289.43     c.m"
"          Runoff coefficient     0.254      0.784      0.291      "
"          Maximum flow           0.059      0.025      0.063      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
                 0.063     0.063     0.030     0.097"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
                 0.063     0.063     0.063     0.097"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
            Total to Infiltration"
"          Maximum flow                 0.137    c.m/sec"
"          Hydrograph volume          675.108    c.m"
                 0.063     0.063     0.063     0.137"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
                 0.063     0.000     0.063     0.137"
" 33       CATCHMENT 60"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       60   60-Infiltration on Golf Course"
"    0.000   % Impervious"
"    0.550   Total Area"
"   45.000   Flow length"
"    3.000   Overland Slope"
"    0.550   Pervious Area"
"   45.000   Pervious length"
"    3.000   Pervious slope"
"    0.000   Impervious Area"
"    0.000   Impervious length"
"    3.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.254   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"
                 0.017     0.000     0.063     0.137 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  25.865     0.001      25.865     minutes"
"          Time to Centroid       251.800    192.686    251.800    minutes"
"          Rainfall depth         49.400     49.400     49.400     mm"
"          Rainfall volume        271.70     0.00       271.70     c.m"
"          Rainfall losses        36.831     9.629      36.831     mm"
"          Runoff depth           12.569     39.771     12.569     mm"
"          Runoff volume          69.13      0.00       69.13      c.m"
"          Runoff coefficient     0.254      0.000      0.254      "
"          Maximum flow           0.017      0.000      0.017      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
                 0.017     0.017     0.063     0.137"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
                 0.017     0.017     0.017     0.137"
" 40       HYDROGRAPH   Combine    3"
```



```
"        6   Combine "
"        3   Node #"
            Total to Infiltration"
"          Maximum flow                 0.154    c.m/sec"
"          Hydrograph volume          744.237    c.m"
                 0.017     0.017     0.017     0.154"
" 38       START/RE-START TOTALS 60"
"        3   Runoff Totals on EXIT"
"          Total Catchment area                    21.320    hectare"
"          Total Impervious area                    0.629    hectare"
"          Total % impervious                       2.948"
" 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:              C:\Users\jswiger\Desktop\Wilder Lake\"
                                                                       MIDUSS"
"              Output filename:              218173-PreDev-Oct03-10yr-SCS.out"
"              Licensee name:                                            GMBP"
"              Company                                 Hewlett-Packard Company"
"              Date & Time last used:                  10/3/2019 at 2:42:23 PM"
" 31         TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32         STORM Mass Curve"
"          3   Mass Curve"
"     56.400   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            90.044    mm/hr"
"            Total depth                  56.400    mm"
"          6   010hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 10"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         10   10- Wilder Lake South"
"      3.000   % Impervious"
"      5.260   Total Area"
"    100.000   Flow length"
"      5.000   Overland Slope"
"      5.102   Pervious Area"
"    100.000   Pervious length"
"      5.000   Pervious slope"
"      0.158   Impervious Area"
"      3.093   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.292   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."
"      0.785   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 10          Pervious   Impervious Total Area "
"            Surface Area          5.102      0.158      5.260      hectare"
"            Time of concentration 31.838     0.455      29.425     minutes"
"            Time to Centroid      258.268    192.500    253.211    minutes"
"            Rainfall depth        56.400     56.400     56.400     mm"
"            Rainfall volume       2877.64    89.00      2966.64    c.m"
"            Rainfall losses       39.957     12.115     39.122     mm"
"            Runoff depth          16.443     44.285     17.278     mm"
"            Runoff volume         838.95     69.88      908.83     c.m"
"            Runoff coefficient    0.292      0.785      0.306      "
"            Maximum flow          0.192      0.033      0.196      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
                0.196     0.196     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
                0.196     0.196     0.196     0.000"
" 40         HYDROGRAPH   Combine    1"
"          6   Combine "
"          1   Node #"
              Wilder Lake Final"
"            Maximum flow                 0.196    c.m/sec"
"            Hydrograph volume          908.834    c.m"
                0.196     0.196     0.196     0.196"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
                0.196     0.000     0.196     0.196"
" 33         CATCHMENT 20"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         20   20 - Creek"
"      6.000   % Impervious"
"      5.500   Total Area"
"     75.000   Flow length"
"      5.000   Overland Slope"
"      5.170   Pervious Area"
"     75.000   Pervious length"
"      5.000   Pervious slope"
"      0.330   Impervious Area"
"      4.787   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.292   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."
"      0.795   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                0.220     0.000     0.196     0.196 c.m/sec"
"            Catchment 20          Pervious   Impervious Total Area "
"            Surface Area          5.170      0.330      5.500      hectare"
"            Time of concentration 26.791     0.591      22.908     minutes"
"            Time to Centroid      251.765    193.283    243.099    minutes"
"            Rainfall depth        56.400     56.400     56.400     mm"
"            Rainfall volume       2915.88    186.12     3102.00    c.m"
"            Rainfall losses       39.957     11.588     38.255     mm"
"            Runoff depth          16.443     44.812     18.145     mm"
"            Runoff volume         850.10     147.88     997.98     c.m"
"            Runoff coefficient    0.292      0.795      0.322      "
"            Maximum flow          0.210      0.069      0.220      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
                0.220     0.220     0.196     0.196"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
                0.220     0.220     0.220     0.196"
" 40         HYDROGRAPH   Combine    2"
"          6   Combine "
"          2   Node #"
              Total to Creek"
"            Maximum flow                 0.220    c.m/sec"
"            Hydrograph volume          997.979    c.m"
                0.220     0.220     0.220     0.220"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.220     0.000     0.220     0.220"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.220     0.000     0.220     0.220"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   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"
"                    0.111     0.000     0.220     0.220 c.m/sec"
"            Catchment 30            Pervious   Impervious Total Area "
"            Surface Area            3.060      0.000      3.060      hectare"
"            Time of concentration   34.042     0.001      34.042     minutes"
"            Time to Centroid        261.040    191.938    261.040    minutes"
"            Rainfall depth          56.400     56.400     56.400     mm"
"            Rainfall volume         1725.84    0.00       1725.84    c.m"
"            Rainfall losses         39.929     10.383     39.929     mm"
"            Runoff depth            16.471     46.017     16.471     mm"
"            Runoff volume           504.01     0.00       504.01     c.m"
"            Runoff coefficient      0.292      0.000      0.292      "
"            Maximum flow            0.111      0.000      0.111      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.111     0.111     0.220     0.220"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.111     0.111     0.111     0.220"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Total to Infiltration"
"            Maximum flow                  0.111    c.m/sec"
"            Hydrograph volume           504.011    c.m"
"                    0.111     0.111     0.111     0.111"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.111     0.000     0.111     0.111"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



```
"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   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"
"                    0.042     0.000     0.111     0.111 c.m/sec"
"            Catchment 40            Pervious   Impervious Total Area "
"            Surface Area            1.070      0.000      1.070      hectare"
"            Time of concentration   30.848     0.001      30.847     minutes"
"            Time to Centroid        257.034    191.938    257.034    minutes"
"            Rainfall depth          56.400     56.400     56.400     mm"
"            Rainfall volume         603.48     0.00       603.48     c.m"
"            Rainfall losses         39.948     10.382     39.948     mm"
"            Runoff depth            16.452     46.018     16.452     mm"
"            Runoff volume           176.04     0.00       176.04     c.m"
"            Runoff coefficient      0.292      0.000      0.292      "
"            Maximum flow            0.042      0.000      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.042     0.042     0.111     0.111"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.042     0.042     0.042     0.111"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                Total to Off-Site"
"            Maximum flow                  0.042    c.m/sec"
"            Hydrograph volume           176.036    c.m"
"                    0.042     0.042     0.042     0.042"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.042     0.000     0.042     0.042"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   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"
                     0.089     0.000     0.042     0.042 c.m/sec"
            Catchment 41            Pervious   Impervious Total Area "
            Surface Area            3.180      0.000      3.180      hectare"
            Time of concentration   49.241     0.001      49.240     minutes"
            Time to Centroid        280.586    191.938    280.586    minutes"
            Rainfall depth          56.400     56.400     56.400     mm"
            Rainfall volume         1793.52    0.00       1793.52    c.m"
            Rainfall losses         39.925     10.386     39.925     mm"
            Runoff depth            16.475     46.014     16.475     mm"
            Runoff volume           523.90     0.00       523.90     c.m"
            Runoff coefficient      0.292      0.000      0.292      "
            Maximum flow            0.089      0.000      0.089      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.089     0.089     0.042     0.042"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.089     0.089     0.089     0.042"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                 0.127     c.m/sec"
            Hydrograph volume          699.935     c.m"
                     0.089     0.089     0.089     0.127"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                     0.089     0.000     0.089     0.127"
" 33        CATCHMENT 42"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         42   42 - West Flow Off Site"
        0.000   % Impervious"
        0.690   Total Area"
       20.000   Flow length"
        4.000   Overland Slope"
        0.690   Pervious Area"
       20.000   Pervious length"
        4.000   Pervious slope"
        0.000   Impervious Area"
        0.000   Impervious length"
        4.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.289   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     0.089     0.127 c.m/sec"
            Catchment 42            Pervious   Impervious Total Area "
            Surface Area            0.690      0.000      0.690      hectare"
            Time of concentration   12.961     0.000      12.961     minutes"
            Time to Centroid        234.306    191.938    234.306    minutes"
            Rainfall depth          56.400     56.400     56.400     mm"
            Rainfall volume         389.16     0.00       389.16     c.m"
            Rainfall losses         40.128     10.379     40.128     mm"
            Runoff depth            16.272     46.021     16.272     mm"
            Runoff volume           112.28     0.00       112.28     c.m"
            Runoff coefficient      0.289      0.000      0.289      "
            Maximum flow            0.039      0.000      0.039      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.039     0.039     0.089     0.127"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.039     0.039     0.039     0.127"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                 0.144     c.m/sec"
            Hydrograph volume          812.213     c.m"
                     0.039     0.039     0.039     0.144"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                     0.039     0.000     0.039     0.144"
" 33        CATCHMENT 50"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         50   50 - Flow to Golf Course"
        7.000   % Impervious"
        2.010   Total Area"
       45.000   Flow length"
        3.000   Overland Slope"
        1.869   Pervious Area"
       45.000   Pervious length"
        3.000   Pervious slope"
        0.141   Impervious Area"
        3.387   Impervious length"
        3.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.292   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."
        0.793   Impervious Runoff coefficient"
        0.100   Impervious Ia/S coefficient"
        0.518   Impervious Initial abstraction"
                     0.089     0.000     0.039     0.144 c.m/sec"
            Catchment 50            Pervious   Impervious Total Area "
            Surface Area            1.869      0.141      2.010      hectare"
            Time of concentration   22.984     0.560      19.177     minutes"
            Time to Centroid        246.791    193.118    237.679    minutes"
            Rainfall depth          56.400     56.400     56.400     mm"
            Rainfall volume         1054.29    79.35      1133.64    c.m"
            Rainfall losses         39.945     11.695     37.967     mm"
            Runoff depth            16.455     44.705     18.433     mm"
```

```
"          Runoff volume          307.60     62.90      370.50     c.m"
"          Runoff coefficient     0.292      0.793      0.327      "
"          Maximum flow           0.085      0.029      0.089      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                 0.089     0.089     0.039     0.144"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                 0.089     0.089     0.089     0.144"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                0.189    c.m/sec"
"          Hydrograph volume         874.511    c.m"
"                 0.089     0.089     0.089     0.189"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                 0.089     0.000     0.089     0.189"
" 33       CATCHMENT 60"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       60   60-Infiltration on Golf Course"
"    0.000   % Impervious"
"    0.550   Total Area"
"   45.000   Flow length"
"    3.000   Overland Slope"
"    0.550   Pervious Area"
"   45.000   Pervious length"
"    3.000   Pervious slope"
"    0.000   Impervious Area"
"    0.000   Impervious length"
"    3.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.292   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"
"                 0.025     0.000     0.089     0.189 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  22.984     0.001      22.984     minutes"
"          Time to Centroid       246.791    191.938    246.791    minutes"
"          Rainfall depth         56.400     56.400     56.400     mm"
"          Rainfall volume        310.20     0.00       310.20     c.m"
"          Rainfall losses        39.945     10.381     39.945     mm"
"          Runoff depth           16.455     46.019     16.455     mm"
"          Runoff volume          90.50      0.00       90.50      c.m"
"          Runoff coefficient     0.292      0.000      0.292      "
"          Maximum flow           0.025      0.000      0.025      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                 0.025     0.025     0.089     0.189"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                 0.025     0.025     0.025     0.189"
" 40       HYDROGRAPH   Combine    3"
```



```
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                0.212    c.m/sec"
"          Hydrograph volume         965.016    c.m"
"                 0.025     0.025     0.025     0.212"
" 38       START/RE-START TOTALS 60"
"        3   Runoff Totals on EXIT"
"          Total Catchment area                    21.320    hectare"
"          Total Impervious area                    0.629    hectare"
"          Total % impervious                       2.948"
" 19       EXIT"
```

```
                MIDUSS Output ----------------------------------------------->"
                MIDUSS version                          Version 2.25  rev. 473"
                MIDUSS created                       Sunday, February 07, 2010"
           10   Units used:                                          ie METRIC"
                Job folder:                C:\Users\jswiger\Desktop\Wilder Lake\"
                                                                        MIDUSS"
                Output filename:               218173-PreDev-Oct03-25yr-SCS.out"
                Licensee name:                                            GMBP"
                Company                                 Hewlett-Packard Company"
                Date & Time last used:                  10/3/2019 at 2:46:50 PM"
 31          TIME PARAMETERS"
     10.000   Time Step"
    360.000   Max. Storm length"
   2400.000   Max. Hydrograph"
 32          STORM Mass Curve"
          3   Mass Curve"
     65.300   Rainfall depth"
    360.000   Duration"
         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
            Maximum intensity           104.253    mm/hr"
            Total depth                  65.300    mm"
          6   025hyd   Hydrograph extension used in this file"
 33          CATCHMENT 10"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         10   10- Wilder Lake South"
      3.000   % Impervious"
      5.260   Total Area"
    100.000   Flow length"
      5.000   Overland Slope"
      5.102   Pervious Area"
    100.000   Pervious length"
      5.000   Pervious slope"
      0.158   Impervious Area"
      3.093   Impervious length"
      5.000   Impervious slope"
      0.250   Pervious Manning 'n'"
     74.000   Pervious SCS Curve No."
      0.334   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."
      0.794   Impervious Runoff coefficient"
      0.100   Impervious Ia/S coefficient"
      0.518   Impervious Initial abstraction"
                0.278     0.000     0.000     0.000 c.m/sec"
            Catchment 10          Pervious   Impervious Total Area "
            Surface Area          5.102      0.158      5.260      hectare"
            Time of concentration 28.178     0.428      26.276     minutes"
            Time to Centroid      252.330    191.540    248.163    minutes"
            Rainfall depth        65.300     65.300     65.300     mm"
            Rainfall volume       3331.74    103.04     3434.78    c.m"
            Rainfall losses       43.511     13.449     42.609     mm"
            Runoff depth          21.789     51.851     22.691     mm"
            Runoff volume         1111.72    81.82      1193.54    c.m"
            Runoff coefficient    0.334      0.794      0.347      "
            Maximum flow          0.273      0.039      0.278      c.m/sec"
 40         HYDROGRAPH Add Runoff "
          4   Add Runoff "
                0.278     0.278     0.000     0.000"
```



```
 40         HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                0.278     0.278     0.278     0.000"
 40         HYDROGRAPH   Combine    1"
          6   Combine "
          1   Node #"
              Wilder Lake Final"
            Maximum flow                  0.278    c.m/sec"
            Hydrograph volume          1193.537    c.m"
                0.278     0.278     0.278     0.278"
 40         HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                0.278     0.000     0.278     0.278"
 33         CATCHMENT 20"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         20   20 - Creek"
      6.000   % Impervious"
      5.500   Total Area"
     75.000   Flow length"
      5.000   Overland Slope"
      5.170   Pervious Area"
     75.000   Pervious length"
      5.000   Pervious slope"
      0.330   Impervious Area"
      4.787   Impervious length"
      5.000   Impervious slope"
      0.250   Pervious Manning 'n'"
     74.000   Pervious SCS Curve No."
      0.333   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."
      0.803   Impervious Runoff coefficient"
      0.100   Impervious Ia/S coefficient"
      0.518   Impervious Initial abstraction"
                0.321     0.000     0.278     0.278 c.m/sec"
            Catchment 20          Pervious   Impervious Total Area "
            Surface Area          5.170      0.330      5.500      hectare"
            Time of concentration 23.711     0.556      20.623     minutes"
            Time to Centroid      246.463    192.285    239.238    minutes"
            Rainfall depth        65.300     65.300     65.300     mm"
            Rainfall volume       3376.01    215.49     3591.50    c.m"
            Rainfall losses       43.552     12.872     41.711     mm"
            Runoff depth          21.748     52.428     23.589     mm"
            Runoff volume         1124.37    173.01     1297.39    c.m"
            Runoff coefficient    0.333      0.803      0.361      "
            Maximum flow          0.309      0.080      0.321      c.m/sec"
 40         HYDROGRAPH Add Runoff "
          4   Add Runoff "
                0.321     0.321     0.278     0.278"
 40         HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                0.321     0.321     0.321     0.278"
 40         HYDROGRAPH   Combine    2"
          6   Combine "
          2   Node #"
              Total to Creek"
            Maximum flow                  0.321    c.m/sec"
            Hydrograph volume          1297.388    c.m"
                0.321     0.321     0.321     0.321"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
                     0.321     0.000     0.321     0.321"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
                     0.321     0.000     0.321     0.321"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.334   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"
                     0.163     0.000     0.321     0.321 c.m/sec"
"             Catchment 30            Pervious   Impervious Total Area "
"             Surface Area            3.060      0.000      3.060      hectare"
"             Time of concentration   30.129     0.001      30.129     minutes"
"             Time to Centroid        254.933    191.156    254.933    minutes"
"             Rainfall depth          65.300     65.300     65.300     mm"
"             Rainfall volume         1998.18    0.00       1998.18    c.m"
"             Rainfall losses         43.513     11.324     43.513     mm"
"             Runoff depth            21.787     53.976     21.787     mm"
"             Runoff volume           666.67     0.00       666.67     c.m"
"             Runoff coefficient      0.334      0.000      0.334      "
"             Maximum flow            0.163      0.000      0.163      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
                     0.163     0.163     0.321     0.321"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
                     0.163     0.163     0.163     0.321"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
                Total to Infiltration"
             Maximum flow                  0.163     c.m/sec"
             Hydrograph volume           666.675     c.m"
                     0.163     0.163     0.163     0.163"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
                     0.163     0.000     0.163     0.163"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



```
"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.334   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"
                     0.057     0.000     0.163     0.163 c.m/sec"
"             Catchment 40            Pervious   Impervious Total Area "
"             Surface Area            1.070      0.000      1.070      hectare"
"             Time of concentration   27.301     0.001      27.301     minutes"
"             Time to Centroid        251.214    191.156    251.213    minutes"
"             Rainfall depth          65.300     65.300     65.300     mm"
"             Rainfall volume         698.71     0.00       698.71     c.m"
"             Rainfall losses         43.512     11.324     43.512     mm"
"             Runoff depth            21.788     53.976     21.788     mm"
"             Runoff volume           233.13     0.00       233.13     c.m"
"             Runoff coefficient      0.334      0.000      0.334      "
"             Maximum flow            0.057      0.000      0.057      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
                     0.057     0.057     0.163     0.163"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
                     0.057     0.057     0.057     0.163"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
                Total to Off-Site"
             Maximum flow                  0.057     c.m/sec"
             Hydrograph volume           233.131     c.m"
                     0.057     0.057     0.057     0.057"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
                     0.057     0.000     0.057     0.057"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.334   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"
                  0.130     0.000     0.057     0.057 c.m/sec"
          Catchment 41            Pervious   Impervious Total Area "
          Surface Area            3.180      0.000      3.180      hectare"
          Time of concentration   43.580     0.001      43.580     minutes"
          Time to Centroid        272.435    191.156    272.435    minutes"
          Rainfall depth          65.300     65.300     65.300     mm"
          Rainfall volume         2076.54    0.00       2076.54    c.m"
          Rainfall losses         43.490     11.328     43.490     mm"
          Runoff depth            21.810     53.972     21.810     mm"
          Runoff volume           693.54     0.00       693.55     c.m"
          Runoff coefficient      0.334      0.000      0.334      "
          Maximum flow            0.130      0.000      0.130      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
        4   Add Runoff "
                  0.130     0.130     0.057     0.057"
" 40      HYDROGRAPH Copy to Outflow"
        8   Copy to Outflow"
                  0.130     0.130     0.130     0.057"
" 40      HYDROGRAPH   Combine    4"
        6   Combine "
        4   Node #"
            Total to Off-Site"
          Maximum flow                  0.182     c.m/sec"
          Hydrograph volume             926.676   c.m"
                  0.130     0.130     0.130     0.182"
" 40      HYDROGRAPH Start - New Tributary"
        2   Start - New Tributary"
                  0.130     0.000     0.130     0.182"
" 33      CATCHMENT 42"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
       42   42 - West Flow Off Site"
        0.000   % Impervious"
        0.690   Total Area"
       20.000   Flow length"
        4.000   Overland Slope"
        0.690   Pervious Area"
       20.000   Pervious length"
        4.000   Pervious slope"
        0.000   Impervious Area"
        0.000   Impervious length"
        4.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.332   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"
                  0.054     0.000     0.130     0.182 c.m/sec"
          Catchment 42            Pervious   Impervious Total Area "
          Surface Area            0.690      0.000      0.690      hectare"
          Time of concentration   11.471     0.000      11.471     minutes"
          Time to Centroid        230.606    191.157    230.606    minutes"
          Rainfall depth          65.300     65.300     65.300     mm"
          Rainfall volume         450.57     0.00       450.57     c.m"
          Rainfall losses         43.628     11.319     43.628     mm"
          Runoff depth            21.672     53.981     21.672     mm"
          Runoff volume           149.54     0.00       149.54     c.m"
          Runoff coefficient      0.332      0.000      0.332      "
          Maximum flow            0.054      0.000      0.054      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
        4   Add Runoff "
                  0.054     0.054     0.130     0.182"
" 40      HYDROGRAPH Copy to Outflow"
        8   Copy to Outflow"
                  0.054     0.054     0.054     0.182"
" 40      HYDROGRAPH   Combine    4"
        6   Combine "
        4   Node #"
            Total to Off-Site"
          Maximum flow                  0.203     c.m/sec"
          Hydrograph volume             1076.216  c.m"
                  0.054     0.054     0.054     0.203"
" 40      HYDROGRAPH Start - New Tributary"
        2   Start - New Tributary"
                  0.054     0.000     0.054     0.203"
" 33      CATCHMENT 50"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
       50   50 - Flow to Golf Course"
        7.000   % Impervious"
        2.010   Total Area"
       45.000   Flow length"
        3.000   Overland Slope"
        1.869   Pervious Area"
       45.000   Pervious length"
        3.000   Pervious slope"
        0.141   Impervious Area"
        3.387   Impervious length"
        3.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.333   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."
        0.801   Impervious Runoff coefficient"
        0.100   Impervious Ia/S coefficient"
        0.518   Impervious Initial abstraction"
                  0.127     0.000     0.054     0.203 c.m/sec"
          Catchment 50            Pervious   Impervious Total Area "
          Surface Area            1.869      0.141      2.010      hectare"
          Time of concentration   20.342     0.527      17.303     minutes"
          Time to Centroid        242.117    192.125    234.450    minutes"
          Rainfall depth          65.300     65.300     65.300     mm"
          Rainfall volume         1220.65    91.88      1312.53    c.m"
          Rainfall losses         43.572     13.009     41.433     mm"
          Runoff depth            21.728     52.291     23.867     mm"
```

```
          Runoff volume          406.16     73.57      479.73     c.m"
          Runoff coefficient     0.333      0.801      0.365      "
          Maximum flow           0.122      0.034      0.127      c.m/sec"
 40        HYDROGRAPH Add Runoff "
         4   Add Runoff "
                 0.127     0.127     0.054     0.203"
 40        HYDROGRAPH Copy to Outflow"
         8   Copy to Outflow"
                 0.127     0.127     0.127     0.203"
 40        HYDROGRAPH   Combine    3"
         6   Combine "
         3   Node #"
             Total to Infiltration"
          Maximum flow                 0.276    c.m/sec"
          Hydrograph volume          1146.404    c.m"
                 0.127     0.127     0.127     0.276"
 40        HYDROGRAPH Start - New Tributary"
         2   Start - New Tributary"
                 0.127     0.000     0.127     0.276"
 33        CATCHMENT 60"
         1   Triangular SCS"
         2   Proportional to %"
         1   SCS method"
        60   60-Infiltration on Golf Course"
     0.000   % Impervious"
     0.550   Total Area"
    45.000   Flow length"
     3.000   Overland Slope"
     0.550   Pervious Area"
    45.000   Pervious length"
     3.000   Pervious slope"
     0.000   Impervious Area"
     0.000   Impervious length"
     3.000   Impervious slope"
     0.250   Pervious Manning 'n'"
    74.000   Pervious SCS Curve No."
     0.333   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"
                 0.036     0.000     0.127     0.276 c.m/sec"
          Catchment 60           Pervious   Impervious Total Area "
          Surface Area           0.550      0.000      0.550      hectare"
          Time of concentration  20.342     0.001      20.342     minutes"
          Time to Centroid       242.117    191.157    242.117    minutes"
          Rainfall depth         65.300     65.300     65.300     mm"
          Rainfall volume        359.15     0.00       359.15     c.m"
          Rainfall losses        43.572     11.322     43.572     mm"
          Runoff depth           21.728     53.978     21.728     mm"
          Runoff volume          119.50     0.00       119.50     c.m"
          Runoff coefficient     0.333      0.000      0.333      "
          Maximum flow           0.036      0.000      0.036      c.m/sec"
 40        HYDROGRAPH Add Runoff "
         4   Add Runoff "
                 0.036     0.036     0.127     0.276"
 40        HYDROGRAPH Copy to Outflow"
         8   Copy to Outflow"
                 0.036     0.036     0.036     0.276"
 40        HYDROGRAPH   Combine    3"
```



```
         6   Combine "
         3   Node #"
             Total to Infiltration"
          Maximum flow                 0.312    c.m/sec"
          Hydrograph volume          1265.906    c.m"
                 0.036     0.036     0.036     0.312"
 38        START/RE-START TOTALS 60"
         3   Runoff Totals on EXIT"
          Total Catchment area                      21.320    hectare"
          Total Impervious area                      0.629    hectare"
          Total % impervious                         2.948"
 19        EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                        MIDUSS"
"                Output filename:               218173-PreDev-Oct01-50yr-SCS.out"
"                Licensee name:                                            GMBP"
"                Company                                 Hewlett-Packard Company"
"                Date & Time last used:                 10/1/2019 at 11:38:59 AM"
" 31           TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     2400.000   Max. Hydrograph"
" 32           STORM Mass Curve"
"            3   Mass Curve"
"       71.900   Rainfall depth"
"      360.000   Duration"
"           47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"             Maximum intensity           114.790    mm/hr"
"             Total depth                  71.900    mm"
"            6   OSOhyd   Hydrograph extension used in this file"
" 33           CATCHMENT 10"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           10   10- Wilder Lake South"
"        3.000   % Impervious"
"        5.260   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        5.102   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.158   Impervious Area"
"        3.093   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.361   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."
"        0.799   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.349     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           5.102      0.158      5.260      hectare"
"             Time of concentration  26.112     0.411      24.465     minutes"
"             Time to Centroid       248.923    190.950    245.207    minutes"
"             Rainfall depth         71.900     71.900     71.900     mm"
"             Rainfall volume        3668.48    113.46     3781.94    c.m"
"             Rainfall losses        45.948     14.439     45.003     mm"
"             Runoff depth           25.952     57.461     26.897     mm"
"             Runoff volume          1324.13    90.67      1414.80    c.m"
"             Runoff coefficient     0.361      0.799      0.374      "
"             Maximum flow           0.343      0.043      0.349      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.349     0.349     0.000     0.000"
```



```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.349     0.349     0.349     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Wilder Lake Final"
"             Maximum flow                    0.349    c.m/sec"
"             Hydrograph volume            1414.804    c.m"
"                     0.349     0.349     0.349     0.349"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.349     0.000     0.349     0.349"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           20   20 - Creek"
"        6.000   % Impervious"
"        5.500   Total Area"
"       75.000   Flow length"
"        5.000   Overland Slope"
"        5.170   Pervious Area"
"       75.000   Pervious length"
"        5.000   Pervious slope"
"        0.330   Impervious Area"
"        4.787   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.362   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."
"        0.808   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.402     0.000     0.349     0.349 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           5.170      0.330      5.500      hectare"
"             Time of concentration  21.972     0.534      19.298     minutes"
"             Time to Centroid       243.363    191.662    236.915    minutes"
"             Rainfall depth         71.900     71.900     71.900     mm"
"             Rainfall volume        3717.23    237.27     3954.50    c.m"
"             Rainfall losses        45.893     13.838     43.969     mm"
"             Runoff depth           26.007     58.062     27.931     mm"
"             Runoff volume          1344.58    191.60     1536.19    c.m"
"             Runoff coefficient     0.362      0.808      0.388      "
"             Maximum flow           0.389      0.089      0.402      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.402     0.402     0.349     0.349"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.402     0.402     0.402     0.349"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total to Creek"
"             Maximum flow                    0.402    c.m/sec"
"             Hydrograph volume            1536.187    c.m"
"                     0.402     0.402     0.402     0.402"
```

```
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.402     0.000     0.402     0.402"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.402     0.000     0.402     0.402"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.362   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"
"                  0.197     0.000     0.402     0.402 c.m/sec"
"            Catchment 30            Pervious   Impervious Total Area "
"            Surface Area            3.060      0.000      3.060      hectare"
"            Time of concentration   27.920     0.001      27.920     minutes"
"            Time to Centroid        251.247    190.669    251.247    minutes"
"            Rainfall depth          71.900     71.900     71.900     mm"
"            Rainfall volume         2200.14    0.00       2200.14    c.m"
"            Rainfall losses         45.896     12.015     45.896     mm"
"            Runoff depth            26.004     59.885     26.004     mm"
"            Runoff volume           795.73     0.00       795.73     c.m"
"            Runoff coefficient      0.362      0.000      0.362      "
"            Maximum flow            0.197      0.000      0.197      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.197     0.197     0.402     0.402"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.197     0.197     0.197     0.402"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Total to Infiltration"
"            Maximum flow                  0.197     c.m/sec"
"            Hydrograph volume           795.730     c.m"
"                  0.197     0.197     0.197     0.197"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.197     0.000     0.197     0.197"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



```
"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.361   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"
"                  0.074     0.000     0.197     0.197 c.m/sec"
"            Catchment 40            Pervious   Impervious Total Area "
"            Surface Area            1.070      0.000      1.070      hectare"
"            Time of concentration   25.300     0.001      25.299     minutes"
"            Time to Centroid        247.798    190.669    247.798    minutes"
"            Rainfall depth          71.900     71.900     71.900     mm"
"            Rainfall volume         769.33     0.00       769.33     c.m"
"            Rainfall losses         45.937     12.014     45.937     mm"
"            Runoff depth            25.963     59.886     25.963     mm"
"            Runoff volume           277.81     0.00       277.81     c.m"
"            Runoff coefficient      0.361      0.000      0.361      "
"            Maximum flow            0.074      0.000      0.074      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.074     0.074     0.197     0.197"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.074     0.074     0.074     0.197"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                Total to Off-Site"
"            Maximum flow                  0.074     c.m/sec"
"            Hydrograph volume           277.807     c.m"
"                  0.074     0.074     0.074     0.074"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.074     0.000     0.074     0.074"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.362   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"
                  0.162     0.000     0.074     0.074 c.m/sec"
            Catchment 41            Pervious   Impervious Total Area "
            Surface Area            3.180      0.000      3.180      hectare"
            Time of concentration   40.385     0.001      40.385     minutes"
            Time to Centroid        267.660    190.669    267.660    minutes"
            Rainfall depth          71.900     71.900     71.900     mm"
            Rainfall volume         2286.42    0.00       2286.42    c.m"
            Rainfall losses         45.885     12.019     45.885     mm"
            Runoff depth            26.015     59.881     26.015     mm"
            Runoff volume           827.27     0.00       827.27     c.m"
            Runoff coefficient      0.362      0.000      0.362      "
            Maximum flow            0.162      0.000      0.162      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                  0.162     0.162     0.074     0.074"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                  0.162     0.162     0.162     0.074"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                  0.231    c.m/sec"
            Hydrograph volume          1105.077    c.m"
                  0.162     0.162     0.162     0.231"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                  0.162     0.000     0.162     0.231"
" 33        CATCHMENT 42"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         42   42 - West Flow Off Site"
        0.000   % Impervious"
        0.690   Total Area"
       20.000   Flow length"
        4.000   Overland Slope"
        0.690   Pervious Area"
       20.000   Pervious length"
        4.000   Pervious slope"
        0.000   Impervious Area"
        0.000   Impervious length"
        4.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.361   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"
```



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"        0.518   Impervious Initial abstraction"
                  0.068     0.000     0.162     0.231 c.m/sec"
            Catchment 42            Pervious   Impervious Total Area "
            Surface Area            0.690      0.000      0.690      hectare"
            Time of concentration   10.630     0.000      10.630     minutes"
            Time to Centroid        228.472    190.670    228.472    minutes"
            Rainfall depth          71.900     71.900     71.900     mm"
            Rainfall volume         496.11     0.00       496.11     c.m"
            Rainfall losses         45.969     12.009     45.969     mm"
            Runoff depth            25.931     59.891     25.931     mm"
            Runoff volume           178.92     0.00       178.92     c.m"
            Runoff coefficient      0.361      0.000      0.361      "
            Maximum flow            0.068      0.000      0.068      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                  0.068     0.068     0.162     0.231"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                  0.068     0.068     0.068     0.231"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                  0.261    c.m/sec"
            Hydrograph volume          1284.001    c.m"
                  0.068     0.068     0.068     0.261"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                  0.068     0.000     0.068     0.261"
" 33        CATCHMENT 50"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         50   50 - Flow to Golf Course"
        7.000   % Impervious"
        2.010   Total Area"
       45.000   Flow length"
        3.000   Overland Slope"
        1.869   Pervious Area"
       45.000   Pervious length"
        3.000   Pervious slope"
        0.141   Impervious Area"
        3.387   Impervious length"
        3.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.360   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."
        0.805   Impervious Runoff coefficient"
        0.100   Impervious Ia/S coefficient"
        0.518   Impervious Initial abstraction"
                  0.157     0.000     0.068     0.261 c.m/sec"
            Catchment 50            Pervious   Impervious Total Area "
            Surface Area            1.869      0.141      2.010      hectare"
            Time of concentration   18.850     0.506      16.209     minutes"
            Time to Centroid        239.289    191.506    232.409    minutes"
            Rainfall depth          71.900     71.900     71.900     mm"
            Rainfall volume         1344.03    101.16     1445.19    c.m"
            Rainfall losses         45.991     13.998     43.751     mm"
            Runoff depth            25.909     57.902     28.149     mm"
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"          Runoff volume          484.32     81.47      565.79     c.m"
"          Runoff coefficient     0.360      0.805      0.391      "
"          Maximum flow           0.151      0.038      0.157      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                 0.157     0.157     0.068     0.261"
" 40        HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                 0.157     0.157     0.157     0.261"
" 40        HYDROGRAPH   Combine    3"
"         6   Combine "
"         3   Node #"
"             Total to Infiltration"
"          Maximum flow                 0.351    c.m/sec"
"          Hydrograph volume          1361.521    c.m"
"                 0.157     0.157     0.157     0.351"
" 40        HYDROGRAPH Start - New Tributary"
"         2   Start - New Tributary"
"                 0.157     0.000     0.157     0.351"
" 33        CATCHMENT 60"
"         1   Triangular SCS"
"         2   Proportional to %"
"         1   SCS method"
"        60   60-Infiltration on Golf Course"
"     0.000   % Impervious"
"     0.550   Total Area"
"    45.000   Flow length"
"     3.000   Overland Slope"
"     0.550   Pervious Area"
"    45.000   Pervious length"
"     3.000   Pervious slope"
"     0.000   Impervious Area"
"     0.000   Impervious length"
"     3.000   Impervious slope"
"     0.250   Pervious Manning 'n'"
"    74.000   Pervious SCS Curve No."
"     0.360   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"
"                 0.045     0.000     0.157     0.351 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  18.850     0.001      18.850     minutes"
"          Time to Centroid       239.289    190.670    239.289    minutes"
"          Rainfall depth         71.900     71.900     71.900     mm"
"          Rainfall volume        395.45     0.00       395.45     c.m"
"          Rainfall losses        45.991     12.012     45.991     mm"
"          Runoff depth           25.909     59.888     25.909     mm"
"          Runoff volume          142.50     0.00       142.50     c.m"
"          Runoff coefficient     0.360      0.000      0.360      "
"          Maximum flow           0.045      0.000      0.045      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                 0.045     0.045     0.157     0.351"
" 40        HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                 0.045     0.045     0.045     0.351"
" 40        HYDROGRAPH   Combine    3"
```



```
"         6   Combine "
"         3   Node #"
"             Total to Infiltration"
"          Maximum flow                 0.395    c.m/sec"
"          Hydrograph volume          1504.023    c.m"
"                 0.045     0.045     0.045     0.395"
" 38        START/RE-START TOTALS 60"
"         3   Runoff Totals on EXIT"
"          Total Catchment area                      21.320    hectare"
"          Total Impervious area                      0.629    hectare"
"          Total % impervious                         2.948"
" 19        EXIT"
```

```
"              MIDUSS Output ----------------------------------------------->"
"              MIDUSS version                          Version 2.25  rev. 473"
"              MIDUSS created                       Sunday, February 07, 2010"
"         10   Units used:                                          ie METRIC"
"              Job folder:                C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                      MIDUSS"
"              Output filename:               218173-PreDev-Oct03-100yr-SCS.out"
"              Licensee name:                                            GMBP"
"              Company                                 Hewlett-Packard Company"
"              Date & Time last used:                  10/3/2019 at 2:44:56 PM"
" 31          TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"          3   Mass Curve"
"     78.400   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"           Maximum intensity            125.167    mm/hr"
"           Total depth                   78.400    mm"
"          6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         10   10- Wilder Lake South"
"      3.000   % Impervious"
"      5.260   Total Area"
"    100.000   Flow length"
"      5.000   Overland Slope"
"      5.102   Pervious Area"
"    100.000   Pervious length"
"      5.000   Pervious slope"
"      0.158   Impervious Area"
"      3.093   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.387   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."
"      0.803   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.429     0.000     0.000     0.000 c.m/sec"
"           Catchment 10            Pervious   Impervious Total Area "
"           Surface Area            5.102      0.158      5.260      hectare"
"           Time of concentration   24.444     0.397      22.993     minutes"
"           Time to Centroid        245.955    190.445    242.605    minutes"
"           Rainfall depth          78.400     78.400     78.400     mm"
"           Rainfall volume         4000.13    123.72     4123.84    c.m"
"           Rainfall losses         48.070     15.420     47.091     mm"
"           Runoff depth            30.330     62.980     31.309     mm"
"           Runoff volume           1547.49    99.38      1646.88    c.m"
"           Runoff coefficient      0.387      0.803      0.399      "
"           Maximum flow            0.422      0.047      0.429      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.429     0.429     0.000     0.000"
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" 40        HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.429     0.429     0.429     0.000"
" 40        HYDROGRAPH   Combine    1"
"          6   Combine "
"          1   Node #"
"              Wilder Lake Final"
"           Maximum flow                 0.429    c.m/sec"
"           Hydrograph volume         1646.875    c.m"
"                 0.429     0.429     0.429     0.429"
" 40        HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                 0.429     0.000     0.429     0.429"
" 33        CATCHMENT 20"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"         20   20 - Creek"
"      6.000   % Impervious"
"      5.500   Total Area"
"     75.000   Flow length"
"      5.000   Overland Slope"
"      5.170   Pervious Area"
"     75.000   Pervious length"
"      5.000   Pervious slope"
"      0.330   Impervious Area"
"      4.787   Impervious length"
"      5.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.386   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."
"      0.811   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.487     0.000     0.429     0.429 c.m/sec"
"           Catchment 20            Pervious   Impervious Total Area "
"           Surface Area            5.170      0.330      5.500      hectare"
"           Time of concentration   20.569     0.516      18.200     minutes"
"           Time to Centroid        240.810    191.126    234.939    minutes"
"           Rainfall depth          78.400     78.400     78.400     mm"
"           Rainfall volume         4053.28    258.72     4312.00    c.m"
"           Rainfall losses         48.102     14.802     46.104     mm"
"           Runoff depth            30.298     63.598     32.296     mm"
"           Runoff volume           1566.43    209.87     1776.30    c.m"
"           Runoff coefficient      0.386      0.811      0.412      "
"           Maximum flow            0.473      0.097      0.487      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.487     0.487     0.429     0.429"
" 40        HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.487     0.487     0.487     0.429"
" 40        HYDROGRAPH   Combine    2"
"          6   Combine "
"          2   Node #"
"              Total to Creek"
"           Maximum flow                 0.487    c.m/sec"
"           Hydrograph volume         1776.303    c.m"
"                 0.487     0.487     0.487     0.487"
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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.487     0.000     0.487     0.487"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.487     0.000     0.487     0.487"
" 33          CATCHMENT 30"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           30   30 - Infiltration"
"        0.000   % Impervious"
"        3.060   Total Area"
"      100.000   Flow length"
"        4.000   Overland Slope"
"        3.060   Pervious Area"
"      100.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.386   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"
"                    0.241     0.000     0.487     0.487 c.m/sec"
"             Catchment 30            Pervious   Impervious Total Area "
"             Surface Area            3.060      0.000      3.060      hectare"
"             Time of concentration   26.137     0.001      26.137     minutes"
"             Time to Centroid        248.275    190.249    248.275    minutes"
"             Rainfall depth          78.400     78.400     78.400     mm"
"             Rainfall volume         2399.04    0.00       2399.04    c.m"
"             Rainfall losses         48.108     12.690     48.108     mm"
"             Runoff depth            30.292     65.710     30.292     mm"
"             Runoff volume           926.92     0.00       926.92     c.m"
"             Runoff coefficient      0.386      0.000      0.386      "
"             Maximum flow            0.241      0.000      0.241      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.241     0.241     0.487     0.487"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.241     0.241     0.241     0.487"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                Total to Infiltration"
"             Maximum flow                 0.241    c.m/sec"
"             Hydrograph volume            926.923    c.m"
"                    0.241     0.241     0.241     0.241"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.241     0.000     0.241     0.241"
" 33          CATCHMENT 40"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
```



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"           40   40 - South East Flow Off-Site"
"        0.000   % Impervious"
"        1.070   Total Area"
"       60.000   Flow length"
"        2.000   Overland Slope"
"        1.070   Pervious Area"
"       60.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.387   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"
"                    0.090     0.000     0.241     0.241 c.m/sec"
"             Catchment 40            Pervious   Impervious Total Area "
"             Surface Area            1.070      0.000      1.070      hectare"
"             Time of concentration   23.684     0.001      23.684     minutes"
"             Time to Centroid        244.932    190.249    244.932    minutes"
"             Rainfall depth          78.400     78.400     78.400     mm"
"             Rainfall volume         838.88     0.00       838.88     c.m"
"             Rainfall losses         48.079     12.689     48.079     mm"
"             Runoff depth            30.321     65.711     30.321     mm"
"             Runoff volume           324.43     0.00       324.43     c.m"
"             Runoff coefficient      0.387      0.000      0.387      "
"             Maximum flow            0.090      0.000      0.090      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.090     0.090     0.241     0.241"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.090     0.090     0.090     0.241"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                Total to Off-Site"
"             Maximum flow                 0.090    c.m/sec"
"             Hydrograph volume            324.434    c.m"
"                    0.090     0.090     0.090     0.090"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.090     0.000     0.090     0.090"
" 33          CATCHMENT 41"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"           41   41 -South West Flow Off Site"
"        0.000   % Impervious"
"        3.180   Total Area"
"      185.000   Flow length"
"        4.000   Overland Slope"
"        3.180   Pervious Area"
"      185.000   Pervious length"
"        4.000   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
```

```
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.387   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"
                     0.202     0.000     0.090     0.090 c.m/sec"
            Catchment 41            Pervious   Impervious Total Area "
            Surface Area            3.180      0.000      3.180      hectare"
            Time of concentration   37.805     0.001      37.805     minutes"
            Time to Centroid        263.702    190.249    263.701    minutes"
            Rainfall depth          78.400     78.400     78.400     mm"
            Rainfall volume         2493.12    0.00       2493.12    c.m"
            Rainfall losses         48.036     12.694     48.036     mm"
            Runoff depth            30.364     65.706     30.364     mm"
            Runoff volume           965.56     0.00       965.57     c.m"
            Runoff coefficient      0.387      0.000      0.387      "
            Maximum flow            0.202      0.000      0.202      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.202     0.202     0.090     0.090"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.202     0.202     0.202     0.090"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                  0.282    c.m/sec"
            Hydrograph volume           1289.999   c.m"
                     0.202     0.202     0.202     0.282"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                     0.202     0.000     0.202     0.282"
" 33        CATCHMENT 42"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         42   42 - West Flow Off Site"
        0.000   % Impervious"
        0.690   Total Area"
       20.000   Flow length"
        4.000   Overland Slope"
        0.690   Pervious Area"
       20.000   Pervious length"
        4.000   Pervious slope"
        0.000   Impervious Area"
        0.000   Impervious length"
        4.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.387   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"
```



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"        0.518   Impervious Initial abstraction"
                     0.082     0.000     0.202     0.282 c.m/sec"
            Catchment 42            Pervious   Impervious Total Area "
            Surface Area            0.690      0.000      0.690      hectare"
            Time of concentration   9.951      0.000      9.951      minutes"
            Time to Centroid        226.658    190.249    226.658    minutes"
            Rainfall depth          78.400     78.400     78.400     mm"
            Rainfall volume         540.96     0.00       540.96     c.m"
            Rainfall losses         48.085     12.684     48.085     mm"
            Runoff depth            30.315     65.716     30.315     mm"
            Runoff volume           209.17     0.00       209.17     c.m"
            Runoff coefficient      0.387      0.000      0.387      "
            Maximum flow            0.082      0.000      0.082      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.082     0.082     0.202     0.282"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.082     0.082     0.082     0.282"
" 40        HYDROGRAPH   Combine    4"
          6   Combine "
          4   Node #"
              Total to Off-Site"
            Maximum flow                  0.323    c.m/sec"
            Hydrograph volume           1499.174   c.m"
                     0.082     0.082     0.082     0.323"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                     0.082     0.000     0.082     0.323"
" 33        CATCHMENT 50"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
         50   50 - Flow to Golf Course"
        7.000   % Impervious"
        2.010   Total Area"
       45.000   Flow length"
        3.000   Overland Slope"
        1.869   Pervious Area"
       45.000   Pervious length"
        3.000   Pervious slope"
        0.141   Impervious Area"
        3.387   Impervious length"
        3.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.386   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."
        0.809   Impervious Runoff coefficient"
        0.100   Impervious Ia/S coefficient"
        0.518   Impervious Initial abstraction"
                     0.187     0.000     0.082     0.323 c.m/sec"
            Catchment 50            Pervious   Impervious Total Area "
            Surface Area            1.869      0.141      2.010      hectare"
            Time of concentration   17.646     0.488      15.307     minutes"
            Time to Centroid        236.922    190.974    230.658    minutes"
            Rainfall depth          78.400     78.400     78.400     mm"
            Rainfall volume         1465.53    110.31     1575.84    c.m"
            Rainfall losses         48.162     14.984     45.839     mm"
            Runoff depth            30.238     63.416     32.561     mm"
```

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"          Runoff volume          565.24     89.23      654.47     c.m"
"          Runoff coefficient     0.386      0.809      0.415      "
"          Maximum flow           0.181      0.042      0.187      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                 0.187     0.187     0.082     0.323"
" 40       HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                 0.187     0.187     0.187     0.323"
" 40       HYDROGRAPH   Combine    3"
"         6   Combine "
"         3   Node #"
"             Total to Infiltration"
"          Maximum flow                 0.429    c.m/sec"
"          Hydrograph volume          1581.392    c.m"
"                 0.187     0.187     0.187     0.429"
" 40       HYDROGRAPH Start - New Tributary"
"         2   Start - New Tributary"
"                 0.187     0.000     0.187     0.429"
" 33       CATCHMENT 60"
"         1   Triangular SCS"
"         2   Proportional to %"
"         1   SCS method"
"        60   60-Infiltration on Golf Course"
"     0.000   % Impervious"
"     0.550   Total Area"
"    45.000   Flow length"
"     3.000   Overland Slope"
"     0.550   Pervious Area"
"    45.000   Pervious length"
"     3.000   Pervious slope"
"     0.000   Impervious Area"
"     0.000   Impervious length"
"     3.000   Impervious slope"
"     0.250   Pervious Manning 'n'"
"    74.000   Pervious SCS Curve No."
"     0.386   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"
"                 0.053     0.000     0.187     0.429 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  17.646     0.001      17.646     minutes"
"          Time to Centroid       236.922    190.249    236.922    minutes"
"          Rainfall depth         78.400     78.400     78.400     mm"
"          Rainfall volume        431.20     0.00       431.20     c.m"
"          Rainfall losses        48.162     12.687     48.162     mm"
"          Runoff depth           30.238     65.713     30.238     mm"
"          Runoff volume          166.31     0.00       166.31     c.m"
"          Runoff coefficient     0.386      0.000      0.386      "
"          Maximum flow           0.053      0.000      0.053      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                 0.053     0.053     0.187     0.429"
" 40       HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                 0.053     0.053     0.053     0.429"
" 40       HYDROGRAPH   Combine    3"
```



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"         6   Combine "
"         3   Node #"
"             Total to Infiltration"
"          Maximum flow                 0.482    c.m/sec"
"          Hydrograph volume          1747.702    c.m"
"                 0.053     0.053     0.053     0.482"
" 38       START/RE-START TOTALS 60"
"         3   Runoff Totals on EXIT"
"          Total Catchment area                      21.320    hectare"
"          Total Impervious area                      0.629    hectare"
"          Total % impervious                         2.948"
" 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:                 C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                    MIDUSS"
"            Output filename:          218173-PreDev-Oct01-Hazel-SCS-2.out"
"            Licensee name:                                            GMBP"
"            Company                                Hewlett-Packard Company"
"            Date & Time last used:                  10/2/2019 at 12:08:01 PM"
" 31      TIME PARAMETERS"
"   10.000   Time Step"
" 2880.000   Max. Storm length"
" 8640.000   Max. Hydrograph"
" 32      STORM Historic"
"        5   Historic"
" 2880.000   Duration"
"  288.000   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      2.028      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      2.028      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      2.028      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      2.028"
"              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"
"              2.028      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      2.028      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      6.000      6.000      6.000      6.000"
"              6.000      6.000      4.000      4.000      4.000"
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"             4.000      4.000      4.000      6.000      6.000"
"             6.000      6.000      6.000      6.000     13.000"
"            13.000     13.000     13.000     13.000     13.000"
"            17.000     17.000     17.000     17.000     17.000"
"            17.000     13.000     13.000     13.000     13.000"
"            13.000     13.000     23.000     13.000     23.000"
"            23.000     23.000     23.000     13.000     13.000"
"            13.000     13.000     13.000     13.000     13.000"
"            13.000     13.000     13.000     13.000     13.000"
"            53.000     53.000     53.000     53.000     53.000"
"            53.000     38.000     38.000     38.000     38.000"
"            38.000     38.000     13.000     13.000     13.000"
"            13.000     13.000     13.000"
"         Maximum intensity               53.000     mm/hr"
"         Total depth                    284.997     mm"
"        6   200hyd   Hydrograph extension used in this file"
" 33      CATCHMENT 10"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       10   10- Wilder Lake South"
"    3.000   % Impervious"
"    5.260   Total Area"
"  100.000   Flow length"
"    5.000   Overland Slope"
"    5.102   Pervious Area"
"  100.000   Pervious length"
"    5.000   Pervious slope"
"    0.158   Impervious Area"
"    3.093   Impervious length"
"    5.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.730   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"
"                  0.737      0.000      0.000      0.000 c.m/sec"
"         Catchment 10              Pervious    Impervious Total Area "
"         Surface Area              5.102       0.158      5.260      hectare"
"         Time of concentration     25.051      0.556      24.199     minutes"
"         Time to Centroid          2523.723    2239.598   2513.845   minutes"
"         Rainfall depth            284.997     284.997    284.997    mm"
"         Rainfall volume           1.4541      0.0450     1.4991     ha-m"
"         Rainfall losses           76.925      42.678     75.897     mm"
"         Runoff depth              208.073     242.320    209.100    mm"
"         Runoff volume             1.0616      0.0382     1.0999     ha-m"
"         Runoff coefficient        0.730       0.850      0.734      "
"         Maximum flow              0.717       0.020      0.737      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                  0.737      0.737      0.000      0.000"
" 40      HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                  0.737      0.737      0.737      0.000"
" 40      HYDROGRAPH   Combine    1"
"        6   Combine "
"        1   Node #"
"            Wilder Lake Final"
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"          Maximum flow                    0.737    c.m/sec"
"          Hydrograph volume           10998.661    c.m"
"                 0.737     0.737     0.737     0.737"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                 0.737     0.000     0.737     0.737"
" 33       CATCHMENT 20"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       20   20 - Creek"
"    6.000   % Impervious"
"    5.500   Total Area"
"   75.000   Flow length"
"    5.000   Overland Slope"
"    5.170   Pervious Area"
"   75.000   Pervious length"
"    5.000   Pervious slope"
"    0.330   Impervious Area"
"    4.787   Impervious length"
"    5.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.730   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."
"    0.862   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                 0.754     0.000     0.737     0.737 c.m/sec"
"          Catchment 20          Pervious   Impervious Total Area "
"          Surface Area          5.170      0.330      5.500      hectare"
"          Time of concentration 21.079     0.722      19.653     minutes"
"          Time to Centroid      2518.236   2229.041   2497.975   minutes"
"          Rainfall depth        284.997    284.997    284.997    mm"
"          Rainfall volume       1.4734     0.0940     1.5675     ha-m"
"          Rainfall losses       76.930     39.404     74.679     mm"
"          Runoff depth          208.067    245.593    210.319    mm"
"          Runoff volume         1.0757     0.0810     1.1568     ha-m"
"          Runoff coefficient    0.730      0.862      0.738      "
"          Maximum flow          0.713      0.042      0.754      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                 0.754     0.754     0.737     0.737"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                 0.754     0.754     0.754     0.737"
" 40       HYDROGRAPH   Combine    2"
"        6   Combine "
"        2   Node #"
"            Total to Creek"
"          Maximum flow                    0.754    c.m/sec"
"          Hydrograph volume           11567.516    c.m"
"                 0.754     0.754     0.754     0.754"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                 0.754     0.000     0.754     0.754"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                 0.754     0.000     0.754     0.754"
" 33       CATCHMENT 30"
```



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"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       30   30 - Infiltration"
"    0.000   % Impervious"
"    3.060   Total Area"
"  100.000   Flow length"
"    4.000   Overland Slope"
"    3.060   Pervious Area"
"  100.000   Pervious length"
"    4.000   Pervious slope"
"    0.000   Impervious Area"
"    0.000   Impervious length"
"    4.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.730   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"
"                 0.429     0.000     0.754     0.754 c.m/sec"
"          Catchment 30          Pervious   Impervious Total Area "
"          Surface Area          3.060      0.000      3.060      hectare"
"          Time of concentration 26.785     0.001      26.785     minutes"
"          Time to Centroid      2526.281   2268.083   2526.282   minutes"
"          Rainfall depth        284.997    284.997    284.997    mm"
"          Rainfall volume       8720.91    0.01       8720.92    c.m"
"          Rainfall losses       76.985     33.597     76.985     mm"
"          Runoff depth          208.012    251.400    208.012    mm"
"          Runoff volume         6365.16    0.01       6365.17    c.m"
"          Runoff coefficient    0.730      0.000      0.730      "
"          Maximum flow          0.429      0.000      0.429      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                 0.429     0.429     0.754     0.754"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                 0.429     0.429     0.429     0.754"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                    0.429    c.m/sec"
"          Hydrograph volume            6365.167    c.m"
"                 0.429     0.429     0.429     0.429"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                 0.429     0.000     0.429     0.429"
" 33       CATCHMENT 40"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       40   40 - South East Flow Off-Site"
"    0.000   % Impervious"
"    1.070   Total Area"
"   60.000   Flow length"
"    2.000   Overland Slope"
"    1.070   Pervious Area"
"   60.000   Pervious length"
```

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"      2.000   Pervious slope"
"      0.000   Impervious Area"
"      0.000   Impervious length"
"      2.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.731   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"
"                0.150     0.000     0.429     0.429 c.m/sec"
"           Catchment 40           Pervious   Impervious Total Area "
"           Surface Area           1.070      0.000      1.070      hectare"
"           Time of concentration  24.271     0.001      24.271     minutes"
"           Time to Centroid       2522.843   2268.077   2522.842   minutes"
"           Rainfall depth         284.997    284.997    284.997    mm"
"           Rainfall volume        3049.47    0.00       3049.47    c.m"
"           Rainfall losses        76.782     33.592     76.782     mm"
"           Runoff depth           208.215    251.405    208.215    mm"
"           Runoff volume          2227.90    0.00       2227.90    c.m"
"           Runoff coefficient     0.731      0.000      0.731      "
"           Maximum flow           0.150      0.000      0.150      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                0.150     0.150     0.429     0.429"
" 40        HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                0.150     0.150     0.150     0.429"
" 40        HYDROGRAPH   Combine    4"
"         6   Combine "
"         4   Node #"
"             Total to Off-Site"
"           Maximum flow                 0.150    c.m/sec"
"           Hydrograph volume          2227.904    c.m"
"                0.150     0.150     0.150     0.150"
" 40        HYDROGRAPH Start - New Tributary"
"         2   Start - New Tributary"
"                0.150     0.000     0.150     0.150"
" 33        CATCHMENT 41"
"         1   Triangular SCS"
"         2   Proportional to %"
"         1   SCS method"
"        41   41 -South West Flow Off Site"
"      0.000   % Impervious"
"      3.180   Total Area"
"    185.000   Flow length"
"      4.000   Overland Slope"
"      3.180   Pervious Area"
"    185.000   Pervious length"
"      4.000   Pervious slope"
"      0.000   Impervious Area"
"      0.000   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.730   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"
"                0.445     0.000     0.150     0.150 c.m/sec"
"           Catchment 41           Pervious   Impervious Total Area "
"           Surface Area           3.180      0.000      3.180      hectare"
"           Time of concentration  38.743     0.002      38.743     minutes"
"           Time to Centroid       2543.007   2268.113   2543.007   minutes"
"           Rainfall depth         284.997    284.997    284.997    mm"
"           Rainfall volume        9062.91    0.01       9062.92    c.m"
"           Rainfall losses        76.829     33.619     76.829     mm"
"           Runoff depth           208.168    251.379    208.168    mm"
"           Runoff volume          6619.73    0.01       6619.74    c.m"
"           Runoff coefficient     0.730      0.000      0.730      "
"           Maximum flow           0.445      0.000      0.445      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                0.445     0.445     0.150     0.150"
" 40        HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                0.445     0.445     0.445     0.150"
" 40        HYDROGRAPH   Combine    4"
"         6   Combine "
"         4   Node #"
"             Total to Off-Site"
"           Maximum flow                 0.584    c.m/sec"
"           Hydrograph volume          8847.645    c.m"
"                0.445     0.445     0.445     0.584"
" 40        HYDROGRAPH Start - New Tributary"
"         2   Start - New Tributary"
"                0.445     0.000     0.445     0.584"
" 33        CATCHMENT 42"
"         1   Triangular SCS"
"         2   Proportional to %"
"         1   SCS method"
"        42   42 - West Flow Off Site"
"      0.000   % Impervious"
"      0.690   Total Area"
"     20.000   Flow length"
"      4.000   Overland Slope"
"      0.690   Pervious Area"
"     20.000   Pervious length"
"      4.000   Pervious slope"
"      0.000   Impervious Area"
"      0.000   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.729   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"
"                0.094     0.000     0.445     0.584 c.m/sec"
"           Catchment 42           Pervious   Impervious Total Area "
"           Surface Area           0.690      0.000      0.690      hectare"
"           Time of concentration  10.198     0.000      10.198     minutes"
"           Time to Centroid       2503.287   2268.042   2503.287   minutes"
"           Rainfall depth         284.997    284.997    284.997    mm"
```

```
"          Rainfall volume        1966.48    0.00       1966.48    c.m"
"          Rainfall losses        77.330     33.567     77.330     mm"
"          Runoff depth           207.667    251.431    207.667    mm"
"          Runoff volume          1432.90    0.00       1432.90    c.m"
"          Runoff coefficient     0.729      0.000      0.729      "
"          Maximum flow           0.094      0.000      0.094      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.094     0.094     0.445     0.584"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.094     0.094     0.094     0.584"
" 40       HYDROGRAPH   Combine    4"
"        6   Combine "
"        4   Node #"
"            Total to Off-Site"
"          Maximum flow                  0.677    c.m/sec"
"          Hydrograph volume          10280.551    c.m"
"                0.094     0.094     0.094     0.677"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.094     0.000     0.094     0.677"
" 33       CATCHMENT 50"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       50   50 - Flow to Golf Course"
"    7.000   % Impervious"
"    2.010   Total Area"
"   45.000   Flow length"
"    3.000   Overland Slope"
"    1.869   Pervious Area"
"   45.000   Pervious length"
"    3.000   Pervious slope"
"    0.141   Impervious Area"
"    3.387   Impervious length"
"    3.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.728   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."
"    0.858   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.278     0.000     0.094     0.677 c.m/sec"
"          Catchment 50           Pervious   Impervious Total Area "
"          Surface Area           1.869      0.141      2.010      hectare"
"          Time of concentration  18.084     0.684      16.665     minutes"
"          Time to Centroid       2513.316   2230.543   2490.258   minutes"
"          Rainfall depth         284.997    284.997    284.997    mm"
"          Rainfall volume        5327.45    400.99     5728.45    c.m"
"          Rainfall losses        77.589     40.350     74.983     mm"
"          Runoff depth           207.408    244.647    210.015    mm"
"          Runoff volume          3877.07    344.22     4221.29    c.m"
"          Runoff coefficient     0.728      0.858      0.737      "
"          Maximum flow           0.260      0.018      0.278      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.278     0.278     0.094     0.677"
" 40       HYDROGRAPH Copy to Outflow"
```



```
"        8   Copy to Outflow"
"                0.278     0.278     0.278     0.677"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                  0.699    c.m/sec"
"          Hydrograph volume          10586.460    c.m"
"                0.278     0.278     0.278     0.699"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.278     0.000     0.278     0.699"
" 33       CATCHMENT 60"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"       60   60-Infiltration on Golf Course"
"    0.000   % Impervious"
"    0.550   Total Area"
"   45.000   Flow length"
"    3.000   Overland Slope"
"    0.550   Pervious Area"
"   45.000   Pervious length"
"    3.000   Pervious slope"
"    0.000   Impervious Area"
"    0.000   Impervious length"
"    3.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.728   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"
"                0.076     0.000     0.278     0.699 c.m/sec"
"          Catchment 60           Pervious   Impervious Total Area "
"          Surface Area           0.550      0.000      0.550      hectare"
"          Time of concentration  18.084     0.001      18.084     minutes"
"          Time to Centroid       2513.316   2268.062   2513.315   minutes"
"          Rainfall depth         284.997    284.997    284.997    mm"
"          Rainfall volume        1567.48    0.00       1567.49    c.m"
"          Rainfall losses        77.589     33.581     77.589     mm"
"          Runoff depth           207.408    251.416    207.408    mm"
"          Runoff volume          1140.74    0.00       1140.74    c.m"
"          Runoff coefficient     0.728      0.000      0.728      "
"          Maximum flow           0.076      0.000      0.076      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.076     0.076     0.278     0.699"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.076     0.076     0.076     0.699"
" 40       HYDROGRAPH   Combine    3"
"        6   Combine "
"        3   Node #"
"            Total to Infiltration"
"          Maximum flow                  0.774    c.m/sec"
"          Hydrograph volume          11727.206    c.m"
"                0.076     0.076     0.076     0.774"
" 38       START/RE-START TOTALS 60"
```

```
"          3.  Runoff Totals on EXIT"
"           Total Catchment area                    21.320    hectare"
"           Total Impervious area                    0.629    hectare"
"           Total % impervious                       2.948"
" 19        EXIT"
```

APPENDIX B:
MIDUSS MODELLING – POST-DEVELOPMENT CONDITIONS

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                        MIDUSS"
"                Output filename:                 218173- PostDev-Nov7-2yr.out"
"                Licensee name:                                           GMBP"
"                Company                              Hewlett-Packard Company"
"                Date & Time last used:               11/7/2019 at 3:51:56 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     2400.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"       38.800   Rainfall depth"
"      360.000   Duration"
"           47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            61.945    mm/hr"
"            Total depth                  38.800    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          100   100- Wilder Lake South"
"       10.000   % Impervious"
"        4.250   Total Area"
"       70.000   Flow length"
"        4.000   Overland Slope"
"        3.825   Pervious Area"
"       70.000   Pervious length"
"        4.000   Pervious slope"
"        0.425   Impervious Area"
"        7.778   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.193   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."
"        0.781   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.065     0.000     0.000     0.000 c.m/sec"
"            Catchment 100          Pervious   Impervious Total Area "
"            Surface Area           3.825      0.425      4.250      hectare"
"            Time of concentration  39.335     0.993      27.427     minutes"
"            Time to Centroid       270.768    197.107    247.892    minutes"
"            Rainfall depth         38.800     38.800     38.800     mm"
"            Rainfall volume        1484.10    164.90     1649.00    c.m"
"            Rainfall losses        31.321     8.480      29.037     mm"
"            Runoff depth           7.479      30.320     9.763      mm"
"            Runoff volume          286.07     128.86     414.93     c.m"
"            Runoff coefficient     0.193      0.781      0.252      "
"            Maximum flow           0.055      0.059      0.065      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.065     0.065     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.065     0.065     0.065     0.000"
" 40         HYDROGRAPH   Combine    6"
"            6   Combine "
"            6   Node #"
"                "
"            Maximum flow                 0.065    c.m/sec"
"            Hydrograph volume          414.928    c.m"
"                  0.065     0.065     0.065     0.065"
" 40         HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.065     0.000     0.065     0.065"
" 33         CATCHMENT 101"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          101   101 - Developed Area South"
"       30.000   % Impervious"
"        4.890   Total Area"
"       75.000   Flow length"
"        2.000   Overland Slope"
"        3.423   Pervious Area"
"       75.000   Pervious length"
"        2.000   Pervious slope"
"        1.467   Impervious Area"
"       32.143   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.193   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."
"        0.855   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.206     0.000     0.065     0.065 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           3.423      1.467      4.890      hectare"
"            Time of concentration  50.473     2.864      19.267     minutes"
"            Time to Centroid       284.422    199.367    228.671    minutes"
"            Rainfall depth         38.800     38.800     38.800     mm"
"            Rainfall volume        1328.12    569.20     1897.32    c.m"
"            Rainfall losses        31.322     5.607      23.608     mm"
"            Runoff depth           7.478      33.193     15.192     mm"
"            Runoff volume          255.96     486.95     742.91     c.m"
"            Runoff coefficient     0.193      0.855      0.392      "
"            Maximum flow           0.042      0.202      0.206      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.206     0.206     0.065     0.065"
" 54         POND DESIGN"
"       0.206   Current peak flow    c.m/sec"
"       0.080   Target outflow    c.m/sec"
"       742.9   Hydrograph volume    c.m"
"         12.   Number of stages"
"     423.000   Minimum water level    metre"
"     425.750   Maximum water level    metre"
"     423.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
```

```
"          423.000     0.000     0.000"
"          423.250  1.00E-04    15.300"
"          423.500   0.00020    68.600"
"          423.750   0.00030   162.000"
"          424.000   0.00040   284.900"
"          424.250   0.00050   438.500"
"          424.500   0.00060   624.800"
"          424.750   0.03550   845.500"
"          425.000   0.03910  1102.500"
"          425.250   0.04240  1397.400"
"          425.500   0.04540  1731.900"
"          425.750     1.114  2108.600"
"       Peak outflow                0.008    c.m/sec"
"       Maximum level             424.556    metre"
"       Maximum storage           674.222    c.m"
"       Centroidal lag            174.511   hours"
"            0.206     0.206     0.008     0.065 c.m/sec"
" 40    HYDROGRAPH   Combine    6"
"      6   Combine "
"      6   Node #"
"          "
"       Maximum flow                0.065    c.m/sec"
"       Hydrograph volume         591.041    c.m"
"            0.206     0.206     0.008     0.065"
" 40    HYDROGRAPH Start - New Tributary"
"      2   Start - New Tributary"
"            0.206     0.000     0.008     0.065"
" 33    CATCHMENT 102"
"      1   Triangular SCS"
"      2   Proportional to %"
"      1   SCS method"
"    102   102 - Developed Area North"
"   30.000   % Impervious"
"    0.900   Total Area"
"   45.000   Flow length"
"    2.000   Overland Slope"
"    0.630   Pervious Area"
"   45.000   Pervious length"
"    2.000   Pervious slope"
"    0.270   Impervious Area"
"   19.286   Impervious length"
"    2.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.193   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."
"    0.838   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"            0.039     0.000     0.008     0.065 c.m/sec"
"       Catchment 102          Pervious   Impervious Total Area "
"       Surface Area           0.630      0.270      0.900      hectare"
"       Time of concentration  37.149     2.108      14.351     minutes"
"       Time to Centroid       268.079    197.933    222.441    minutes"
"       Rainfall depth         38.800     38.800     38.800     mm"
"       Rainfall volume        244.44     104.76     349.20     c.m"
"       Rainfall losses        31.319     6.296      23.812     mm"
"       Runoff depth           7.481      32.504     14.988     mm"
"       Runoff volume          47.13      87.76      134.89     c.m"
"       Runoff coefficient     0.193      0.838      0.386      "
```



```
"       Maximum flow            0.009     0.038     0.039     c.m/sec"
" 40    HYDROGRAPH Add Runoff "
"      4   Add Runoff "
"            0.039     0.039     0.008     0.065"
" 54    POND DESIGN"
"   0.039   Current peak flow    c.m/sec"
"   0.030   Target outflow    c.m/sec"
"   134.9   Hydrograph volume    c.m"
"     11.   Number of stages"
" 423.200   Minimum water level    metre"
" 424.850   Maximum water level    metre"
" 423.200   Starting water level    metre"
"       0   Keep Design Data: 1 = True; 0 = False"
"             Level Discharge    Volume"
"          423.350     0.000     0.000"
"          423.500  1.00E-05     9.800"
"          423.650  2.00E-05    24.900"
"          423.800  3.00E-05    45.600"
"          423.950  4.00E-05    72.300"
"          424.100  5.00E-05   105.600"
"          424.250  6.00E-05   145.700"
"          424.400   0.01320   193.300"
"          424.550   0.01548   248.600"
"          424.700   0.01746   312.100"
"          424.850    0.5145   384.400"
"       Peak outflow                0.000    c.m/sec"
"       Maximum level             424.205    metre"
"       Maximum storage           133.770    c.m"
"       Centroidal lag            441.029   hours"
"            0.039     0.039     0.000     0.065 c.m/sec"
" 40    HYDROGRAPH   Combine    6"
"      6   Combine "
"      6   Node #"
"          "
"       Maximum flow                0.065    c.m/sec"
"       Hydrograph volume         598.502    c.m"
"            0.039     0.039     0.000     0.065"
" 40    HYDROGRAPH Start - New Tributary"
"      2   Start - New Tributary"
"            0.039     0.000     0.000     0.065"
" 33    CATCHMENT 200"
"      1   Triangular SCS"
"      2   Proportional to %"
"      1   SCS method"
"    200   200 - Creek"
"   11.000   % Impervious"
"    4.210   Total Area"
"   75.000   Flow length"
"    5.000   Overland Slope"
"    3.747   Pervious Area"
"   75.000   Pervious length"
"    5.000   Pervious slope"
"    0.463   Impervious Area"
"    9.270   Impervious length"
"    5.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.192   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."
"    0.783   Impervious Runoff coefficient"
```

```
      0.100   Impervious Ia/S coefficient"
      0.518   Impervious Initial abstraction"
                0.071     0.000     0.000     0.065 c.m/sec"
          Catchment 200           Pervious   Impervious Total Area "
          Surface Area            3.747      0.463      4.210      hectare"
          Time of concentration   38.342     1.032      25.855     minutes"
          Time to Centroid        269.563    197.197    245.344    minutes"
          Rainfall depth          38.800     38.800     38.800     mm"
          Rainfall volume         1453.80    179.68     1633.48    c.m"
          Rainfall losses         31.332     8.404      28.810     mm"
          Runoff depth            7.468      30.396     9.990      mm"
          Runoff volume           279.82     140.76     420.59     c.m"
          Runoff coefficient      0.192      0.783      0.257      "
          Maximum flow            0.055      0.065      0.071      c.m/sec"
40        HYDROGRAPH Add Runoff "
        4   Add Runoff "
                0.071     0.071     0.000     0.065"
40        HYDROGRAPH Copy to Outflow"
        8   Copy to Outflow"
                0.071     0.071     0.071     0.065"
40        HYDROGRAPH   Combine    7"
        6   Combine "
        7   Node #"
            Total to Creek"
          Maximum flow                  0.071    c.m/sec"
          Hydrograph volume           420.587    c.m"
                0.071     0.071     0.071     0.071"
40        HYDROGRAPH Start - New Tributary"
        2   Start - New Tributary"
                0.071     0.000     0.071     0.071"
33        CATCHMENT 201"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
      201   201"
   20.000   % Impervious"
    2.150   Total Area"
   45.000   Flow length"
    2.000   Overland Slope"
    1.720   Pervious Area"
   45.000   Pervious length"
    2.000   Pervious slope"
    0.430   Impervious Area"
   11.250   Impervious length"
    2.000   Impervious slope"
    0.250   Pervious Manning 'n'"
   74.000   Pervious SCS Curve No."
    0.193   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."
    0.818   Impervious Runoff coefficient"
    0.100   Impervious Ia/S coefficient"
    0.518   Impervious Initial abstraction"
                0.064     0.000     0.071     0.071 c.m/sec"
          Catchment 201           Pervious   Impervious Total Area "
          Surface Area            1.720      0.430      2.150      hectare"
          Time of concentration   37.149     1.525      18.809     minutes"
          Time to Centroid        268.079    197.542    231.764    minutes"
          Rainfall depth          38.800     38.800     38.800     mm"
          Rainfall volume         667.36     166.84     834.20     c.m"
          Rainfall losses         31.319     7.047      26.465     mm"
```



```
          Runoff depth            7.481      31.753     12.335     mm"
          Runoff volume           128.67     136.54     265.20     c.m"
          Runoff coefficient      0.193      0.818      0.318      "
          Maximum flow            0.026      0.061      0.064      c.m/sec"
40        HYDROGRAPH Add Runoff "
        4   Add Runoff "
                0.064     0.064     0.071     0.071"
40        HYDROGRAPH Copy to Outflow"
        8   Copy to Outflow"
                0.064     0.064     0.064     0.071"
40        HYDROGRAPH   Combine    10"
        6   Combine "
       10   Node #"
            To Pond 201"
          Maximum flow                  0.064    c.m/sec"
          Hydrograph volume           265.205    c.m"
                0.064     0.064     0.064     0.064"
40        HYDROGRAPH Start - New Tributary"
        2   Start - New Tributary"
                0.064     0.000     0.064     0.064"
33        CATCHMENT 400"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
      400   400 - South to Off Site"
    8.000   % Impervious"
    0.990   Total Area"
   75.000   Flow length"
    2.000   Overland Slope"
    0.911   Pervious Area"
   75.000   Pervious length"
    2.000   Pervious slope"
    0.079   Impervious Area"
    6.522   Impervious length"
    2.000   Impervious slope"
    0.250   Pervious Manning 'n'"
   74.000   Pervious SCS Curve No."
    0.193   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."
    0.790   Impervious Runoff coefficient"
    0.100   Impervious Ia/S coefficient"
    0.518   Impervious Initial abstraction"
                0.012     0.000     0.064     0.064 c.m/sec"
          Catchment 400           Pervious   Impervious Total Area "
          Surface Area            0.911      0.079      0.990      hectare"
          Time of concentration   50.473     1.100      37.504     minutes"
          Time to Centroid        284.422    197.305    261.538    minutes"
          Rainfall depth          38.800     38.800     38.800     mm"
          Rainfall volume         353.39     30.73      384.12     c.m"
          Rainfall losses         31.322     8.163      29.470     mm"
          Runoff depth            7.478      30.637     9.330      mm"
          Runoff volume           68.11      24.26      92.37      c.m"
          Runoff coefficient      0.193      0.790      0.240      "
          Maximum flow            0.011      0.011      0.012      c.m/sec"
40        HYDROGRAPH Add Runoff "
        4   Add Runoff "
                0.012     0.012     0.064     0.064"
40        HYDROGRAPH Copy to Outflow"
        8   Copy to Outflow"
                0.012     0.012     0.012     0.064"
```

```
" 40          HYDROGRAPH   Combine     8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                  0.012     c.m/sec"
"            Hydrograph volume            92.371     c.m"
"                   0.012     0.012     0.012     0.012"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.012     0.000     0.012     0.012"
" 33          CATCHMENT 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         401   401 - To Off Site - West"
"       8.000   % Impervious"
"       1.690   Total Area"
"      75.000   Flow length"
"       3.000   Overland Slope"
"       1.555   Pervious Area"
"      75.000   Pervious length"
"       3.000   Pervious slope"
"       0.135   Impervious Area"
"       6.522   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.193   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."
"       0.780   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.022     0.000     0.012     0.012 c.m/sec"
"            Catchment 401          Pervious   Impervious Total Area "
"            Surface Area           1.555      0.135      1.690      hectare"
"            Time of concentration  44.692     0.974      33.304     minutes"
"            Time to Centroid       277.367    197.060    256.448    minutes"
"            Rainfall depth         38.800     38.800     38.800     mm"
"            Rainfall volume        603.26     52.46      655.72     c.m"
"            Rainfall losses        31.325     8.520      29.501     mm"
"            Runoff depth           7.475      30.280     9.299      mm"
"            Runoff volume          116.22     40.94      157.16     c.m"
"            Runoff coefficient     0.193      0.780      0.240      "
"            Maximum flow           0.020      0.019      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.022     0.022     0.012     0.012"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.022     0.022     0.022     0.012"
" 40          HYDROGRAPH   Combine     8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                  0.035     c.m/sec"
"            Hydrograph volume            249.531    c.m"
"                   0.022     0.022     0.022     0.035"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.022     0.000     0.022     0.035"
```



```
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         500   500 - to golf course"
"      25.000   % Impervious"
"       1.690   Total Area"
"      45.000   Flow length"
"       4.000   Overland Slope"
"       1.268   Pervious Area"
"      45.000   Pervious length"
"       4.000   Pervious slope"
"       0.423   Impervious Area"
"      15.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.193   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."
"       0.816   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.063     0.000     0.022     0.035 c.m/sec"
"            Catchment 500          Pervious   Impervious Total Area "
"            Surface Area           1.268      0.423      1.690      hectare"
"            Time of concentration  30.175     1.472      13.383     minutes"
"            Time to Centroid       259.585    197.544    223.290    minutes"
"            Rainfall depth         38.800     38.800     38.800     mm"
"            Rainfall volume        491.79     163.93     655.72     c.m"
"            Rainfall losses        31.315     7.145      25.273     mm"
"            Runoff depth           7.485      31.655     13.527     mm"
"            Runoff volume          94.87      133.74     228.61     c.m"
"            Runoff coefficient     0.193      0.816      0.349      "
"            Maximum flow           0.022      0.060      0.063      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.063     0.063     0.022     0.035"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.063     0.063     0.063     0.035"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"            Maximum flow                  0.126     c.m/sec"
"            Hydrograph volume            493.814    c.m"
"                   0.063     0.063     0.063     0.126"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.063     0.000     0.063     0.126"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         600   600"
"       0.000   % Impervious"
"       0.550   Total Area"
"      30.000   Flow length"
"       4.000   Overland Slope"
"       0.550   Pervious Area"
```

```
"      30.000   Pervious length"
"       4.000   Pervious slope"
"       0.000   Impervious Area"
"       0.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.193   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"
                     0.011     0.000     0.063     0.126 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  23.659     0.001      23.658     minutes"
            Time to Centroid       251.504    194.150    251.504    minutes"
            Rainfall depth         38.800     38.800     38.800     mm"
            Rainfall volume        213.40     0.00       213.40     c.m"
            Rainfall losses        31.317     8.458      31.317     mm"
            Runoff depth           7.483      30.342     7.483      mm"
            Runoff volume          41.15      0.00       41.15      c.m"
            Runoff coefficient     0.193      0.000      0.193      "
            Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.011     0.011     0.063     0.126"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.011     0.011     0.011     0.126"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.128    c.m/sec"
            Hydrograph volume          534.969    c.m"
                     0.011     0.011     0.011     0.128"
" 40        HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.128    c.m/sec"
            Hydrograph volume          534.969    c.m"
                     0.011     0.128     0.011     0.000"
" 54        POND DESIGN"
       0.128   Current peak flow    c.m/sec"
       0.100   Target outflow    c.m/sec"
       535.0   Hydrograph volume    c.m"
         10.   Number of stages"
     423.300   Minimum water level    metre"
     424.500   Maximum water level    metre"
     423.300   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
               423.300     0.000     0.000"
               423.400   0.01126   172.400"
               423.500   0.02640   353.500"
               423.600   0.03737   543.700"
               423.700   0.04577   743.000"
               423.800   0.05281   951.800"
```



```
"              423.900   0.05904  1170.100"
"              424.000    0.3343  1398.300"
"              424.100    0.8324  1636.400"
"              424.200     1.475  1884.800"
"           Peak outflow                    0.023    c.m/sec"
"           Maximum level                 423.475    metre"
"           Maximum storage               307.387    c.m"
"           Centroidal lag                  7.840    hours"
"                0.011     0.128     0.023     0.000 c.m/sec"
" 40        HYDROGRAPH   Combine    7"
"         6   Combine "
"         7   Node #"
"             Total to Creek"
"           Maximum flow                    0.081    c.m/sec"
"           Hydrograph volume             955.447    c.m"
"                0.011     0.128     0.023     0.081"
" 38        START/RE-START TOTALS 10"
"         3   Runoff Totals on EXIT"
"           Total Catchment area                      21.320    hectare"
"           Total Impervious area                      3.692    hectare"
"           Total % impervious                        17.317"
" 19        EXIT"
```

```
"              MIDUSS Output ----------------------------------------------->"
"              MIDUSS version                          Version 2.25  rev. 473"
"              MIDUSS created                       Sunday, February 07, 2010"
"         10   Units used:                                          ie METRIC"
"              Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                      MIDUSS"
"              Output filename:                 218173- PostDev-Oct22-5yr.out"
"              Licensee name:                                            GMBP"
"              Company                              Hewlett-Packard Company"
"              Date & Time last used:              10/22/2019 at 2:59:54 PM"
" 31         TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32         STORM Mass Curve"
"          3   Mass Curve"
"     49.400   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            78.868    mm/hr"
"            Total depth                  49.400    mm"
"          6   005hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 100"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        100   100- Wilder Lake South"
"     10.000   % Impervious"
"      4.250   Total Area"
"     70.000   Flow length"
"      4.000   Overland Slope"
"      3.825   Pervious Area"
"     70.000   Pervious length"
"      4.000   Pervious slope"
"      0.425   Impervious Area"
"      7.778   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.255   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."
"      0.799   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.125     0.000     0.000     0.000 c.m/sec"
"            Catchment 100          Pervious   Impervious Total Area "
"            Surface Area           3.825      0.425      4.250      hectare"
"            Time of concentration  30.929     0.895      23.171     minutes"
"            Time to Centroid       258.231    195.261    241.964    minutes"
"            Rainfall depth         49.400     49.400     49.400     mm"
"            Rainfall volume        1889.55    209.95     2099.50    c.m"
"            Rainfall losses        36.808     9.928      34.120     mm"
"            Runoff depth           12.592     39.472     15.280     mm"
"            Runoff volume          481.64     167.76     649.39     c.m"
"            Runoff coefficient     0.255      0.799      0.309      "
"            Maximum flow           0.115      0.077      0.125      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.125     0.125     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.125     0.125     0.125     0.000"
" 40         HYDROGRAPH   Combine    6"
"          6   Combine "
"          6   Node #"
"              To Wilder Lake"
"            Maximum flow                 0.125    c.m/sec"
"            Hydrograph volume          649.394    c.m"
"                 0.125     0.125     0.125     0.125"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                 0.125     0.000     0.125     0.125"
" 33         CATCHMENT 101"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        101   101 - Developed Area South"
"     30.000   % Impervious"
"      4.890   Total Area"
"     75.000   Flow length"
"      2.000   Overland Slope"
"      3.423   Pervious Area"
"     75.000   Pervious length"
"      2.000   Pervious slope"
"      1.467   Impervious Area"
"     32.143   Impervious length"
"      2.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.255   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."
"      0.875   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.275     0.000     0.125     0.125 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           3.423      1.467      4.890      hectare"
"            Time of concentration  39.688     2.581      17.613     minutes"
"            Time to Centroid       269.223    197.459    226.530    minutes"
"            Rainfall depth         49.400     49.400     49.400     mm"
"            Rainfall volume        1690.96    724.70     2415.66    c.m"
"            Rainfall losses        36.783     6.167      27.598     mm"
"            Runoff depth           12.617     43.233     21.802     mm"
"            Runoff volume          431.87     634.23     1066.10    c.m"
"            Runoff coefficient     0.255      0.875      0.441      "
"            Maximum flow           0.084      0.266      0.275      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.275     0.275     0.125     0.125"
" 54         POND DESIGN"
"      0.275   Current peak flow    c.m/sec"
"      0.080   Target outflow    c.m/sec"
"     1066.1   Hydrograph volume    c.m"
"        12.   Number of stages"
"    423.000   Minimum water level    metre"
"    425.750   Maximum water level    metre"
"    423.000   Starting water level    metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"                Level Discharge    Volume"
```

```
"            423.000     0.000     0.000"
"            423.250  1.00E-04    15.300"
"            423.500   0.00020    68.600"
"            423.750   0.00030   162.000"
"            424.000   0.00040   284.900"
"            424.250   0.00050   438.500"
"            424.500   0.00060   624.800"
"            424.750   0.03550   845.500"
"            425.000   0.03910  1102.500"
"            425.250   0.04240  1397.400"
"            425.500   0.04540  1731.900"
"            425.750     1.114  2108.600"
"         Peak outflow                 0.028    c.m/sec"
"         Maximum level              424.694    metre"
"         Maximum storage            796.257    c.m"
"         Centroidal lag             124.064   hours"
"              0.275     0.275     0.028     0.125 c.m/sec"
" 40      HYDROGRAPH   Combine    6"
"        6   Combine "
"        6   Node #"
"            To Wilder Lake"
"         Maximum flow                 0.125    c.m/sec"
"         Hydrograph volume         1146.508    c.m"
"                0.275     0.275     0.028     0.125"
" 40      HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.275     0.000     0.028     0.125"
" 33      CATCHMENT 102"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      102   102 - Developed Area North"
"   30.000   % Impervious"
"    0.900   Total Area"
"   45.000   Flow length"
"    2.000   Overland Slope"
"    0.630   Pervious Area"
"   45.000   Pervious length"
"    2.000   Pervious slope"
"    0.270   Impervious Area"
"   19.286   Impervious length"
"    2.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.255   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."
"    0.856   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.053     0.000     0.028     0.125 c.m/sec"
"         Catchment 102          Pervious   Impervious Total Area "
"         Surface Area           0.630      0.270      0.900      hectare"
"         Time of concentration  29.211     1.900      13.109     minutes"
"         Time to Centroid       256.003    196.082    220.675    minutes"
"         Rainfall depth         49.400     49.400     49.400     mm"
"         Rainfall volume        311.22     133.38     444.60     c.m"
"         Rainfall losses        36.785     7.116      27.884     mm"
"         Runoff depth           12.615     42.284     21.516     mm"
"         Runoff volume          79.48      114.17     193.64     c.m"
"         Runoff coefficient     0.255      0.856      0.436      "
```



```
"         Maximum flow           0.019      0.050      0.053      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.053     0.053     0.028     0.125"
" 54      POND DESIGN"
"    0.053   Current peak flow    c.m/sec"
"    0.030   Target outflow    c.m/sec"
"    193.6   Hydrograph volume    c.m"
"      11.   Number of stages"
"  423.200   Minimum water level    metre"
"  424.850   Maximum water level    metre"
"  423.200   Starting water level    metre"
"        0   Keep Design Data: 1 = True; 0 = False"
"              Level Discharge    Volume"
"            423.350     0.000     0.000"
"            423.500  1.00E-05     9.800"
"            423.650  2.00E-05    24.900"
"            423.800  3.00E-05    45.600"
"            423.950  4.00E-05    72.300"
"            424.100  5.00E-05   105.600"
"            424.250  6.00E-05   145.700"
"            424.400   0.01320   193.300"
"            424.550   0.01548   248.600"
"            424.700   0.01746   312.100"
"            424.850    0.5145   384.400"
"         Peak outflow                 0.004    c.m/sec"
"         Maximum level              424.297    metre"
"         Maximum storage            160.645    c.m"
"         Centroidal lag             349.496   hours"
"              0.053     0.053     0.004     0.125 c.m/sec"
" 40      HYDROGRAPH   Combine    6"
"        6   Combine "
"        6   Node #"
"            To Wilder Lake"
"         Maximum flow                 0.125    c.m/sec"
"         Hydrograph volume         1200.646    c.m"
"                0.053     0.053     0.004     0.125"
" 40      HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.053     0.000     0.004     0.125"
" 33      CATCHMENT 200"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      200   200 - Creek"
"   11.000   % Impervious"
"    4.210   Total Area"
"   75.000   Flow length"
"    5.000   Overland Slope"
"    3.747   Pervious Area"
"   75.000   Pervious length"
"    5.000   Pervious slope"
"    0.463   Impervious Area"
"    9.270   Impervious length"
"    5.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.255   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."
"    0.801   Impervious Runoff coefficient"
```

```
 0.100   Impervious Ia/S coefficient"
 0.518   Impervious Initial abstraction"
         0.124     0.000     0.004     0.125 c.m/sec"
     Catchment 200          Pervious   Impervious Total Area "
     Surface Area           3.747      0.463      4.210      hectare"
     Time of concentration  30.149     0.930      21.975     minutes"
     Time to Centroid       257.210    195.358    239.907    minutes"
     Rainfall depth         49.400     49.400     49.400     mm"
     Rainfall volume        1850.97    228.77     2079.74    c.m"
     Rainfall losses        36.801     9.810      33.832     mm"
     Runoff depth           12.599     39.590     15.568     mm"
     Runoff volume          472.06     183.34     655.40     c.m"
     Runoff coefficient     0.255      0.801      0.315      "
     Maximum flow           0.113      0.084      0.124      c.m/sec"
40   HYDROGRAPH Add Runoff "
   4   Add Runoff "
         0.124     0.124     0.004     0.125"
40   HYDROGRAPH Copy to Outflow"
   8   Copy to Outflow"
         0.124     0.124     0.124     0.125"
40   HYDROGRAPH   Combine    7"
   6   Combine "
   7   Node #"
       Total to Creek"
     Maximum flow                0.124     c.m/sec"
     Hydrograph volume         655.404     c.m"
         0.124     0.124     0.124     0.124"
40   HYDROGRAPH Start - New Tributary"
   2   Start - New Tributary"
         0.124     0.000     0.124     0.124"
33   CATCHMENT 201"
   1   Triangular SCS"
   2   Proportional to %"
   1   SCS method"
 201   201"
20.000 % Impervious"
 2.150 Total Area"
45.000 Flow length"
 2.000 Overland Slope"
 1.720 Pervious Area"
45.000 Pervious length"
 2.000 Pervious slope"
 0.430 Impervious Area"
11.250 Impervious length"
 2.000 Impervious slope"
 0.250 Pervious Manning 'n'"
74.000 Pervious SCS Curve No."
 0.255 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."
 0.835 Impervious Runoff coefficient"
 0.100 Impervious Ia/S coefficient"
 0.518 Impervious Initial abstraction"
         0.087     0.000     0.124     0.124 c.m/sec"
     Catchment 201          Pervious   Impervious Total Area "
     Surface Area           1.720      0.430      2.150      hectare"
     Time of concentration  29.211     1.375      16.692     minutes"
     Time to Centroid       256.003    195.982    229.008    minutes"
     Rainfall depth         49.400     49.400     49.400     mm"
     Rainfall volume        849.68     212.42     1062.10    c.m"
     Rainfall losses        36.785     8.155      31.059     mm"
```



```
     Runoff depth           12.615     41.245     18.341     mm"
     Runoff volume          216.98     177.35     394.34     c.m"
     Runoff coefficient     0.255      0.835      0.371      "
     Maximum flow           0.052      0.079      0.087      c.m/sec"
40   HYDROGRAPH Add Runoff "
   4   Add Runoff "
         0.087     0.087     0.124     0.124"
40   HYDROGRAPH Copy to Outflow"
   8   Copy to Outflow"
         0.087     0.087     0.087     0.124"
40   HYDROGRAPH   Combine    10"
   6   Combine "
  10   Node #"
       To Pond 201"
     Maximum flow                0.087     c.m/sec"
     Hydrograph volume         394.336     c.m"
         0.087     0.087     0.087     0.087"
40   HYDROGRAPH Start - New Tributary"
   2   Start - New Tributary"
         0.087     0.000     0.087     0.087"
33   CATCHMENT 400"
   1   Triangular SCS"
   2   Proportional to %"
   1   SCS method"
 400   400 - South to Off Site"
 8.000 % Impervious"
 0.990 Total Area"
75.000 Flow length"
 2.000 Overland Slope"
 0.911 Pervious Area"
75.000 Pervious length"
 2.000 Pervious slope"
 0.079 Impervious Area"
 6.522 Impervious length"
 2.000 Impervious slope"
 0.250 Pervious Manning 'n'"
74.000 Pervious SCS Curve No."
 0.255 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."
 0.805 Impervious Runoff coefficient"
 0.100 Impervious Ia/S coefficient"
 0.518 Impervious Initial abstraction"
         0.024     0.000     0.087     0.087 c.m/sec"
     Catchment 400          Pervious   Impervious Total Area "
     Surface Area           0.911      0.079      0.990      hectare"
     Time of concentration  39.688     0.991      31.362     minutes"
     Time to Centroid       269.223    195.516    253.366    minutes"
     Rainfall depth         49.400     49.400     49.400     mm"
     Rainfall volume        449.94     39.12      489.06     c.m"
     Rainfall losses        36.783     9.628      34.611     mm"
     Runoff depth           12.617     39.772     14.789     mm"
     Runoff volume          114.91     31.50      146.41     c.m"
     Runoff coefficient     0.255      0.805      0.299      "
     Maximum flow           0.022      0.014      0.024      c.m/sec"
40   HYDROGRAPH Add Runoff "
   4   Add Runoff "
         0.024     0.024     0.087     0.087"
40   HYDROGRAPH Copy to Outflow"
   8   Copy to Outflow"
         0.024     0.024     0.024     0.087"
```

```
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.024    c.m/sec"
"            Hydrograph volume          146.413    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 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         401   401 - To Off Site - West"
"       8.000   % Impervious"
"       1.690   Total Area"
"      75.000   Flow length"
"       3.000   Overland Slope"
"       1.555   Pervious Area"
"      75.000   Pervious length"
"       3.000   Pervious slope"
"       0.135   Impervious Area"
"       6.522   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.255   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."
"       0.798   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.045     0.000     0.024     0.024 c.m/sec"
"            Catchment 401          Pervious   Impervious Total Area "
"            Surface Area           1.555      0.135      1.690      hectare"
"            Time of concentration  35.142     0.878      27.825     minutes"
"            Time to Centroid       263.458    195.210    248.884    minutes"
"            Rainfall depth         49.400     49.400     49.400     mm"
"            Rainfall volume        768.07     66.79      834.86     c.m"
"            Rainfall losses        36.780     9.990      34.637     mm"
"            Runoff depth           12.620     39.410     14.763     mm"
"            Runoff volume          196.22     53.28      249.50     c.m"
"            Runoff coefficient     0.255      0.798      0.299      "
"            Maximum flow           0.042      0.024      0.045      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.045     0.045     0.024     0.024"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.045     0.045     0.045     0.024"
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.069    c.m/sec"
"            Hydrograph volume          395.912    c.m"
"                   0.045     0.045     0.045     0.069"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.045     0.000     0.045     0.069"
```



```
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         500   500 - to golf course"
"      25.000   % Impervious"
"       1.690   Total Area"
"      45.000   Flow length"
"       4.000   Overland Slope"
"       1.268   Pervious Area"
"      45.000   Pervious length"
"       4.000   Pervious slope"
"       0.423   Impervious Area"
"      15.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.255   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."
"       0.832   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.086     0.000     0.045     0.069 c.m/sec"
"            Catchment 500          Pervious   Impervious Total Area "
"            Surface Area           1.268      0.423      1.690      hectare"
"            Time of concentration  23.727     1.327      12.059     minutes"
"            Time to Centroid       249.003    195.959    221.372    minutes"
"            Rainfall depth         49.400     49.400     49.400     mm"
"            Rainfall volume        626.15     208.72     834.86     c.m"
"            Rainfall losses        36.801     8.305      29.677     mm"
"            Runoff depth           12.599     41.095     19.723     mm"
"            Runoff volume          159.69     173.63     333.32     c.m"
"            Runoff coefficient     0.255      0.832      0.399      "
"            Maximum flow           0.043      0.077      0.086      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.086     0.086     0.045     0.069"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.086     0.086     0.086     0.069"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"            Maximum flow                 0.172    c.m/sec"
"            Hydrograph volume          727.653    c.m"
"                   0.086     0.086     0.086     0.172"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.086     0.000     0.086     0.172"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         600   600"
"       0.000   % Impervious"
"       0.550   Total Area"
"      30.000   Flow length"
"       4.000   Overland Slope"
"       0.550   Pervious Area"
```

```
"      30.000   Pervious length"
"       4.000   Pervious slope"
"       0.000   Impervious Area"
"       0.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.254   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"
                     0.021     0.000     0.086     0.172 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  18.603     0.001      18.603     minutes"
            Time to Centroid       242.576    192.686    242.576    minutes"
            Rainfall depth         49.400     49.400     49.400     mm"
            Rainfall volume        271.70     0.00       271.70     c.m"
            Rainfall losses        36.868     9.628      36.868     mm"
            Runoff depth           12.532     39.772     12.532     mm"
            Runoff volume          68.93      0.00       68.93      c.m"
            Runoff coefficient     0.254      0.000      0.254      "
            Maximum flow           0.021      0.000      0.021      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.021     0.021     0.086     0.172"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.021     0.021     0.021     0.172"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.178    c.m/sec"
            Hydrograph volume          796.581    c.m"
                     0.021     0.021     0.021     0.178"
" 40        HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.178    c.m/sec"
            Hydrograph volume          796.581    c.m"
                     0.021     0.178     0.021     0.000"
" 54        POND DESIGN"
       0.178   Current peak flow    c.m/sec"
       0.100   Target outflow    c.m/sec"
       796.6   Hydrograph volume    c.m"
         10.   Number of stages"
     423.300   Minimum water level    metre"
     424.500   Maximum water level    metre"
     423.300   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
               423.300     0.000     0.000"
               423.400   0.01130   172.400"
               423.500   0.02640   353.500"
               423.600   0.03737   543.700"
               423.700   0.04577   743.000"
               423.800   0.05281   951.800"
```



```
"              423.900   0.05904  1170.100"
"              424.000    0.3343  1398.300"
"              424.100    0.8324  1636.400"
"              424.200     1.475  1884.800"
"        Peak outflow                    0.033    c.m/sec"
"        Maximum level                 423.559    metre"
"        Maximum storage               465.065    c.m"
"        Centroidal lag                  7.632   hours"
"            0.021     0.178     0.033     0.000 c.m/sec"
" 40     HYDROGRAPH   Combine    7"
"      6   Combine "
"      7   Node #"
"          Total to Creek"
"        Maximum flow                    0.152    c.m/sec"
"        Hydrograph volume            1451.910    c.m"
"                0.021     0.178     0.033     0.152"
" 38     START/RE-START TOTALS 10"
"      3   Runoff Totals on EXIT"
"        Total Catchment area                      21.320    hectare"
"        Total Impervious area                      3.692    hectare"
"        Total % impervious                        17.317"
" 19     EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                       MIDUSS"
"                Output filename:                 218173- PostDev-Oct22-10yr.out"
"                Licensee name:                                          GMBP"
"                Company                                 Hewlett-Packard Company"
"                Date & Time last used:                 10/22/2019 at 2:58:31 PM"
" 31          TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     2400.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"       56.400   Rainfall depth"
"      360.000   Duration"
"           47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity            90.044    mm/hr"
"            Total depth                  56.400    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          100   100- Wilder Lake South"
"       10.000   % Impervious"
"        4.250   Total Area"
"       70.000   Flow length"
"        4.000   Overland Slope"
"        3.825   Pervious Area"
"       70.000   Pervious length"
"        4.000   Pervious slope"
"        0.425   Impervious Area"
"        7.778   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   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."
"        0.806   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.165     0.000     0.000     0.000 c.m/sec"
"            Catchment 100          Pervious   Impervious Total Area "
"            Surface Area           3.825      0.425      4.250      hectare"
"            Time of concentration  27.484     0.846      21.228     minutes"
"            Time to Centroid       252.653    194.303    238.950    minutes"
"            Rainfall depth         56.400     56.400     56.400     mm"
"            Rainfall volume        2157.30    239.70     2397.00    c.m"
"            Rainfall losses        39.936     10.920     37.035     mm"
"            Runoff depth           16.464     45.480     19.365     mm"
"            Runoff volume          629.74     193.29     823.03     c.m"
"            Runoff coefficient     0.292      0.806      0.343      "
"            Maximum flow           0.153      0.088      0.165      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.165     0.165     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.165     0.165     0.165     0.000"
" 40         HYDROGRAPH   Combine    6"
"           6   Combine "
"           6   Node #"
"               To Wilder Lake"
"            Maximum flow                 0.165    c.m/sec"
"            Hydrograph volume          823.033    c.m"
"                  0.165     0.165     0.165     0.165"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.165     0.000     0.165     0.165"
" 33         CATCHMENT 101"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         101   101 - Developed Area South"
"      30.000   % Impervious"
"       4.890   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       3.423   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       1.467   Impervious Area"
"      32.143   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.292   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."
"       0.884   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.324     0.000     0.165     0.165 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           3.423      1.467      4.890      hectare"
"            Time of concentration  35.267     2.440      16.730     minutes"
"            Time to Centroid       262.591    196.450    225.242    minutes"
"            Rainfall depth         56.400     56.400     56.400     mm"
"            Rainfall volume        1930.57    827.39     2757.96    c.m"
"            Rainfall losses        39.937     6.570      29.927     mm"
"            Runoff depth           16.463     49.830     26.473     mm"
"            Runoff volume          563.53     731.01     1294.55    c.m"
"            Runoff coefficient     0.292      0.884      0.469      "
"            Maximum flow           0.121      0.307      0.324      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.324     0.324     0.165     0.165"
" 54         POND DESIGN"
"       0.324   Current peak flow    c.m/sec"
"       0.080   Target outflow    c.m/sec"
"      1294.5   Hydrograph volume    c.m"
"         12.   Number of stages"
"     423.000   Minimum water level    metre"
"     425.750   Maximum water level    metre"
"     423.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
```

```
            423.000      0.000      0.000"
            423.250   1.00E-04     15.300"
            423.500    0.00020     68.600"
            423.750    0.00030    162.000"
            424.000    0.00040    284.900"
            424.250    0.00050    438.500"
            424.500    0.00060    624.800"
            424.750    0.03550    845.500"
            425.000    0.03910   1102.500"
            425.250    0.04240   1397.400"
            425.500    0.04540   1731.900"
            425.750      1.114   2108.600"
        Peak outflow                  0.036    c.m/sec"
        Maximum level               424.818    metre"
        Maximum storage             915.326    c.m"
        Centroidal lag              103.601   hours"
             0.324      0.324      0.036      0.165 c.m/sec"
40      HYDROGRAPH   Combine     6"
      6   Combine "
      6   Node #"
          To Wilder Lake"
        Maximum flow                  0.178    c.m/sec"
        Hydrograph volume          1547.189    c.m"
             0.324      0.324      0.036      0.178"
40      HYDROGRAPH Start - New Tributary"
      2   Start - New Tributary"
             0.324      0.000      0.036      0.178"
33      CATCHMENT 102"
      1   Triangular SCS"
      2   Proportional to %"
      1   SCS method"
    102   102 - Developed Area North"
 30.000   % Impervious"
  0.900   Total Area"
 45.000   Flow length"
  2.000   Overland Slope"
  0.630   Pervious Area"
 45.000   Pervious length"
  2.000   Pervious slope"
  0.270   Impervious Area"
 19.286   Impervious length"
  2.000   Impervious slope"
  0.250   Pervious Manning 'n'"
 74.000   Pervious SCS Curve No."
  0.291   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."
  0.864   Impervious Runoff coefficient"
  0.100   Impervious Ia/S coefficient"
  0.518   Impervious Initial abstraction"
             0.062      0.000      0.036      0.178 c.m/sec"
        Catchment 102          Pervious   Impervious Total Area "
        Surface Area           0.630      0.270      0.900      hectare"
        Time of concentration  25.957     1.796      12.427     minutes"
        Time to Centroid       250.709    195.198    219.622    minutes"
        Rainfall depth         56.400     56.400     56.400     mm"
        Rainfall volume        355.32     152.28     507.60     c.m"
        Rainfall losses        39.988     7.660      30.290     mm"
        Runoff depth           16.412     48.740     26.110     mm"
        Runoff volume          103.39     131.60     234.99     c.m"
        Runoff coefficient     0.291      0.864      0.463      "
```



```
        Maximum flow                  0.026      0.057      0.062      c.m/sec"
40      HYDROGRAPH Add Runoff "
      4   Add Runoff "
             0.062      0.062      0.036      0.178"
54      POND DESIGN"
  0.062   Current peak flow    c.m/sec"
  0.030   Target outflow    c.m/sec"
  235.0   Hydrograph volume    c.m"
    11.   Number of stages"
423.200   Minimum water level    metre"
424.850   Maximum water level    metre"
423.200   Starting water level    metre"
      0   Keep Design Data: 1 = True; 0 = False"
            Level Discharge    Volume"
        423.350      0.000      0.000"
        423.500   1.00E-05      9.800"
        423.650   2.00E-05     24.900"
        423.800   3.00E-05     45.600"
        423.950   4.00E-05     72.300"
        424.100   5.00E-05    105.600"
        424.250   6.00E-05    145.700"
        424.400    0.01320    193.300"
        424.550    0.01548    248.600"
        424.700    0.01746    312.100"
        424.850     0.5145    384.400"
        Peak outflow                  0.008    c.m/sec"
        Maximum level               424.335    metre"
        Maximum storage             172.668    c.m"
        Centroidal lag                6.976   hours"
             0.062      0.062      0.008      0.178 c.m/sec"
40      HYDROGRAPH   Combine     6"
      6   Combine "
      6   Node #"
          To Wilder Lake"
        Maximum flow                  0.178    c.m/sec"
        Hydrograph volume          1642.706    c.m"
             0.062      0.062      0.008      0.178"
40      HYDROGRAPH Start - New Tributary"
      2   Start - New Tributary"
             0.062      0.000      0.008      0.178"
33      CATCHMENT 200"
      1   Triangular SCS"
      2   Proportional to %"
      1   SCS method"
    200   200 - Creek"
 11.000   % Impervious"
  4.210   Total Area"
 75.000   Flow length"
  5.000   Overland Slope"
  3.747   Pervious Area"
 75.000   Pervious length"
  5.000   Pervious slope"
  0.463   Impervious Area"
  9.270   Impervious length"
  5.000   Impervious slope"
  0.250   Pervious Manning 'n'"
 74.000   Pervious SCS Curve No."
  0.292   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."
  0.809   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.166     0.000     0.008     0.178 c.m/sec"
"             Catchment 200           Pervious   Impervious Total Area "
"             Surface Area            3.747      0.463      4.210      hectare"
"             Time of concentration   26.791     0.879      20.174     minutes"
"             Time to Centroid        251.765    194.407    237.117    minutes"
"             Rainfall depth          56.400     56.400     56.400     mm"
"             Rainfall volume         2113.25    261.19     2374.44    c.m"
"             Rainfall losses         39.957     10.774     36.747     mm"
"             Runoff depth            16.443     45.626     19.653     mm"
"             Runoff volume           616.10     211.29     827.39     c.m"
"             Runoff coefficient      0.292      0.809      0.348      "
"             Maximum flow            0.152      0.096      0.166      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.166     0.166     0.008     0.178"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.166     0.166     0.166     0.178"
" 40          HYDROGRAPH   Combine    7"
"           6   Combine "
"           7   Node #"
"               Total to Creek"
"             Maximum flow                 0.166    c.m/sec"
"             Hydrograph volume            827.392  c.m"
"                0.166     0.166     0.166     0.166"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.166     0.000     0.166     0.166"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   201"
"      20.000   % Impervious"
"       2.150   Total Area"
"      45.000   Flow length"
"       2.000   Overland Slope"
"       1.720   Pervious Area"
"      45.000   Pervious length"
"       2.000   Pervious slope"
"       0.430   Impervious Area"
"      11.250   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.291   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."
"       0.842   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                0.104     0.000     0.166     0.166 c.m/sec"
"             Catchment 201           Pervious   Impervious Total Area "
"             Surface Area            1.720      0.430      2.150      hectare"
"             Time of concentration   25.957     1.300      15.610     minutes"
"             Time to Centroid        250.709    195.141    227.391    minutes"
"             Rainfall depth          56.400     56.400     56.400     mm"
"             Rainfall volume         970.08     242.52     1212.60    c.m"
"             Rainfall losses         39.988     8.936      33.778     mm"
```



```
"             Runoff depth            16.412     47.465     22.622     mm"
"             Runoff volume           282.28     204.10     486.38     c.m"
"             Runoff coefficient      0.291      0.842      0.401      "
"             Maximum flow            0.072      0.090      0.104      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.104     0.104     0.166     0.166"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.104     0.104     0.104     0.166"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"             Maximum flow                 0.104    c.m/sec"
"             Hydrograph volume            486.376  c.m"
"                0.104     0.104     0.104     0.104"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.104     0.000     0.104     0.104"
" 33          CATCHMENT 400"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         400   400 - South to Off Site"
"       8.000   % Impervious"
"       0.990   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       0.911   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       0.079   Impervious Area"
"       6.522   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.292   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."
"       0.813   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                0.034     0.000     0.104     0.104 c.m/sec"
"             Catchment 400           Pervious   Impervious Total Area "
"             Surface Area            0.911      0.079      0.990      hectare"
"             Time of concentration   35.267     0.937      28.573     minutes"
"             Time to Centroid        262.591    194.568    249.327    minutes"
"             Rainfall depth          56.400     56.400     56.400     mm"
"             Rainfall volume         513.69     44.67      558.36     c.m"
"             Rainfall losses         39.937     10.543     37.585     mm"
"             Runoff depth            16.463     45.857     18.815     mm"
"             Runoff volume           149.95     36.32      186.26     c.m"
"             Runoff coefficient      0.292      0.813      0.334      "
"             Maximum flow            0.032      0.016      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.034     0.034     0.104     0.104"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.034     0.034     0.034     0.104"
```

```
" 40          HYDROGRAPH    Combine     8"
"           6   Combine "
"           8   Node #"
               Total to Off-Site"
            Maximum flow                  0.034     c.m/sec"
            Hydrograph volume           186.265     c.m"
                    0.034     0.034     0.034     0.034"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
                    0.034     0.000     0.034     0.034"
" 33          CATCHMENT 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
         401   401 - To Off Site - West"
       8.000   % Impervious"
       1.690   Total Area"
      75.000   Flow length"
       3.000   Overland Slope"
       1.555   Pervious Area"
      75.000   Pervious length"
       3.000   Pervious slope"
       0.135   Impervious Area"
       6.522   Impervious length"
       3.000   Impervious slope"
       0.250   Pervious Manning 'n'"
      74.000   Pervious SCS Curve No."
       0.292   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."
       0.805   Impervious Runoff coefficient"
       0.100   Impervious Ia/S coefficient"
       0.518   Impervious Initial abstraction"
                    0.063     0.000     0.034     0.034 c.m/sec"
            Catchment 401          Pervious   Impervious Total Area "
            Surface Area           1.555      0.135      1.690      hectare"
            Time of concentration  31.228     0.830      25.342     minutes"
            Time to Centroid       257.476    194.253    245.235    minutes"
            Rainfall depth         56.400     56.400     56.400     mm"
            Rainfall volume        876.91     76.25      953.16     c.m"
            Rainfall losses        39.949     10.975     37.631     mm"
            Runoff depth           16.451     45.425     18.769     mm"
            Runoff volume          255.79     61.41      317.20     c.m"
            Runoff coefficient     0.292      0.805      0.333      "
            Maximum flow           0.059      0.028      0.063      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
                    0.063     0.063     0.034     0.034"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
                    0.063     0.063     0.063     0.034"
" 40          HYDROGRAPH    Combine     8"
"           6   Combine "
"           8   Node #"
               Total to Off-Site"
            Maximum flow                  0.097     c.m/sec"
            Hydrograph volume           503.467     c.m"
                    0.063     0.063     0.063     0.097"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
                    0.063     0.000     0.063     0.097"
```



```
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
         500   500 - to golf course"
      25.000   % Impervious"
       1.690   Total Area"
      45.000   Flow length"
       4.000   Overland Slope"
       1.268   Pervious Area"
      45.000   Pervious length"
       4.000   Pervious slope"
       0.423   Impervious Area"
      15.000   Impervious length"
       4.000   Impervious slope"
       0.250   Pervious Manning 'n'"
      74.000   Pervious SCS Curve No."
       0.292   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."
       0.838   Impervious Runoff coefficient"
       0.100   Impervious Ia/S coefficient"
       0.518   Impervious Initial abstraction"
                    0.103     0.000     0.063     0.097 c.m/sec"
            Catchment 500          Pervious   Impervious Total Area "
            Surface Area           1.268      0.423      1.690      hectare"
            Time of concentration  21.084     1.255      11.381     minutes"
            Time to Centroid       244.388    195.105    220.273    minutes"
            Rainfall depth         56.400     56.400     56.400     mm"
            Rainfall volume        714.87     238.29     953.16     c.m"
            Rainfall losses        39.952     9.121      32.244     mm"
            Runoff depth           16.448     47.279     24.156     mm"
            Runoff volume          208.48     199.75     408.23     c.m"
            Runoff coefficient     0.292      0.838      0.428      "
            Maximum flow           0.061      0.089      0.103      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
                    0.103     0.103     0.063     0.097"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
                    0.103     0.103     0.103     0.097"
" 40          HYDROGRAPH    Combine    10"
"           6   Combine "
          10   Node #"
               To Pond 201"
            Maximum flow                  0.207     c.m/sec"
            Hydrograph volume           894.606     c.m"
                    0.103     0.103     0.103     0.207"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
                    0.103     0.000     0.103     0.207"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
         600   600"
       0.000   % Impervious"
       0.550   Total Area"
      30.000   Flow length"
       4.000   Overland Slope"
       0.550   Pervious Area"
```

```
      30.000   Pervious length"
       4.000   Pervious slope"
       0.000   Impervious Area"
       0.000   Impervious length"
       4.000   Impervious slope"
       0.250   Pervious Manning 'n'"
      74.000   Pervious SCS Curve No."
       0.292   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"
                 0.029     0.000     0.103     0.207 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  16.531     0.000      16.531     minutes"
            Time to Centroid       238.664    191.938    238.664    minutes"
            Rainfall depth         56.400     56.400     56.400     mm"
            Rainfall volume        310.20     0.00       310.20     c.m"
            Rainfall losses        39.948     10.379     39.948     mm"
            Runoff depth           16.452     46.021     16.452     mm"
            Runoff volume          90.48      0.00       90.48      c.m"
            Runoff coefficient     0.292      0.000      0.292      "
            Maximum flow           0.029      0.000      0.029      c.m/sec"
 40         HYDROGRAPH Add Runoff "
          4   Add Runoff "
                 0.029     0.029     0.103     0.207"
 40         HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                 0.029     0.029     0.029     0.207"
 40         HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.225    c.m/sec"
            Hydrograph volume          985.089    c.m"
                 0.029     0.029     0.029     0.225"
 40         HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.225    c.m/sec"
            Hydrograph volume          985.089    c.m"
                 0.029     0.225     0.029     0.000"
 54         POND DESIGN"
       0.225   Current peak flow    c.m/sec"
       0.100   Target outflow    c.m/sec"
       985.1   Hydrograph volume    c.m"
         10.   Number of stages"
     423.300   Minimum water level    metre"
     424.500   Maximum water level    metre"
     423.300   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
               423.300     0.000     0.000"
               423.400   0.01130   172.400"
               423.500   0.02640   353.500"
               423.600   0.03737   543.700"
               423.700   0.04577   743.000"
               423.800   0.05281   951.800"
```



```
               423.900   0.05904  1170.100"
               424.000    0.3343  1398.300"
               424.100    0.8324  1636.400"
               424.200     1.475  1884.800"
            Peak outflow                 0.039    c.m/sec"
            Maximum level              423.621    metre"
            Maximum storage            586.372    c.m"
            Centroidal lag               7.701    hours"
                 0.029     0.225     0.039     0.000 c.m/sec"
 40         HYDROGRAPH   Combine    7"
          6   Combine "
          7   Node #"
              Total to Creek"
            Maximum flow                 0.197    c.m/sec"
            Hydrograph volume         1812.361    c.m"
                 0.029     0.225     0.039     0.197"
 38         START/RE-START TOTALS 10"
          3   Runoff Totals on EXIT"
            Total Catchment area                    21.320    hectare"
            Total Impervious area                    3.692    hectare"
            Total % impervious                      17.317"
 19         EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 07, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                        MIDUSS"
"                Output filename:               218173- PostDev-Oct22-25yr.out"
"                Licensee name:                                            GMBP"
"                Company                              Hewlett-Packard Company"
"                Date & Time last used:               10/22/2019 at 2:57:05 PM"
" 31           TIME PARAMETERS"
"       10.000   Time Step"
"      360.000   Max. Storm length"
"     2400.000   Max. Hydrograph"
" 32           STORM Mass Curve"
"            3   Mass Curve"
"       65.300   Rainfall depth"
"      360.000   Duration"
"           47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"              Maximum intensity           104.253    mm/hr"
"              Total depth                  65.300    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33           CATCHMENT 100"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          100   100- Wilder Lake South"
"       10.000   % Impervious"
"        4.250   Total Area"
"       70.000   Flow length"
"        4.000   Overland Slope"
"        3.825   Pervious Area"
"       70.000   Pervious length"
"        4.000   Pervious slope"
"        0.425   Impervious Area"
"        7.778   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.333   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."
"        0.815   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.239     0.000     0.000     0.000 c.m/sec"
"              Catchment 100          Pervious   Impervious Total Area "
"              Surface Area           3.825      0.425      4.250      hectare"
"              Time of concentration  24.325     0.796      19.296     minutes"
"              Time to Centroid       247.284    193.300    235.747    minutes"
"              Rainfall depth         65.300     65.300     65.300     mm"
"              Rainfall volume        2497.73    277.53     2775.25    c.m"
"              Rainfall losses        43.552     12.101     40.407     mm"
"              Runoff depth           21.748     53.199     24.893     mm"
"              Runoff volume          831.86     226.10     1057.96    c.m"
"              Runoff coefficient     0.333      0.815      0.381      "
"              Maximum flow           0.225      0.102      0.239      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.239     0.239     0.000     0.000"
```



```
" 40           HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.239     0.239     0.239     0.000"
" 40           HYDROGRAPH   Combine    6"
"            6   Combine "
"            6   Node #"
"                To Wilder Lake"
"              Maximum flow                   0.239    c.m/sec"
"              Hydrograph volume           1057.956    c.m"
"                     0.239     0.239     0.239     0.239"
" 40           HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.239     0.000     0.239     0.239"
" 33           CATCHMENT 101"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          101   101 - Developed Area South"
"       30.000   % Impervious"
"        4.890   Total Area"
"       75.000   Flow length"
"        2.000   Overland Slope"
"        3.423   Pervious Area"
"       75.000   Pervious length"
"        2.000   Pervious slope"
"        1.467   Impervious Area"
"       32.143   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.334   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."
"        0.891   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.388     0.000     0.239     0.239 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           3.423      1.467      4.890      hectare"
"              Time of concentration  31.213     2.295      15.776     minutes"
"              Time to Centroid       256.305    195.371    223.777    minutes"
"              Rainfall depth         65.300     65.300     65.300     mm"
"              Rainfall volume        2235.22    957.95     3193.17    c.m"
"              Rainfall losses        43.520     7.104      32.595     mm"
"              Runoff depth           21.780     58.196     32.705     mm"
"              Runoff volume          745.52     853.73     1599.25    c.m"
"              Runoff coefficient     0.334      0.891      0.501      "
"              Maximum flow           0.174      0.359      0.388      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.388     0.388     0.239     0.239"
" 54           POND DESIGN"
"        0.388   Current peak flow    c.m/sec"
"        0.080   Target outflow    c.m/sec"
"       1599.3   Hydrograph volume    c.m"
"          12.   Number of stages"
"      423.000   Minimum water level    metre"
"      425.750   Maximum water level    metre"
"      423.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
```

```
"            423.000     0.000     0.000"
"            423.250  1.00E-04    15.300"
"            423.500   0.00020    68.600"
"            423.750   0.00030   162.000"
"            424.000   0.00040   284.900"
"            424.250   0.00050   438.500"
"            424.500   0.00060   624.800"
"            424.750   0.03550   845.500"
"            425.000   0.03910  1102.500"
"            425.250   0.04240  1397.400"
"            425.500   0.04540  1731.900"
"            425.750     1.114  2108.600"
"         Peak outflow                  0.040    c.m/sec"
"         Maximum level               425.033    metre"
"         Maximum storage            1141.935    c.m"
"         Centroidal lag               85.913   hours"
"              0.388     0.388     0.040     0.239 c.m/sec"
" 40      HYDROGRAPH   Combine    6"
"       6   Combine "
"       6   Node #"
"           To Wilder Lake"
"         Maximum flow                  0.256    c.m/sec"
"         Hydrograph volume          2084.097    c.m"
"              0.388     0.388     0.040     0.256"
" 40      HYDROGRAPH Start - New Tributary"
"       2   Start - New Tributary"
"              0.388     0.000     0.040     0.256"
" 33      CATCHMENT 102"
"       1   Triangular SCS"
"       2   Proportional to %"
"       1   SCS method"
"     102   102 - Developed Area North"
"  30.000   % Impervious"
"   0.900   Total Area"
"  45.000   Flow length"
"   2.000   Overland Slope"
"   0.630   Pervious Area"
"  45.000   Pervious length"
"   2.000   Pervious slope"
"   0.270   Impervious Area"
"  19.286   Impervious length"
"   2.000   Impervious slope"
"   0.250   Pervious Manning 'n'"
"  74.000   Pervious SCS Curve No."
"   0.334   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."
"   0.872   Impervious Runoff coefficient"
"   0.100   Impervious Ia/S coefficient"
"   0.518   Impervious Initial abstraction"
"              0.075     0.000     0.040     0.256 c.m/sec"
"         Catchment 102          Pervious   Impervious Total Area "
"         Surface Area           0.630      0.270      0.900      hectare"
"         Time of concentration  22.973     1.689      11.725     minutes"
"         Time to Centroid       245.475    194.420    218.493    minutes"
"         Rainfall depth         65.300     65.300     65.300     mm"
"         Rainfall volume        411.39     176.31     587.70     c.m"
"         Rainfall losses        43.520     8.339      32.966     mm"
"         Runoff depth           21.780     56.961     32.334     mm"
"         Runoff volume          137.21     153.79     291.01     c.m"
"         Runoff coefficient     0.334      0.872      0.495      "
```



```
"         Maximum flow              0.038     0.067     0.075     c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"       4   Add Runoff "
"              0.075     0.075     0.040     0.256"
" 54      POND DESIGN"
"   0.075   Current peak flow    c.m/sec"
"   0.030   Target outflow    c.m/sec"
"   291.0   Hydrograph volume    c.m"
"     11.   Number of stages"
" 423.200   Minimum water leve    metre"
" 424.850   Maximum water leve    metre"
" 423.200   Starting water level    metre"
"       0   Keep Design Data: 1 = True; 0 = False"
"             Level Discharge    Volume"
"           423.350     0.000     0.000"
"           423.500  1.00E-05     9.800"
"           423.650  2.00E-05    24.900"
"           423.800  3.00E-05    45.600"
"           423.950  4.00E-05    72.300"
"           424.100  5.00E-05   105.600"
"           424.250  6.00E-05   145.700"
"           424.400   0.01320   193.300"
"           424.550   0.01548   248.600"
"           424.700   0.01746   312.100"
"           424.850    0.5145   384.400"
"         Peak outflow                  0.013    c.m/sec"
"         Maximum level               424.404    metre"
"         Maximum storage             194.912    c.m"
"         Centroidal lag                6.196   hours"
"              0.075     0.075     0.013     0.256 c.m/sec"
" 40      HYDROGRAPH   Combine    6"
"       6   Combine "
"       6   Node #"
"           To Wilder Lake"
"         Maximum flow                  0.260    c.m/sec"
"         Hydrograph volume          2235.181    c.m"
"              0.075     0.075     0.013     0.260"
" 40      HYDROGRAPH Start - New Tributary"
"       2   Start - New Tributary"
"              0.075     0.000     0.013     0.260"
" 33      CATCHMENT 200"
"       1   Triangular SCS"
"       2   Proportional to %"
"       1   SCS method"
"     200   200 - Creek"
"  11.000   % Impervious"
"   4.210   Total Area"
"  75.000   Flow length"
"   5.000   Overland Slope"
"   3.747   Pervious Area"
"  75.000   Pervious length"
"   5.000   Pervious slope"
"   0.463   Impervious Area"
"   9.270   Impervious length"
"   5.000   Impervious slope"
"   0.250   Pervious Manning 'n'"
"  74.000   Pervious SCS Curve No."
"   0.333   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."
"   0.816   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.239     0.000     0.013     0.260 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           3.747      0.463      4.210      hectare"
"             Time of concentration  23.711     0.827      18.391     minutes"
"             Time to Centroid       246.463    193.392    234.126    minutes"
"             Rainfall depth         65.300     65.300     65.300     mm"
"             Rainfall volume        2446.73    302.40     2749.13    c.m"
"             Rainfall losses        43.552     12.005     40.082     mm"
"             Runoff depth           21.748     53.295     25.218     mm"
"             Runoff volume          814.88     246.81     1061.69    c.m"
"             Runoff coefficient     0.333      0.816      0.386      "
"             Maximum flow           0.224      0.111      0.239      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.239     0.239     0.013     0.260"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.239     0.239     0.239     0.260"
" 40          HYDROGRAPH   Combine    7"
"           6   Combine "
"           7   Node #"
"               Total to Creek"
"             Maximum flow                 0.239    c.m/sec"
"             Hydrograph volume         1061.687    c.m"
"                0.239     0.239     0.239     0.239"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.239     0.000     0.239     0.239"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   201"
"      20.000   % Impervious"
"       2.150   Total Area"
"      45.000   Flow length"
"       2.000   Overland Slope"
"       1.720   Pervious Area"
"      45.000   Pervious length"
"       2.000   Pervious slope"
"       0.430   Impervious Area"
"      11.250   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.334   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."
"       0.847   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                0.136     0.000     0.239     0.239 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           1.720      0.430      2.150      hectare"
"             Time of concentration  22.973     1.223      14.526     minutes"
"             Time to Centroid       245.475    194.236    225.576    minutes"
"             Rainfall depth         65.300     65.300     65.300     mm"
"             Rainfall volume        1123.16    280.79     1403.95    c.m"
"             Rainfall losses        43.520     9.986      36.813     mm"
```



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"             Runoff depth           21.780     55.314     28.487     mm"
"             Runoff volume          374.61     237.85     612.46     c.m"
"             Runoff coefficient     0.334      0.847      0.436      "
"             Maximum flow           0.105      0.105      0.136      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.136     0.136     0.239     0.239"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.136     0.136     0.136     0.239"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"             Maximum flow                 0.136    c.m/sec"
"             Hydrograph volume          612.464    c.m"
"                0.136     0.136     0.136     0.136"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.136     0.000     0.136     0.136"
" 33          CATCHMENT 400"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         400   400 - South to Off Site"
"       8.000   % Impervious"
"       0.990   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       0.911   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       0.079   Impervious Area"
"       6.522   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.334   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."
"       0.820   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                0.049     0.000     0.136     0.136 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.911      0.079      0.990      hectare"
"             Time of concentration  31.213     0.881      25.870     minutes"
"             Time to Centroid       256.305    193.558    245.252    minutes"
"             Rainfall depth         65.300     65.300     65.300     mm"
"             Rainfall volume        594.75     51.72      646.47     c.m"
"             Rainfall losses        43.520     11.745     40.978     mm"
"             Runoff depth           21.780     53.555     24.322     mm"
"             Runoff volume          198.37     42.42      240.79     c.m"
"             Runoff coefficient     0.334      0.820      0.372      "
"             Maximum flow           0.046      0.019      0.049      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.049     0.049     0.136     0.136"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.049     0.049     0.049     0.136"
```

```
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.049    c.m/sec"
"            Hydrograph volume          240.786    c.m"
"                   0.049     0.049     0.049     0.049"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.049     0.000     0.049     0.049"
" 33          CATCHMENT 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         401   401 - To Off Site - West"
"       8.000   % Impervious"
"       1.690   Total Area"
"      75.000   Flow length"
"       3.000   Overland Slope"
"       1.555   Pervious Area"
"      75.000   Pervious length"
"       3.000   Pervious slope"
"       0.135   Impervious Area"
"       6.522   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.334   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."
"       0.814   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.088     0.000     0.049     0.049 c.m/sec"
"            Catchment 401          Pervious   Impervious Total Area "
"            Surface Area           1.555      0.135      1.690      hectare"
"            Time of concentration  27.638     0.781      22.938     minutes"
"            Time to Centroid       251.647    193.253    241.430    minutes"
"            Rainfall depth         65.300     65.300     65.300     mm"
"            Rainfall volume        1015.28    88.29      1103.57    c.m"
"            Rainfall losses        43.510     12.153     41.001     mm"
"            Runoff depth           21.790     53.147     24.299     mm"
"            Runoff volume          338.80     71.86      410.65     c.m"
"            Runoff coefficient     0.334      0.814      0.372      "
"            Maximum flow           0.083      0.032      0.088      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.088     0.088     0.049     0.049"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.088     0.088     0.088     0.049"
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.136    c.m/sec"
"            Hydrograph volume          651.437    c.m"
"                   0.088     0.088     0.088     0.136"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.088     0.000     0.088     0.136"
```



```
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         500   500 - to golf course"
"      25.000   % Impervious"
"       1.690   Total Area"
"      45.000   Flow length"
"       4.000   Overland Slope"
"       1.268   Pervious Area"
"      45.000   Pervious length"
"       4.000   Pervious slope"
"       0.423   Impervious Area"
"      15.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.332   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."
"       0.844   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.130     0.000     0.088     0.136 c.m/sec"
"            Catchment 500          Pervious   Impervious Total Area "
"            Surface Area           1.268      0.423      1.690      hectare"
"            Time of concentration  18.660     1.180      10.648     minutes"
"            Time to Centroid       239.912    194.187    218.954    minutes"
"            Rainfall depth         65.300     65.300     65.300     mm"
"            Rainfall volume        827.68     275.89     1103.57    c.m"
"            Rainfall losses        43.602     10.218     35.256     mm"
"            Runoff depth           21.698     55.082     30.044     mm"
"            Runoff volume          275.02     232.72     507.74     c.m"
"            Runoff coefficient     0.332      0.844      0.460      "
"            Maximum flow           0.086      0.103      0.130      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.130     0.130     0.088     0.136"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.130     0.130     0.130     0.136"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"            Maximum flow                 0.266    c.m/sec"
"            Hydrograph volume         1120.206    c.m"
"                   0.130     0.130     0.130     0.266"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.130     0.000     0.130     0.266"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         600   600"
"       0.000   % Impervious"
"       0.550   Total Area"
"      30.000   Flow length"
"       4.000   Overland Slope"
"       0.550   Pervious Area"
```

```
"      30.000   Pervious length"
"       4.000   Pervious slope"
"       0.000   Impervious Area"
"       0.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.332   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"
"                 0.042     0.000     0.130     0.266 c.m/sec"
"            Catchment 600          Pervious   Impervious Total Area "
"            Surface Area           0.550     0.000      0.550      hectare"
"            Time of concentration  14.630    0.000      14.630     minutes"
"            Time to Centroid       234.956   191.157    234.956    minutes"
"            Rainfall depth         65.300    65.300     65.300     mm"
"            Rainfall volume        359.15    0.00       359.15     c.m"
"            Rainfall losses        43.593    11.320     43.593     mm"
"            Runoff depth           21.707    53.980     21.707     mm"
"            Runoff volume          119.39    0.00       119.39     c.m"
"            Runoff coefficient     0.332     0.000      0.332      "
"            Maximum flow           0.042     0.000      0.042      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.042     0.042     0.130     0.266"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.042     0.042     0.042     0.266"
" 40         HYDROGRAPH  Combine    10"
"          6   Combine "
"         10   Node #"
"              To Pond 201"
"            Maximum flow                 0.304    c.m/sec"
"            Hydrograph volume          1239.592    c.m"
"                 0.042     0.042     0.042     0.304"
" 40         HYDROGRAPH   Confluence    10"
"          7   Confluence "
"         10   Node #"
"              To Pond 201"
"            Maximum flow                 0.304    c.m/sec"
"            Hydrograph volume          1239.592    c.m"
"                 0.042     0.304     0.042     0.000"
" 54         POND DESIGN"
"       0.304   Current peak flow    c.m/sec"
"       0.100   Target outflow    c.m/sec"
"      1239.6   Hydrograph volume    c.m"
"         10.   Number of stages"
"     423.300   Minimum water level    metre"
"     424.500   Maximum water level    metre"
"     423.300   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               423.300     0.000     0.000"
"               423.400   0.01130   172.400"
"               423.500   0.02640   353.500"
"               423.600   0.03737   543.700"
"               423.700   0.04577   743.000"
"               423.800   0.05281   951.800"
```



```
"               423.900   0.05904  1170.100"
"               424.000    0.3343  1398.300"
"               424.100    0.8324  1636.400"
"               424.200     1.475  1884.800"
"            Peak outflow                 0.046    c.m/sec"
"            Maximum level              423.707    metre"
"            Maximum storage            758.582    c.m"
"            Centroidal lag               7.868   hours"
"                 0.042     0.304     0.046     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    7"
"          6   Combine "
"          7   Node #"
"              Total to Creek"
"            Maximum flow                 0.275    c.m/sec"
"            Hydrograph volume          2301.263    c.m"
"                 0.042     0.304     0.046     0.275"
" 38         START/RE-START TOTALS 10"
"          3   Runoff Totals on EXIT"
"            Total Catchment area                      21.320    hectare"
"            Total Impervious area                      3.692    hectare"
"            Total % impervious                        17.317"
" 19         EXIT"
```

```
              MIDUSS Output ----------------------------------------------->"
              MIDUSS version                          Version 2.25  rev. 473"
              MIDUSS created                       Sunday, February 07, 2010"
        10    Units used:                                          ie METRIC"
              Job folder:                C:\Users\jswiger\Desktop\Wilder Lake\"
                                                                      MIDUSS"
              Output filename:                 218173- PostDev-Oct22-50yr.out"
              Licensee name:                                            GMBP"
              Company                                 Hewlett-Packard Company"
              Date & Time last used:                 10/22/2019 at 2:55:20 PM"
31          TIME PARAMETERS"
    10.000    Time Step"
   360.000    Max. Storm length"
  2400.000    Max. Hydrograph"
32          STORM Mass Curve"
         3    Mass Curve"
    71.900    Rainfall depth"
   360.000    Duration"
        47    C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
            Maximum intensity           114.790    mm/hr"
            Total depth                  71.900    mm"
         6    050hyd   Hydrograph extension used in this file"
33          CATCHMENT 100"
         1    Triangular SCS"
         2    Proportional to %"
         1    SCS method"
       100    100- Wilder Lake South"
    10.000    % Impervious"
     4.250    Total Area"
    70.000    Flow length"
     4.000    Overland Slope"
     3.825    Pervious Area"
    70.000    Pervious length"
     4.000    Pervious slope"
     0.425    Impervious Area"
     7.778    Impervious length"
     4.000    Impervious slope"
     0.250    Pervious Manning 'n'"
    74.000    Pervious SCS Curve No."
     0.362    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."
     0.819    Impervious Runoff coefficient"
     0.100    Impervious Ia/S coefficient"
     0.518    Impervious Initial abstraction"
                 0.299     0.000     0.000     0.000 c.m/sec"
            Catchment 100          Pervious   Impervious Total Area "
            Surface Area           3.825      0.425      4.250      hectare"
            Time of concentration  22.541     0.765      18.161     minutes"
            Time to Centroid       244.098    192.679    233.757    minutes"
            Rainfall depth         71.900     71.900     71.900     mm"
            Rainfall volume        2750.18    305.58     3055.75    c.m"
            Rainfall losses        45.897     12.986     42.605     mm"
            Runoff depth           26.003     58.914     29.295     mm"
            Runoff volume          994.63     250.39     1245.02    c.m"
            Runoff coefficient     0.362      0.819      0.407      "
            Maximum flow           0.284      0.113      0.299      c.m/sec"
40          HYDROGRAPH Add Runoff "
         4    Add Runoff "
                 0.299     0.299     0.000     0.000"
```



```
40          HYDROGRAPH Copy to Outflow"
         8    Copy to Outflow"
                 0.299     0.299     0.299     0.000"
40          HYDROGRAPH   Combine    6"
         6    Combine "
         6    Node #"
              To Wilder Lake"
            Maximum flow                 0.299    c.m/sec"
            Hydrograph volume         1245.016    c.m"
                 0.299     0.299     0.299     0.299"
40          HYDROGRAPH Start - New Tributary"
         2    Start - New Tributary"
                 0.299     0.000     0.299     0.299"
33          CATCHMENT 101"
         1    Triangular SCS"
         2    Proportional to %"
         1    SCS method"
       101    101 - Developed Area South"
    30.000    % Impervious"
     4.890    Total Area"
    75.000    Flow length"
     2.000    Overland Slope"
     3.423    Pervious Area"
    75.000    Pervious length"
     2.000    Pervious slope"
     1.467    Impervious Area"
    32.143    Impervious length"
     2.000    Impervious slope"
     0.250    Pervious Manning 'n'"
    74.000    Pervious SCS Curve No."
     0.362    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."
     0.895    Impervious Runoff coefficient"
     0.100    Impervious Ia/S coefficient"
     0.518    Impervious Initial abstraction"
                 0.439     0.000     0.299     0.299 c.m/sec"
            Catchment 101          Pervious   Impervious Total Area "
            Surface Area           3.423      1.467      4.890      hectare"
            Time of concentration  28.924     2.205      15.167     minutes"
            Time to Centroid       252.595    194.695    222.782    minutes"
            Rainfall depth         71.900     71.900     71.900     mm"
            Rainfall volume        2461.14    1054.77    3515.91    c.m"
            Rainfall losses        45.903     7.517      34.387     mm"
            Runoff depth           25.997     64.383     37.513     mm"
            Runoff volume          889.88     944.50     1834.38    c.m"
            Runoff coefficient     0.362      0.895      0.522      "
            Maximum flow           0.220      0.398      0.439      c.m/sec"
40          HYDROGRAPH Add Runoff "
         4    Add Runoff "
                 0.439     0.439     0.299     0.299"
54          POND DESIGN"
     0.439    Current peak flow    c.m/sec"
     0.080    Target outflow    c.m/sec"
    1834.4    Hydrograph volume    c.m"
       12.    Number of stages"
   423.000    Minimum water level    metre"
   425.750    Maximum water level    metre"
   423.000    Starting water level    metre"
         0    Keep Design Data: 1 = True; 0 = False"
                Level Discharge    Volume"
```

```
                 423.000     0.000     0.000"
                 423.250  1.00E-04    15.300"
                 423.500   0.00020    68.600"
                 423.750   0.00030   162.000"
                 424.000   0.00040   284.900"
                 424.250   0.00050   438.500"
                 424.500   0.00060   624.800"
                 424.750   0.03550   845.500"
                 425.000   0.03910  1102.500"
                 425.250   0.04240  1397.400"
                 425.500   0.04540  1731.900"
                 425.750     1.114  2108.600"
              Peak outflow                 0.042    c.m/sec"
              Maximum level              425.195    metre"
              Maximum storage           1332.223    c.m"
              Centroidal lag              76.929   hours"
                   0.439     0.439     0.042     0.299 c.m/sec"
40            HYDROGRAPH   Combine    6"
            6   Combine "
            6   Node #"
                To Wilder Lake"
              Maximum flow                 0.333    c.m/sec"
              Hydrograph volume         2502.071    c.m"
                   0.439     0.439     0.042     0.333"
40            HYDROGRAPH Start - New Tributary"
            2   Start - New Tributary"
                   0.439     0.000     0.042     0.333"
33            CATCHMENT 102"
            1   Triangular SCS"
            2   Proportional to %"
            1   SCS method"
          102   102 - Developed Area North"
       30.000   % Impervious"
        0.900   Total Area"
       45.000   Flow length"
        2.000   Overland Slope"
        0.630   Pervious Area"
       45.000   Pervious length"
        2.000   Pervious slope"
        0.270   Impervious Area"
       19.286   Impervious length"
        2.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.361   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."
        0.877   Impervious Runoff coefficient"
        0.100   Impervious Ia/S coefficient"
        0.518   Impervious Initial abstraction"
                   0.086     0.000     0.042     0.333 c.m/sec"
              Catchment 102          Pervious   Impervious Total Area "
              Surface Area           0.630      0.270      0.900      hectare"
              Time of concentration  21.289     1.623      11.265     minutes"
              Time to Centroid       242.461    193.925    217.722    minutes"
              Rainfall depth         71.900     71.900     71.900     mm"
              Rainfall volume        452.97     194.13     647.10     c.m"
              Rainfall losses        45.913     8.862      34.798     mm"
              Runoff depth           25.987     63.038     37.102     mm"
              Runoff volume          163.72     170.20     333.92     c.m"
              Runoff coefficient     0.361      0.877      0.516      "
```



```
              Maximum flow            0.048      0.074      0.086      c.m/sec"
40            HYDROGRAPH Add Runoff "
            4   Add Runoff "
                   0.086     0.086     0.042     0.333"
54            POND DESIGN"
        0.086   Current peak flow    c.m/sec"
        0.030   Target outflow    c.m/sec"
        333.9   Hydrograph volume    c.m"
          11.   Number of stages"
      423.200   Minimum water level    metre"
      424.850   Maximum water level    metre"
      423.200   Starting water level    metre"
            0   Keep Design Data: 1 = True; 0 = False"
                  Level Discharge    Volume"
                 423.350     0.000     0.000"
                 423.500  1.00E-05     9.800"
                 423.650  2.00E-05    24.900"
                 423.800  3.00E-05    45.600"
                 423.950  4.00E-05    72.300"
                 424.100  5.00E-05   105.600"
                 424.250  6.00E-05   145.700"
                 424.400   0.01320   193.300"
                 424.550   0.01548   248.600"
                 424.700   0.01746   312.100"
                 424.850    0.5145   384.400"
              Peak outflow                 0.014    c.m/sec"
              Maximum level              424.471    metre"
              Maximum storage            219.526    c.m"
              Centroidal lag               6.033   hours"
                   0.086     0.086     0.014     0.333 c.m/sec"
40            HYDROGRAPH   Combine    6"
            6   Combine "
            6   Node #"
                To Wilder Lake"
              Maximum flow                 0.339    c.m/sec"
              Hydrograph volume         2696.717    c.m"
                   0.086     0.086     0.014     0.339"
40            HYDROGRAPH Start - New Tributary"
            2   Start - New Tributary"
                   0.086     0.000     0.014     0.339"
33            CATCHMENT 200"
            1   Triangular SCS"
            2   Proportional to %"
            1   SCS method"
          200   200 - Creek"
       11.000   % Impervious"
        4.210   Total Area"
       75.000   Flow length"
        5.000   Overland Slope"
        3.747   Pervious Area"
       75.000   Pervious length"
        5.000   Pervious slope"
        0.463   Impervious Area"
        9.270   Impervious length"
        5.000   Impervious slope"
        0.250   Pervious Manning 'n'"
       74.000   Pervious SCS Curve No."
        0.362   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."
        0.821   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                0.299     0.000     0.014     0.339 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           3.747      0.463      4.210      hectare"
"             Time of concentration  21.972     0.795      17.333     minutes"
"             Time to Centroid       243.363    192.770    232.279    minutes"
"             Rainfall depth         71.900     71.900     71.900     mm"
"             Rainfall volume        2694.02    332.97     3026.99    c.m"
"             Rainfall losses        45.893     12.868     42.260     mm"
"             Runoff depth           26.007     59.032     29.640     mm"
"             Runoff volume          974.47     273.38     1247.85    c.m"
"             Runoff coefficient     0.362      0.821      0.412      "
"             Maximum flow           0.282      0.123      0.299      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.299     0.299     0.014     0.339"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.299     0.299     0.299     0.339"
" 40          HYDROGRAPH   Combine    7"
"           6   Combine "
"           7   Node #"
"               Total to Creek"
"             Maximum flow                 0.299    c.m/sec"
"             Hydrograph volume         1247.847    c.m"
"                0.299     0.299     0.299     0.299"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.299     0.000     0.299     0.299"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   201"
"      20.000   % Impervious"
"       2.150   Total Area"
"      45.000   Flow length"
"       2.000   Overland Slope"
"       1.720   Pervious Area"
"      45.000   Pervious length"
"       2.000   Pervious slope"
"       0.430   Impervious Area"
"      11.250   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.361   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"
"                0.168     0.000     0.299     0.299 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           1.720      0.430      2.150      hectare"
"             Time of concentration  21.289     1.175      13.843     minutes"
"             Time to Centroid       242.462    193.655    224.394    minutes"
"             Rainfall depth         71.900     71.900     71.900     mm"
"             Rainfall volume        1236.68    309.17     1545.85    c.m"
"             Rainfall losses        45.913     10.804     38.891     mm"
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"             Runoff depth           25.987     61.096     33.009     mm"
"             Runoff volume          446.98     262.71     709.69     c.m"
"             Runoff coefficient     0.361      0.850      0.459      "
"             Maximum flow           0.132      0.116      0.168      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.168     0.168     0.299     0.299"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.168     0.168     0.168     0.299"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"             Maximum flow                 0.168    c.m/sec"
"             Hydrograph volume          709.689    c.m"
"                0.168     0.168     0.168     0.168"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                0.168     0.000     0.168     0.168"
" 33          CATCHMENT 400"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         400   400 - South to Off Site"
"       8.000   % Impervious"
"       0.990   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       0.911   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       0.079   Impervious Area"
"       6.522   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.362   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."
"       0.824   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                0.061     0.000     0.168     0.168 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.911      0.079      0.990      hectare"
"             Time of concentration  28.924     0.847      24.281     minutes"
"             Time to Centroid       252.595    192.923    242.726    minutes"
"             Rainfall depth         71.900     71.900     71.900     mm"
"             Rainfall volume        654.87     56.94      711.81     c.m"
"             Rainfall losses        45.903     12.663     43.244     mm"
"             Runoff depth           25.997     59.237     28.656     mm"
"             Runoff volume          236.78     46.92      283.70     c.m"
"             Runoff coefficient     0.362      0.824      0.399      "
"             Maximum flow           0.058      0.021      0.061      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                0.061     0.061     0.168     0.168"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                0.061     0.061     0.061     0.168"
```

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" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.061    c.m/sec"
"            Hydrograph volume          283.696    c.m"
"                   0.061     0.061     0.061     0.061"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.061     0.000     0.061     0.061"
" 33          CATCHMENT 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         401   401 - To Off Site - West"
"       8.000   % Impervious"
"       1.690   Total Area"
"      75.000   Flow length"
"       3.000   Overland Slope"
"       1.555   Pervious Area"
"      75.000   Pervious length"
"       3.000   Pervious slope"
"       0.135   Impervious Area"
"       6.522   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.361   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."
"       0.819   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.111     0.000     0.061     0.061 c.m/sec"
"            Catchment 401          Pervious   Impervious Total Area "
"            Surface Area           1.555      0.135      1.690      hectare"
"            Time of concentration  25.611     0.750      21.517     minutes"
"            Time to Centroid       248.228    192.632    239.073    minutes"
"            Rainfall depth         71.900     71.900     71.900     mm"
"            Rainfall volume        1117.90    97.21      1215.11    c.m"
"            Rainfall losses        45.942     13.048     43.311     mm"
"            Runoff depth           25.958     58.852     28.589     mm"
"            Runoff volume          403.59     79.57      483.16     c.m"
"            Runoff coefficient     0.361      0.819      0.398      "
"            Maximum flow           0.106      0.036      0.111      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.111     0.111     0.061     0.061"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.111     0.111     0.111     0.061"
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.170    c.m/sec"
"            Hydrograph volume          766.858    c.m"
"                   0.111     0.111     0.111     0.170"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.111     0.000     0.111     0.170"
```



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" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         500   500 - to golf course"
"      25.000   % Impervious"
"       1.690   Total Area"
"      45.000   Flow length"
"       4.000   Overland Slope"
"       1.268   Pervious Area"
"      45.000   Pervious length"
"       4.000   Pervious slope"
"       0.423   Impervious Area"
"      15.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.361   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."
"       0.846   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.157     0.000     0.111     0.170 c.m/sec"
"            Catchment 500          Pervious   Impervious Total Area "
"            Surface Area           1.268      0.423      1.690      hectare"
"            Time of concentration  17.292     1.134      10.204     minutes"
"            Time to Centroid       237.194    193.593    218.067    minutes"
"            Rainfall depth         71.900     71.900     71.900     mm"
"            Rainfall volume        911.33     303.78     1215.11    c.m"
"            Rainfall losses        45.955     11.068     37.233     mm"
"            Runoff depth           25.945     60.832     34.667     mm"
"            Runoff volume          328.86     257.01     585.87     c.m"
"            Runoff coefficient     0.361      0.846      0.482      "
"            Maximum flow           0.105      0.114      0.157      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.157     0.157     0.111     0.170"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.157     0.157     0.157     0.170"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"            Maximum flow                 0.325    c.m/sec"
"            Hydrograph volume         1295.560    c.m"
"                   0.157     0.157     0.157     0.325"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.157     0.000     0.157     0.325"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         600   600"
"       0.000   % Impervious"
"       0.550   Total Area"
"      30.000   Flow length"
"       4.000   Overland Slope"
"       0.550   Pervious Area"
```

```
"      30.000   Pervious length"
"       4.000   Pervious slope"
"       0.000   Impervious Area"
"       0.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.358   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"
                     0.050     0.000     0.157     0.325 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  13.558     0.000      13.558     minutes"
            Time to Centroid       232.669    190.670    232.669    minutes"
            Rainfall depth         71.900     71.900     71.900     mm"
            Rainfall volume        395.45     0.00       395.45     c.m"
            Rainfall losses        46.174     12.010     46.174     mm"
            Runoff depth           25.726     59.890     25.726     mm"
            Runoff volume          141.49     0.00       141.49     c.m"
            Runoff coefficient     0.358      0.000      0.358      "
            Maximum flow           0.050      0.000      0.050      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.050     0.050     0.157     0.325"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.050     0.050     0.050     0.325"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.373    c.m/sec"
            Hydrograph volume         1437.055    c.m"
                     0.050     0.050     0.050     0.373"
" 40        HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.373    c.m/sec"
            Hydrograph volume         1437.055    c.m"
                     0.050     0.373     0.050     0.000"
" 54        POND DESIGN"
       0.373   Current peak flow    c.m/sec"
       0.100   Target outflow    c.m/sec"
      1437.1   Hydrograph volume    c.m"
         10.   Number of stages"
     423.300   Minimum water level    metre"
     424.500   Maximum water level    metre"
     423.300   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
               423.300     0.000     0.000"
               423.400   0.01130   172.400"
               423.500   0.02640   353.500"
               423.600   0.03737   543.700"
               423.700   0.04577   743.000"
               423.800   0.05281   951.800"
```



```
"              423.900   0.05904  1170.100"
"              424.000    0.3343  1398.300"
"              424.100    0.8324  1636.400"
"              424.200     1.475  1884.800"
"            Peak outflow                 0.051    c.m/sec"
"            Maximum level              423.774    metre"
"            Maximum storage            897.717    c.m"
"            Centroidal lag               8.027    hours"
"                 0.050     0.373     0.051     0.000 c.m/sec"
" 40         HYDROGRAPH   Combine    7"
"          6   Combine "
"          7   Node #"
"              Total to Creek"
"            Maximum flow                 0.339    c.m/sec"
"            Hydrograph volume         2684.709    c.m"
"                 0.050     0.373     0.051     0.339"
" 38         START/RE-START TOTALS 10"
"          3   Runoff Totals on EXIT"
"            Total Catchment area                      21.320    hectare"
"            Total Impervious area                      3.692    hectare"
"            Total % impervious                        17.317"
" 19         EXIT"
```

```
"              MIDUSS Output ----------------------------------------------->"
"              MIDUSS version                          Version 2.25  rev. 473"
"              MIDUSS created                       Sunday, February 07, 2010"
"        10    Units used:                                            ie METRIC"
"              Job folder:                C:\Users\jswiger\Desktop\Wilder Lake\"
                                                                        MIDUSS"
"              Output filename:                218173- PostDev-Oct22-100yr.out"
"              Licensee name:                                             GMBP"
"              Company                                  Hewlett-Packard Company"
"              Date & Time last used:                  10/22/2019 at 2:33:24 PM"
" 31         TIME PARAMETERS"
"     10.000   Time Step"
"    360.000   Max. Storm length"
"   2400.000   Max. Hydrograph"
" 32         STORM Mass Curve"
"          3   Mass Curve"
"     78.400   Rainfall depth"
"    360.000   Duration"
"         47   C:\Program Files (x86)\MIDUSS\SCS_6hr_Type2.mrd   SCS 6 hour Type
2"
"            Maximum intensity           125.167    mm/hr"
"            Total depth                  78.400    mm"
"          6   100hyd   Hydrograph extension used in this file"
" 33         CATCHMENT 100"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        100   100- Wilder Lake South"
"     10.000   % Impervious"
"      4.250   Total Area"
"     70.000   Flow length"
"      4.000   Overland Slope"
"      3.825   Pervious Area"
"     70.000   Pervious length"
"      4.000   Pervious slope"
"      0.425   Impervious Area"
"      7.778   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.387   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."
"      0.823   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                0.362     0.000     0.000     0.000 c.m/sec"
"            Catchment 100          Pervious   Impervious Total Area "
"            Surface Area           3.825      0.425      4.250      hectare"
"            Time of concentration  21.101     0.738      17.208     minutes"
"            Time to Centroid       241.493    192.142    232.057    minutes"
"            Rainfall depth         78.400     78.400     78.400     mm"
"            Rainfall volume        2998.80    333.20     3332.00    c.m"
"            Rainfall losses        48.070     13.873     44.650     mm"
"            Runoff depth           30.330     64.527     33.750     mm"
"            Runoff volume          1160.12    274.24     1434.36    c.m"
"            Runoff coefficient     0.387      0.823      0.430      "
"            Maximum flow           0.345      0.123      0.362      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                0.362     0.362     0.000     0.000"
```



```
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
                0.362     0.362     0.362     0.000"
" 40         HYDROGRAPH   Combine    6"
"          6   Combine "
"          6   Node #"
               To Wilder Lake"
"            Maximum flow                  0.362    c.m/sec"
"            Hydrograph volume          1434.355    c.m"
                0.362     0.362     0.362     0.362"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
                0.362     0.000     0.362     0.362"
" 33         CATCHMENT 101"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        101   101 - Developed Area South"
"     30.000   % Impervious"
"      4.890   Total Area"
"     75.000   Flow length"
"      2.000   Overland Slope"
"      3.423   Pervious Area"
"     75.000   Pervious length"
"      2.000   Pervious slope"
"      1.467   Impervious Area"
"     32.143   Impervious length"
"      2.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.387   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."
"      0.899   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
                0.490     0.000     0.362     0.362 c.m/sec"
            Catchment 101          Pervious   Impervious Total Area "
            Surface Area           3.423      1.467      4.890      hectare"
            Time of concentration  27.077     2.128      14.632     minutes"
            Time to Centroid       249.502    194.110    221.873    minutes"
            Rainfall depth         78.400     78.400     78.400     mm"
            Rainfall volume        2683.63    1150.13    3833.76    c.m"
            Rainfall losses        48.054     7.934      36.018     mm"
            Runoff depth           30.346     70.466     42.382     mm"
            Runoff volume          1038.75    1033.74    2072.49    c.m"
            Runoff coefficient     0.387      0.899      0.541      "
            Maximum flow           0.263      0.436      0.490      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
                0.490     0.490     0.362     0.362"
" 54         POND DESIGN"
"      0.490   Current peak flow    c.m/sec"
"      0.080   Target outflow    c.m/sec"
     2072.5   Hydrograph volume    c.m"
        12.   Number of stages"
    423.000   Minimum water level    metre"
    425.750   Maximum water level    metre"
    423.000   Starting water level    metre"
          0   Keep Design Data: 1 = True; 0 = False"
                Level Discharge    Volume"
```

```
            423.000      0.000      0.000"
            423.250   1.00E-04     15.300"
            423.500    0.00020     68.600"
            423.750    0.00030    162.000"
            424.000    0.00040    284.900"
            424.250    0.00050    438.500"
            424.500    0.00060    624.800"
            424.750    0.03550    845.500"
            425.000    0.03910   1102.500"
            425.250    0.04240   1397.400"
            425.500    0.04540   1731.900"
            425.750      1.114   2108.600"
        Peak outflow                  0.044     c.m/sec"
        Maximum level               425.350     metre"
        Maximum storage            1531.441     c.m"
        Centroidal lag               69.749    hours"
             0.490      0.490      0.044      0.362 c.m/sec"
40      HYDROGRAPH   Combine     6"
      6   Combine "
      6   Node #"
          To Wilder Lake"
        Maximum flow                  0.399     c.m/sec"
        Hydrograph volume          2926.708     c.m"
             0.490      0.490      0.044      0.399"
40      HYDROGRAPH Start - New Tributary"
      2   Start - New Tributary"
             0.490      0.000      0.044      0.399"
33      CATCHMENT 102"
      1   Triangular SCS"
      2   Proportional to %"
      1   SCS method"
    102   102 - Developed Area North"
 30.000   % Impervious"
  0.900   Total Area"
 45.000   Flow length"
  2.000   Overland Slope"
  0.630   Pervious Area"
 45.000   Pervious length"
  2.000   Pervious slope"
  0.270   Impervious Area"
 19.286   Impervious length"
  2.000   Impervious slope"
  0.250   Pervious Manning 'n'"
 74.000   Pervious SCS Curve No."
  0.386   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."
  0.880   Impervious Runoff coefficient"
  0.100   Impervious Ia/S coefficient"
  0.518   Impervious Initial abstraction"
             0.098      0.000      0.044      0.399 c.m/sec"
        Catchment 102          Pervious   Impervious Total Area "
        Surface Area           0.630      0.270      0.900      hectare"
        Time of concentration  19.929     1.566      10.850     minutes"
        Time to Centroid       240.018    193.490    217.013    minutes"
        Rainfall depth         78.400     78.400     78.400     mm"
        Rainfall volume        493.92     211.68     705.60     c.m"
        Rainfall losses        48.164     9.402      36.536     mm"
        Runoff depth           30.236     68.998     41.864     mm"
        Runoff volume          190.49     186.29     376.78     c.m"
        Runoff coefficient     0.386      0.880      0.534      "
```



```
        Maximum flow              0.058      0.080      0.098      c.m/sec"
40      HYDROGRAPH Add Runoff "
      4   Add Runoff "
             0.098      0.098      0.044      0.399"
54      POND DESIGN"
  0.098   Current peak flow     c.m/sec"
  0.030   Target outflow     c.m/sec"
  376.8   Hydrograph volume     c.m"
    11.   Number of stages"
423.200   Minimum water level     metre"
424.850   Maximum water level     metre"
423.200   Starting water level     metre"
      0   Keep Design Data: 1 = True; 0 = False"
            Level Discharge     Volume"
          423.350      0.000      0.000"
          423.500   1.00E-05      9.800"
          423.650   2.00E-05     24.900"
          423.800   3.00E-05     45.600"
          423.950   4.00E-05     72.300"
          424.100   5.00E-05    105.600"
          424.250   6.00E-05    145.700"
          424.400    0.01320    193.300"
          424.550    0.01548    248.600"
          424.700    0.01746    312.100"
          424.850     0.5145    384.400"
        Peak outflow                  0.015     c.m/sec"
        Maximum level               424.545     metre"
        Maximum storage             246.818     c.m"
        Centroidal lag                6.073    hours"
             0.098      0.098      0.015      0.399 c.m/sec"
40      HYDROGRAPH   Combine     6"
      6   Combine "
      6   Node #"
          To Wilder Lake"
        Maximum flow                  0.411     c.m/sec"
        Hydrograph volume          3163.568     c.m"
             0.098      0.098      0.015      0.411"
40      HYDROGRAPH Start - New Tributary"
      2   Start - New Tributary"
             0.098      0.000      0.015      0.411"
33      CATCHMENT 200"
      1   Triangular SCS"
      2   Proportional to %"
      1   SCS method"
    200   200 - Creek"
 11.000   % Impervious"
  4.210   Total Area"
 75.000   Flow length"
  5.000   Overland Slope"
  3.747   Pervious Area"
 75.000   Pervious length"
  5.000   Pervious slope"
  0.463   Impervious Area"
  9.270   Impervious length"
  5.000   Impervious slope"
  0.250   Pervious Manning 'n'"
 74.000   Pervious SCS Curve No."
  0.386   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."
  0.825   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.361     0.000     0.015     0.411 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           3.747      0.463      4.210      hectare"
"             Time of concentration  20.569     0.767      16.436     minutes"
"             Time to Centroid       240.810    192.235    230.671    minutes"
"             Rainfall depth         78.400     78.400     78.400     mm"
"             Rainfall volume        2937.57    363.07     3300.64    c.m"
"             Rainfall losses        48.102     13.736     44.321     mm"
"             Runoff depth           30.298     64.664     34.079     mm"
"             Runoff volume          1135.25    299.46     1434.71    c.m"
"             Runoff coefficient     0.386      0.825      0.435      "
"             Maximum flow           0.343      0.134      0.361      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.361     0.361     0.015     0.411"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.361     0.361     0.361     0.411"
" 40          HYDROGRAPH   Combine    7"
"           6   Combine "
"           7   Node #"
"               Total to Creek"
"             Maximum flow                  0.361    c.m/sec"
"             Hydrograph volume          1434.710    c.m"
"                  0.361     0.361     0.361     0.361"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.361     0.000     0.361     0.361"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   201"
"      20.000   % Impervious"
"       2.150   Total Area"
"      45.000   Flow length"
"       2.000   Overland Slope"
"       1.720   Pervious Area"
"      45.000   Pervious length"
"       2.000   Pervious slope"
"       0.430   Impervious Area"
"      11.250   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.386   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."
"       0.852   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.201     0.000     0.361     0.361 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           1.720      0.430      2.150      hectare"
"             Time of concentration  19.929     1.133      13.244     minutes"
"             Time to Centroid       240.018    193.138    223.344    minutes"
"             Rainfall depth         78.400     78.400     78.400     mm"
"             Rainfall volume        1348.48    337.12     1685.60    c.m"
"             Rainfall losses        48.164     11.638     40.859     mm"
```



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"             Runoff depth           30.236     66.762     37.541     mm"
"             Runoff volume          520.06     287.08     807.14     c.m"
"             Runoff coefficient     0.386      0.852      0.479      "
"             Maximum flow           0.160      0.127      0.201      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.201     0.201     0.361     0.361"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.201     0.201     0.201     0.361"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"             Maximum flow                  0.201    c.m/sec"
"             Hydrograph volume           807.135    c.m"
"                  0.201     0.201     0.201     0.201"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.201     0.000     0.201     0.201"
" 33          CATCHMENT 400"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         400   400 - South to Off Site"
"       8.000   % Impervious"
"       0.990   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       0.911   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       0.079   Impervious Area"
"       6.522   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.387   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."
"       0.827   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.073     0.000     0.201     0.201 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.911      0.079      0.990      hectare"
"             Time of concentration  27.077     0.817      22.960     minutes"
"             Time to Centroid       249.502    192.382    240.548    minutes"
"             Rainfall depth         78.400     78.400     78.400     mm"
"             Rainfall volume        714.07     62.09      776.16     c.m"
"             Rainfall losses        48.054     13.526     45.292     mm"
"             Runoff depth           30.346     64.874     33.108     mm"
"             Runoff volume          276.39     51.38      327.77     c.m"
"             Runoff coefficient     0.387      0.827      0.422      "
"             Maximum flow           0.070      0.023      0.073      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.073     0.073     0.201     0.201"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.073     0.073     0.073     0.201"
```

```
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.073    c.m/sec"
"            Hydrograph volume          327.773    c.m"
"                   0.073     0.073     0.073     0.073"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.073     0.000     0.073     0.073"
" 33          CATCHMENT 401"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         401   401 - To Off Site - West"
"       8.000   % Impervious"
"       1.690   Total Area"
"      75.000   Flow length"
"       3.000   Overland Slope"
"       1.555   Pervious Area"
"      75.000   Pervious length"
"       3.000   Pervious slope"
"       0.135   Impervious Area"
"       6.522   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.387   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."
"       0.823   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.136     0.000     0.073     0.073 c.m/sec"
"            Catchment 401          Pervious   Impervious Total Area "
"            Surface Area           1.555      0.135      1.690      hectare"
"            Time of concentration  23.975     0.724      20.347     minutes"
"            Time to Centroid       245.327    192.088    237.019    minutes"
"            Rainfall depth         78.400     78.400     78.400     mm"
"            Rainfall volume        1218.96    106.00     1324.96    c.m"
"            Rainfall losses        48.072     13.910     45.339     mm"
"            Runoff depth           30.328     64.490     33.061     mm"
"            Runoff volume          471.54     87.19      558.73     c.m"
"            Runoff coefficient     0.387      0.823      0.422      "
"            Maximum flow           0.130      0.039      0.136      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.136     0.136     0.073     0.073"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.136     0.136     0.136     0.073"
" 40          HYDROGRAPH   Combine    8"
"           6   Combine "
"           8   Node #"
"               Total to Off-Site"
"            Maximum flow                 0.209    c.m/sec"
"            Hydrograph volume          886.507    c.m"
"                   0.136     0.136     0.136     0.209"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.136     0.000     0.136     0.209"
```



```
" 33          CATCHMENT 500"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         500   500 - to golf course"
"      25.000   % Impervious"
"       1.690   Total Area"
"      45.000   Flow length"
"       4.000   Overland Slope"
"       1.268   Pervious Area"
"      45.000   Pervious length"
"       4.000   Pervious slope"
"       0.423   Impervious Area"
"      15.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.387   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."
"       0.848   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.197     0.000     0.136     0.209 c.m/sec"
"            Catchment 500          Pervious   Impervious Total Area "
"            Surface Area           1.268      0.423      1.690      hectare"
"            Time of concentration  16.187     1.094      9.819      minutes"
"            Time to Centroid       235.137    193.074    217.389    minutes"
"            Rainfall depth         78.400     78.400     78.400     mm"
"            Rainfall volume        993.72     331.24     1324.96    c.m"
"            Rainfall losses        48.049     11.939     39.022     mm"
"            Runoff depth           30.351     66.461     39.378     mm"
"            Runoff volume          384.70     280.80     665.49     c.m"
"            Runoff coefficient     0.387      0.848      0.502      "
"            Maximum flow           0.129      0.124      0.197      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.197     0.197     0.136     0.209"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.197     0.197     0.197     0.209"
" 40          HYDROGRAPH   Combine    10"
"           6   Combine "
"          10   Node #"
"               To Pond 201"
"            Maximum flow                 0.398    c.m/sec"
"            Hydrograph volume         1472.630    c.m"
"                   0.197     0.197     0.197     0.398"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.197     0.000     0.197     0.398"
" 33          CATCHMENT 600"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         600   600"
"       0.000   % Impervious"
"       0.550   Total Area"
"      30.000   Flow length"
"       4.000   Overland Slope"
"       0.550   Pervious Area"
```

```
"      30.000   Pervious length"
"       4.000   Pervious slope"
"       0.000   Impervious Area"
"       0.000   Impervious length"
"       4.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.384   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"
                     0.059     0.000     0.197     0.398 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  12.692     0.000      12.692     minutes"
            Time to Centroid       230.611    190.249    230.611    minutes"
            Rainfall depth         78.400     78.400     78.400     mm"
            Rainfall volume        431.20     0.00       431.20     c.m"
            Rainfall losses        48.324     12.685     48.324     mm"
            Runoff depth           30.076     65.715     30.076     mm"
            Runoff volume          165.42     0.00       165.42     c.m"
            Runoff coefficient     0.384      0.000      0.384      "
            Maximum flow           0.059      0.000      0.059      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.059     0.059     0.197     0.398"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.059     0.059     0.059     0.398"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                  0.457    c.m/sec"
            Hydrograph volume          1638.047    c.m"
                     0.059     0.059     0.059     0.457"
" 40        HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                  0.457    c.m/sec"
            Hydrograph volume          1638.047    c.m"
                     0.059     0.457     0.059     0.000"
" 54        POND DESIGN"
       0.457   Current peak flow    c.m/sec"
       0.100   Target outflow    c.m/sec"
      1638.0   Hydrograph volume    c.m"
         10.   Number of stages"
     423.300   Minimum water level    metre"
     424.500   Maximum water level    metre"
     423.300   Starting water level    metre"
           0   Keep Design Data: 1 = True; 0 = False"
                 Level Discharge    Volume"
               423.300     0.000     0.000"
               423.400   0.01130   172.400"
               423.500   0.02640   353.500"
               423.600   0.03737   543.700"
               423.700   0.04577   743.000"
               423.800   0.05281   951.800"
```



```
               423.900   0.05904  1170.100"
               424.000    0.3343  1398.300"
               424.100    0.8324  1636.400"
               424.200     1.475  1884.800"
            Peak outflow                  0.055    c.m/sec"
            Maximum level               423.842    metre"
            Maximum storage            1042.675    c.m"
            Centroidal lag                8.196    hours"
                 0.059     0.457     0.055     0.000 c.m/sec"
" 40        HYDROGRAPH   Combine    7"
          6   Combine "
          7   Node #"
              Total to Creek"
            Maximum flow                  0.405    c.m/sec"
            Hydrograph volume          3072.450    c.m"
                     0.059     0.457     0.055     0.405"
" 38        START/RE-START TOTALS 10"
          3   Runoff Totals on EXIT"
            Total Catchment area                      21.320    hectare"
            Total Impervious area                      3.692    hectare"
            Total % impervious                        17.317"
" 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:                 C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                    MIDUSS"
"           Output filename:             218173- PostDev-Oct22-Hazel-4.out"
"           Licensee name:                                             GMBP"
"           Company                                 Hewlett-Packard Company"
"           Date & Time last used:                10/22/2019 at 2:48:09 PM"
" 31     TIME PARAMETERS"
"    10.000   Time Step"
"   360.000   Max. Storm length"
"  2400.000   Max. Hydrograph"
" 31     TIME PARAMETERS"
"    10.000   Time Step"
"  2880.000   Max. Storm length"
"  5760.000   Max. Hydrograph"
" 32     STORM Historic"
"         5   Historic"
"  2880.000   Duration"
"   288.000   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     2.028     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     2.028     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     2.028     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     2.028"
"              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"
"              2.028     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     2.028     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"
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"              2.028     2.028     2.028     2.028     2.028"
"              2.028     2.028     2.028     2.028     2.028"
"              2.028     6.000     6.000     6.000     6.000"
"              6.000     6.000     4.000     4.000     4.000"
"              4.000     4.000     4.000     6.000     6.000"
"              6.000     6.000     6.000     6.000    13.000"
"             13.000    13.000    13.000    13.000    13.000"
"             17.000    17.000    17.000    17.000    17.000"
"             17.000    13.000    13.000    13.000    13.000"
"             13.000    13.000    23.000    23.000    23.000"
"             23.000    23.000    23.000    13.000    13.000"
"             13.000    13.000    13.000    13.000    13.000"
"             13.000    13.000    13.000    13.000    13.000"
"             53.000    53.000    53.000    53.000    53.000"
"             53.000    38.000    38.000    38.000    38.000"
"             38.000    38.000    13.000    13.000    13.000"
"             13.000    13.000    13.000"
"          Maximum intensity             53.000    mm/hr"
"          Total depth                  285.008    mm"
"         6   200hyd   Hydrograph extension used in this file"
" 33       CATCHMENT 100"
"         1   Triangular SCS"
"         2   Proportional to %"
"         1   SCS method"
"       100   100- Wilder Lake South"
"    10.000   % Impervious"
"     4.250   Total Area"
"    70.000   Flow length"
"     4.000   Overland Slope"
"     3.825   Pervious Area"
"    70.000   Pervious length"
"     4.000   Pervious slope"
"     0.425   Impervious Area"
"     7.778   Impervious length"
"     4.000   Impervious slope"
"     0.250   Pervious Manning 'n'"
"    74.000   Pervious SCS Curve No."
"     0.730   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."
"     0.888   Impervious Runoff coefficient"
"     0.100   Impervious Ia/S coefficient"
"     0.518   Impervious Initial abstraction"
"                 0.582     0.000     0.000     0.000 c.m/sec"
"          Catchment 100          Pervious   Impervious Total Area "
"          Surface Area           3.825      0.425      4.250      hectare"
"          Time of concentration  21.625     1.034      19.172     minutes"
"          Time to Centroid       2518.886   2228.604   2484.308   minutes"
"          Rainfall depth         285.008    285.008    285.008    mm"
"          Rainfall volume        1.0902     0.1211     1.2113     ha-m"
"          Rainfall losses        76.965     31.809     72.449     mm"
"          Runoff depth           208.044    253.199    212.559    mm"
"          Runoff volume          7957.67    1076.10    9033.76    c.m"
"          Runoff coefficient     0.730      0.888      0.746      "
"          Maximum flow           0.530      0.054      0.582      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"         4   Add Runoff "
"                 0.582     0.582     0.000     0.000"
" 40       HYDROGRAPH Copy to Outflow"
"         8   Copy to Outflow"
"                 0.582     0.582     0.582     0.000"
```

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" 40          HYDROGRAPH   Combine    6"
"           6   Combine "
"           6   Node #"
"               To Wilder Lake"
"            Maximum flow                    0.582    c.m/sec"
"            Hydrograph volume            9033.765    c.m"
"                   0.582     0.582     0.582     0.582"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.582     0.000     0.582     0.582"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         101   101 - Developed Area South"
"      30.000   % Impervious"
"       4.890   Total Area"
"      75.000   Flow length"
"       2.000   Overland Slope"
"       3.423   Pervious Area"
"      75.000   Pervious length"
"       2.000   Pervious slope"
"       1.467   Impervious Area"
"      32.143   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.731   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."
"       0.970   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.692     0.000     0.582     0.582 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           3.423      1.467      4.890      hectare"
"            Time of concentration  27.748     2.981      18.764     minutes"
"            Time to Centroid       2527.670   2271.608   2434.786   minutes"
"            Rainfall depth         285.008    285.008    285.008    mm"
"            Rainfall volume        0.9756     0.4181     1.3937     ha-m"
"            Rainfall losses        76.801     8.480      56.305     mm"
"            Runoff depth           208.207    276.528    228.703    mm"
"            Runoff volume          0.7127     0.4057     1.1184     ha-m"
"            Runoff coefficient     0.731      0.970      0.802      "
"            Maximum flow           0.480      0.212      0.692      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.692     0.692     0.582     0.582"
" 54          POND DESIGN"
"       0.692   Current peak flow    c.m/sec"
"       0.080   Target outflow    c.m/sec"
"     11183.6   Hydrograph volume    c.m"
"         12.   Number of stages"
"     423.000   Minimum water level    metre"
"     425.750   Maximum water level    metre"
"     423.000   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               423.000     0.000     0.000"
"               423.250  1.00E-04    15.300"
"               423.500   0.00020    68.600"
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"               423.750   0.00030   162.000"
"               424.000   0.00040   284.900"
"               424.250   0.00050   438.500"
"               424.500   0.00060   624.800"
"               424.750   0.03550   845.500"
"               425.000   0.03910  1102.500"
"               425.250   0.04240  1397.400"
"               425.500   0.04540  1731.900"
"               425.750     1.114  2108.600"
"            Peak outflow                    0.686    c.m/sec"
"            Maximum level                 425.650    metre"
"            Maximum storage              1957.827    c.m"
"            Centroidal lag                 44.186    hours"
"                   0.692     0.692     0.686     0.582 c.m/sec"
" 40          HYDROGRAPH   Combine    6"
"           6   Combine "
"           6   Node #"
"               To Wilder Lake"
"            Maximum flow                    1.257    c.m/sec"
"            Hydrograph volume           19665.244    c.m"
"                   0.692     0.692     0.686     1.257"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.692     0.000     0.686     1.257"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         102   102 - Developed Area North"
"      30.000   % Impervious"
"       0.900   Total Area"
"      45.000   Flow length"
"       2.000   Overland Slope"
"       0.630   Pervious Area"
"      45.000   Pervious length"
"       2.000   Pervious slope"
"       0.270   Impervious Area"
"      19.286   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.730   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."
"       0.956   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.125     0.000     0.686     1.257 c.m/sec"
"            Catchment 102          Pervious   Impervious Total Area "
"            Surface Area           0.630      0.270      0.900      hectare"
"            Time of concentration  20.423     2.194      13.870     minutes"
"            Time to Centroid       2517.156   2270.825   2428.605   minutes"
"            Rainfall depth         285.008    285.008    285.008    mm"
"            Rainfall volume        1795.55    769.52     2565.07    c.m"
"            Rainfall losses        77.039     12.663     57.726     mm"
"            Runoff depth           207.969    272.345    227.282    mm"
"            Runoff volume          1310.20    735.33     2045.54    c.m"
"            Runoff coefficient     0.730      0.956      0.797      "
"            Maximum flow           0.087      0.037      0.125      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
```

```
"                    0.125     0.125     0.686     1.257"
" 54          POND DESIGN"
"      0.125   Current peak flow    c.m/sec"
"      0.030   Target outflow    c.m/sec"
"     2045.5   Hydrograph volume    c.m"
"        11.   Number of stages"
"    423.200   Minimum water level    metre"
"    424.850   Maximum water level    metre"
"    423.200   Starting water level    metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"                Level Discharge    Volume"
"              423.350     0.000     0.000"
"              423.500   1.00E-05     9.800"
"              423.650   2.00E-05    24.900"
"              423.800   3.00E-05    45.600"
"              423.950   4.00E-05    72.300"
"              424.100   5.00E-05   105.600"
"              424.250   6.00E-05   145.700"
"              424.400    0.01320   193.300"
"              424.550    0.01548   248.600"
"              424.700    0.01746   312.100"
"              424.850     0.5145   384.400"
"          Peak outflow                 0.124    c.m/sec"
"          Maximum level              424.732    metre"
"          Maximum storage            327.624    c.m"
"          Centroidal lag              43.762   hours"
"                0.125     0.125     0.124     1.257 c.m/sec"
" 40       HYDROGRAPH   Combine    6"
"        6   Combine "
"        6   Node #"
"            To Wilder Lake"
"          Maximum flow                 1.380    c.m/sec"
"          Hydrograph volume        21574.660    c.m"
"                0.125     0.125     0.124     1.380"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.125     0.000     0.124     1.380"
" 33       CATCHMENT 200"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      200   200 - Creek"
"   11.000   % Impervious"
"    4.210   Total Area"
"   75.000   Flow length"
"    5.000   Overland Slope"
"    3.747   Pervious Area"
"   75.000   Pervious length"
"    5.000   Pervious slope"
"    0.463   Impervious Area"
"    9.270   Impervious length"
"    5.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.730   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."
"    0.893   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.573     0.000     0.124     1.380 c.m/sec"
```



```
"          Catchment 200          Pervious   Impervious Total Area "
"          Surface Area           3.747      0.463      4.210      hectare"
"          Time of concentration  21.079     1.074      18.453     minutes"
"          Time to Centroid       2518.198   2230.450   2480.419   minutes"
"          Rainfall depth         285.008    285.008    285.008    mm"
"          Rainfall volume        1.0679     0.1320     1.1999     ha-m"
"          Rainfall losses        76.931     30.566     71.831     mm"
"          Runoff depth           208.077    254.442    213.177    mm"
"          Runoff volume          7796.44    1178.32    8974.76    c.m"
"          Runoff coefficient     0.730      0.893      0.748      "
"          Maximum flow           0.517      0.059      0.573      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.573     0.573     0.124     1.380"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.573     0.573     0.573     1.380"
" 40       HYDROGRAPH   Combine    7"
"        6   Combine "
"        7   Node #"
"            Total to Creek"
"          Maximum flow                 0.573    c.m/sec"
"          Hydrograph volume         8974.756    c.m"
"                0.573     0.573     0.573     0.573"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.573     0.000     0.573     0.573"
" 33       CATCHMENT 201"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      201   201"
"   20.000   % Impervious"
"    2.150   Total Area"
"   45.000   Flow length"
"    2.000   Overland Slope"
"    1.720   Pervious Area"
"   45.000   Pervious length"
"    2.000   Pervious slope"
"    0.430   Impervious Area"
"   11.250   Impervious length"
"    2.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.730   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."
"    0.930   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.294     0.000     0.573     0.573 c.m/sec"
"          Catchment 201          Pervious   Impervious Total Area "
"          Surface Area           1.720      0.430      2.150      hectare"
"          Time of concentration  20.423     1.588      15.871     minutes"
"          Time to Centroid       2517.157   2258.271   2454.579   minutes"
"          Rainfall depth         285.008    285.008    285.008    mm"
"          Rainfall volume        4902.14    1225.54    6127.68    c.m"
"          Rainfall losses        77.039     19.830     65.597     mm"
"          Runoff depth           207.969    265.178    219.411    mm"
"          Runoff volume          3577.07    1140.27    4717.33    c.m"
"          Runoff coefficient     0.730      0.930      0.770      "
```

```
"          Maximum flow              0.238      0.056      0.294      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.294      0.294      0.573      0.573"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.294      0.294      0.294      0.573"
" 40       HYDROGRAPH   Combine    10"
"        6   Combine "
"       10   Node #"
"            To Pond 201"
"          Maximum flow                  0.294     c.m/sec"
"          Hydrograph volume          4717.333     c.m"
"                0.294      0.294      0.294      0.294"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.294      0.000      0.294      0.294"
" 33       CATCHMENT 400"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      400   400 - South to Off Site"
"    8.000   % Impervious"
"    0.990   Total Area"
"   75.000   Flow length"
"    2.000   Overland Slope"
"    0.911   Pervious Area"
"   75.000   Pervious length"
"    2.000   Pervious slope"
"    0.079   Impervious Area"
"    6.522   Impervious length"
"    2.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.731   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."
"    0.900   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.137      0.000      0.294      0.294 c.m/sec"
"          Catchment 400          Pervious   Impervious Total Area "
"          Surface Area           0.911      0.079      0.990      hectare"
"          Time of concentration  27.748     1.145      25.173     minutes"
"          Time to Centroid       2527.669   2234.128   2499.257   minutes"
"          Rainfall depth         285.008    285.008    285.008    mm"
"          Rainfall volume        2595.85    225.73     2821.58    c.m"
"          Rainfall losses        76.801     28.420     72.930     mm"
"          Runoff depth           208.207    256.589    212.078    mm"
"          Runoff volume          1896.35    203.22     2099.57    c.m"
"          Runoff coefficient     0.731      0.900      0.744      "
"          Maximum flow           0.128      0.010      0.137      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.137      0.137      0.294      0.294"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.137      0.137      0.137      0.294"
" 40       HYDROGRAPH   Combine    8"
"        6   Combine "
"        8   Node #"
```



```
"            Total to Off-Site"
"          Maximum flow                  0.137     c.m/sec"
"          Hydrograph volume          2099.570     c.m"
"                0.137      0.137      0.137      0.137"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.137      0.000      0.137      0.137"
" 33       CATCHMENT 401"
"        1   Triangular SCS"
"        2   Proportional to %"
"        1   SCS method"
"      401   401 - To Off Site - West"
"    8.000   % Impervious"
"    1.690   Total Area"
"   75.000   Flow length"
"    3.000   Overland Slope"
"    1.555   Pervious Area"
"   75.000   Pervious length"
"    3.000   Pervious slope"
"    0.135   Impervious Area"
"    6.522   Impervious length"
"    3.000   Impervious slope"
"    0.250   Pervious Manning 'n'"
"   74.000   Pervious SCS Curve No."
"    0.731   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."
"    0.887   Impervious Runoff coefficient"
"    0.100   Impervious Ia/S coefficient"
"    0.518   Impervious Initial abstraction"
"                0.235      0.000      0.137      0.137 c.m/sec"
"          Catchment 401          Pervious   Impervious Total Area "
"          Surface Area           1.555      0.135      1.690      hectare"
"          Time of concentration  24.570     1.014      22.321     minutes"
"          Time to Centroid       2523.168   2228.112   2494.997   minutes"
"          Rainfall depth         285.008    285.008    285.008    mm"
"          Rainfall volume        4431.31    385.33     4816.64    c.m"
"          Rainfall losses        76.807     32.259     73.243     mm"
"          Runoff depth           208.202    252.749    211.765    mm"
"          Runoff volume          3237.12    341.72     3578.84    c.m"
"          Runoff coefficient     0.731      0.887      0.743      "
"          Maximum flow           0.219      0.017      0.235      c.m/sec"
" 40       HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.235      0.235      0.137      0.137"
" 40       HYDROGRAPH Copy to Outflow"
"        8   Copy to Outflow"
"                0.235      0.235      0.235      0.137"
" 40       HYDROGRAPH   Combine    8"
"        6   Combine "
"        8   Node #"
"            Total to Off-Site"
"          Maximum flow                  0.372     c.m/sec"
"          Hydrograph volume          5678.406     c.m"
"                0.235      0.235      0.235      0.372"
" 40       HYDROGRAPH Start - New Tributary"
"        2   Start - New Tributary"
"                0.235      0.000      0.235      0.372"
" 33       CATCHMENT 500"
"        1   Triangular SCS"
"        2   Proportional to %"
```

```
"          1   SCS method"
"        500   500 - to golf course"
"     25.000   % Impervious"
"      1.690   Total Area"
"     45.000   Flow length"
"      4.000   Overland Slope"
"      1.268   Pervious Area"
"     45.000   Pervious length"
"      4.000   Pervious slope"
"      0.423   Impervious Area"
"     15.000   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.730   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."
"      0.928   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
                     0.226     0.000     0.235     0.372 c.m/sec"
            Catchment 500          Pervious   Impervious Total Area "
            Surface Area           1.268      0.423      1.690      hectare"
            Time of concentration  16.589     1.533      12.108     minutes"
            Time to Centroid       2512.020   2255.282   2435.610   minutes"
            Rainfall depth         285.008    285.008    285.008    mm"
            Rainfall volume        3612.48    1204.16    4816.64    c.m"
            Rainfall losses        76.946     20.524     62.840     mm"
            Runoff depth           208.063    264.484    222.168    mm"
            Runoff volume          2637.19    1117.45    3754.64    c.m"
            Runoff coefficient     0.730      0.928      0.780      "
            Maximum flow           0.171      0.055      0.226      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.226     0.226     0.235     0.372"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.226     0.226     0.226     0.372"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.518    c.m/sec"
            Hydrograph volume         8471.973    c.m"
                     0.226     0.226     0.226     0.518"
" 40        HYDROGRAPH Start - New Tributary"
          2   Start - New Tributary"
                     0.226     0.000     0.226     0.518"
" 33        CATCHMENT 600"
          1   Triangular SCS"
          2   Proportional to %"
          1   SCS method"
        600   600"
      0.000   % Impervious"
      0.550   Total Area"
     30.000   Flow length"
      4.000   Overland Slope"
      0.550   Pervious Area"
     30.000   Pervious length"
      4.000   Pervious slope"
      0.000   Impervious Area"
```



```
"      0.000   Impervious length"
"      4.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.725   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"
                     0.075     0.000     0.226     0.518 c.m/sec"
            Catchment 600          Pervious   Impervious Total Area "
            Surface Area           0.550      0.000      0.550      hectare"
            Time of concentration  13.007     0.001      13.007     minutes"
            Time to Centroid       2505.507   2268.005   2505.507   minutes"
            Rainfall depth         285.008    285.008    285.008    mm"
            Rainfall volume        1567.54    0.00       1567.55    c.m"
            Rainfall losses        78.262     33.573     78.262     mm"
            Runoff depth           206.747    251.435    206.747    mm"
            Runoff volume          1137.11    0.00       1137.11    c.m"
            Runoff coefficient     0.725      0.000      0.725      "
            Maximum flow           0.075      0.000      0.075      c.m/sec"
" 40        HYDROGRAPH Add Runoff "
          4   Add Runoff "
                     0.075     0.075     0.226     0.518"
" 40        HYDROGRAPH Copy to Outflow"
          8   Copy to Outflow"
                     0.075     0.075     0.075     0.518"
" 40        HYDROGRAPH   Combine    10"
          6   Combine "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.590    c.m/sec"
            Hydrograph volume         9609.080    c.m"
                     0.075     0.075     0.075     0.590"
" 40        HYDROGRAPH   Confluence    10"
          7   Confluence "
         10   Node #"
              To Pond 201"
            Maximum flow                 0.590    c.m/sec"
            Hydrograph volume         9609.080    c.m"
                     0.075     0.590     0.075     0.000"
" 54        POND DESIGN"
      0.590   Current peak flow    c.m/sec"
      0.100   Target outflow    c.m/sec"
     9609.1   Hydrograph volume    c.m"
        10.   Number of stages"
    423.300   Minimum water level    metre"
    424.250   Maximum water level    metre"
    423.300   Starting water level    metre"
          0   Keep Design Data: 1 = True; 0 = False"
                Level Discharge    Volume"
              423.300     0.000     0.000"
              423.400   0.01130   172.400"
              423.500   0.02640   353.500"
              423.600   0.03737   543.700"
              423.700   0.04577   743.000"
              423.800   0.05281   951.800"
              423.900   0.05904  1170.100"
              424.000    0.3343  1398.300"
              424.100    0.8324  1636.400"
```

```
"          424.200     1.475  1884.800"
"     Peak outflow                    0.584    c.m/sec"
"     Maximum level                 424.050    metre"
"     Maximum storage              1517.557    c.m"
"     Centroidal lag                 43.210   hours"
"          0.075     0.590     0.584     0.000 c.m/sec"
" 40  HYDROGRAPH    Combine    7"
"    6   Combine "
"    7   Node #"
"        Total to Creek"
"     Maximum flow                    1.148    c.m/sec"
"     Hydrograph volume           18584.656    c.m"
"          0.075     0.590     0.584     1.148"
" 38  START/RE-START TOTALS 10"
"    3   Runoff Totals on EXIT"
"     Total Catchment area                        21.320    hectare"
"     Total Impervious area                        3.692    hectare"
"     Total % impervious                          17.317"
" 19  EXIT"
```

APPENDIX C:
SWM FACILITY STAGE-STORAGE-DISCHARGE CALCULATIONS

Wilder Lake Subdivision
Township of Southgate
Our File: 218173
November 2019

CATCHMENT 102 - Block 30 Stormwater Management Pond - Infiltration Pond with Outlet

Elevation (m)	Depth (m)	Width	Length	Active area (m^2)	Active Volume (m^3)	Acc. Active Storage (m^3)	
423.35	0.00	2.00	24.50	49	0.0	0.0	Pond Bottom
423.50	0.15	3.20	25.70	82	9.8	9.8	
423.65	0.30	4.40	26.90	118	15.0	24.9	
423.80	0.45	5.60	28.10	157	20.7	45.6	
423.95	0.60	6.80	29.30	199	26.7	72.3	Orifice Invert
424.10	0.75	8.00	30.50	244	33.2	105.6	
424.25	0.90	9.20	31.70	292	40.2	145.7	T/G - Low Side
424.40	1.05	10.40	32.90	342	47.5	193.3	
424.55	1.20	11.60	34.10	396	55.3	248.6	
424.70	1.35	12.80	35.30	452	63.6	312.1	Overflow Weir
424.85	1.50	14.00	36.50	511	72.2	384.4	Top of Bank

Orifice Outlet

Orifice Dia.:	100	mm
Orifice Area:	0.008	m^2
Coefficient:	0.60	
Invert Elev:	423.95	m

Overflow Weir

Weir Inv. =	424.700	m
Weir L =	5.000	m
2g =	19.620	
Max. H =	0.150	m

Stage-Storage-Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Flow from CB Orifice (m^3/s)	Overflow Weir (m^3/s)	Total Discharge (m^3/s)	
423.35	0.00	0.0	0.0000	0.000	0.0000	Pond Bottom
423.50	0.15	9.8	0.0000	0.000	0.0000	
423.65	0.30	24.9	0.0000	0.000	0.0000	
423.80	0.45	45.6	0.0000	0.000	0.0000	
423.95	0.60	72.3	0.0000	0.000	0.0000	Orifice Invert
424.10	0.75	105.6	0.0000	0.000	0.0000	
424.25	0.90	145.7	0.0000	0.000	0.0000	T/G - Low Side
424.40	1.05	193.3	0.0132	0.000	0.0132	
424.55	1.20	248.6	0.0155	0.000	0.0155	
424.70	1.35	312.1	0.0175	0.000	0.0175	Overflow Weir
424.85	1.50	384.4	0.0192	0.495	0.5145	Top of Pond Bank

Wilder Lake Subdivision
Township of Southgate
Our File: 218173
November 2019

CATCHMENT 101 - Block 31 Stormwater Management Pond - Infiltration Pond with Outlet

Elevation (m)	Depth (m)	Active area (m^2)	Acc. Active Volume (m^3)	Storage (m^3)	
423.00	0.00	10	0.0	0.0	Pond Bottom
423.25	0.25	112	15.3	15.3	Orifice Invert
423.50	0.50	315	53.4	68.6	
423.75	0.75	432	93.4	162.0	
424.00	1.00	551	122.9	284.9	
424.25	1.25	678	153.6	438.5	
424.50	1.50	812	186.3	624.8	T/G- Low Side
424.75	1.75	954	220.8	845.5	
425.00	2.00	1102	257.0	1102.5	
425.25	2.25	1257	294.9	1397.4	
425.50	2.50	1419	334.5	1731.9	Overflow Weir
425.75	2.75	1588	711.3	2108.6	Top of Pond Bank

Orifice Outlet

Orifice Dia.:	125	mm
Orifice Area:	0.012	m^2
Coefficient:	0.60	
Invert Elev:	423.25	m

Overflow Weir

Weir Inv. =	425.500	m
Weir L =	5.000	m
2g =	19.620	
Max. H =	0.250	m

Stage-Storage-Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Flow from CB Orifice (m^3/s)	Overflow Weir (m^3/s)	Total Discharge (m^3/s)	
423.00	0.00	0.0	0.0000	0.000	0.0000	Pond Bottom
423.25	0.25	15.3	0.0000	0.000	0.0000	Orifice Invert
423.50	0.50	68.6	0.0000	0.000	0.0000	
423.75	0.75	162.0	0.0000	0.000	0.0000	
424.00	1.00	284.9	0.0000	0.000	0.0000	
424.25	1.25	438.5	0.0000	0.000	0.0000	
424.50	1.50	624.8	0.0000	0.000	0.0000	T/G - Low Side
424.75	1.75	845.5	0.0391	0.000	0.0391	
425.00	2.00	1102.5	0.0424	0.000	0.0424	
425.25	2.25	1397.4	0.0454	0.000	0.0454	
425.50	2.50	1731.9	0.0482	0.000	0.0482	Overflow Weir
425.75	2.75	2108.6	0.0509	1.066	1.1165	Top of Pond Bank

Wilder Lake Subdivision
Township of Southgate
Our File: 218173
November 2019

CATCHMENT 201 - Block 32 Stormwater Management Pond - Wet Pond

Elevation (m)	Depth (m)	W	L	Active area (m^2)	Active Volume (m^3)	Acc. Active Storage (m^3)	
423.30	0.00	30.00	56.00	1680	0.0	0.0	Culvert invert
423.40	0.10	31.00	57.00	1767	172.4	172.4	
423.50	0.20	32.00	58.00	1856	181.2	353.5	
423.60	0.30	33.00	59.00	1947	190.2	543.7	
423.70	0.40	34.00	60.00	2040	199.4	743.0	
423.80	0.50	35.00	61.00	2135	208.8	951.8	
423.90	0.60	36.00	62.00	2232	218.4	1170.1	Overflow Weir
424.00	0.70	37.00	63.00	2331	228.2	1398.3	
424.10	0.80	38.00	64.00	2432	238.2	1636.4	
424.20	0.90	39.00	65.00	2535	248.4	1884.8	Top of Pond Bank

Orifice Outlet

Orifice Dia.:	200	mm
Orifice Area:	0.031	m^2
Coefficient:	0.60	
Invert Elev:	423.30	m

Overflow Weir

Weir Inv. =	423.900	m
Weir L =	5.000	m
2g =	19.620	
Max. H =	0.100	m

Stage-Storage-Discharge Table

Elevation (m)	Stage (m)	Storage (m^3)	Flow from CB Orifice (m^3/s)	Overflow Weir (m^3/s)	Total Discharge (m^3/s)	
423.30	0.00	0.0	0.000	0.000	0.000	Culvert invert
423.40	0.10	172.4	0.011	0.000	0.011	
423.50	0.20	353.5	0.026	0.000	0.026	
423.60	0.30	543.7	0.037	0.000	0.037	
423.70	0.40	743.0	0.046	0.000	0.046	
423.80	0.50	951.8	0.053	0.000	0.053	
423.90	0.60	1170.1	0.059	0.000	0.059	Overflow Weir
424.00	0.70	1398.3	0.065	0.270	0.334	
424.10	0.80	1636.4	0.070	0.762	0.832	
424.20	0.90	1884.8	0.075	1.401	1.475	Top of Pond Bank

APPENDIX D:
MIDUSS MODELLING - ENHANCED GRASS SWALES

```
"          MIDUSS Output ----------------------------------------------->"
"          MIDUSS version                          Version 2.25  rev. 473"
"          MIDUSS created                       Sunday, February 07, 2010"
"     10   Units used:                                        ie METRIC"
"          Job folder:              C:\Users\jswiger\Desktop\Wilder Lake\"
"                                                                  MIDUSS"
"          Output filename:         218173-EGS-25mm-updatedCatchments.Out"
"          Licensee name:                                            GMBP"
"          Company                                 Hewlett-Packard Company"
"          Date & Time last used:                  11/7/2019 at 3:14:25 PM"
" 31     TIME PARAMETERS"
"      5.000   Time Step"
"    240.000   Max. Storm length"
"   3600.000   Max. Hydrograph"
" 32      STORM Chicago storm"
"          1   Chicago storm"
"    640.170   Coefficient A"
"      5.901   Constant B"
"      0.840   Exponent C"
"      0.375   Fraction R"
"    240.000   Duration"
"      1.000   Time step multiplier"
"          Maximum intensity            70.168    mm/hr"
"          Total depth                  25.126    mm"
"          6   025hyd   Hydrograph extension used in this file"
" 40     HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                0.000     0.000     0.000     0.000"
" 33     CATCHMENT 500"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        500   Catchment 500 east of road"
"     13.000   % Impervious"
"      1.000   Total Area"
"     45.000   Flow length"
"      3.000   Overland Slope"
"      0.870   Pervious Area"
"     45.000   Pervious length"
"      3.000   Pervious slope"
"      0.130   Impervious Area"
"      6.724   Impervious length"
"      3.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     75.000   Pervious SCS Curve No."
"      0.109   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.467   Pervious Initial abstraction"
"      0.015   Impervious Manning 'n'"
"     98.000   Impervious SCS Curve No."
"      0.777   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 500          Pervious   Impervious Total Area "
"          Surface Area           0.870      0.130      1.000      hectare"
"          Time of concentration  41.914     0.961      20.787     minutes"
"          Time to Centroid       188.309    112.491    149.196    minutes"
"          Rainfall depth         25.126     25.126     25.126     mm"
"          Rainfall volume        218.59     32.66      251.26     c.m"
"          Rainfall losses        22.387     5.599      20.205     mm"
"          Runoff depth           2.738      19.526     4.921      mm"
"          Runoff volume          23.82      25.38      49.21      c.m"
```



```
"          Runoff coefficient     0.109      0.777      0.196      "
"          Maximum flow           0.004      0.021      0.021      c.m/sec"
" 40     HYDROGRAPH Add Runoff "
"        4   Add Runoff "
"                0.021     0.021     0.000     0.000"
" 52     CHANNEL DESIGN"
"      0.021   Current peak flow    c.m/sec"
"      0.035   Manning 'n'"
"         0.   Cross-section type: 0=trapezoidal; 1=general"
"      1.500   Basewidth    metre"
"      3.000   Left bank slope"
"      3.000   Right bank slope"
"      0.700   Channel depth    metre"
"      3.700   Gradient   %"
"          Depth of flow                  0.028    metre"
"          Velocity                       0.482    m/sec"
"          Channel capacity               7.831    c.m/sec"
"          Critical depth                 0.027    metre"
" 53     ROUTE    Channel Route 120"
"    120.00      Channel Route 120 Reach length   ( metre)"
"      0.498   X-factor <= 0.5"
"    186.567   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"
"    150.000   Routing time step   ( seconds)"
"          1   No. of sub-reaches"
"          Peak outflow                   0.017    c.m/sec"
"                0.021     0.021     0.017     0.000 c.m/sec"
" 40     HYDROGRAPH   Combine    100"
"          6   Combine "
"        100   Node #"
"              "
"          Maximum flow                   0.017    c.m/sec"
"          Hydrograph volume             49.206    c.m"
"                0.021     0.021     0.017     0.017"
" 40     HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                0.021     0.000     0.017     0.017"
" 33     CATCHMENT 501"
"          1   Triangular SCS"
"          2   Proportional to %"
"          1   SCS method"
"        501   Catchment 500 west of road"
"     21.000   % Impervious"
"      0.520   Total Area"
"     30.000   Flow length"
"      3.000   Overland Slope"
"      0.411   Pervious Area"
"     30.000   Pervious length"
"      3.000   Pervious slope"
"      0.109   Impervious Area"
"      7.975   Impervious length"
"      3.000   Impervious slope"
"      0.250   Pervious Manning 'r'"
"     75.000   Pervious SCS Curve No."
"      0.109   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.467   Pervious Initial abstraction"
"      0.015   Impervious Manning 'n'"
"     98.000   Impervious SCS Curve No."
"      0.783   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.018     0.000     0.017     0.017 c.m/sec"
"             Catchment 501          Pervious   Impervious Total Area "
"             Surface Area           0.411      0.109      0.520      hectare"
"             Time of concentration  32.863     1.064      11.987     minutes"
"             Time to Centroid       176.350    112.658    134.536    minutes"
"             Rainfall depth         25.126     25.126     25.126     mm"
"             Rainfall volume        103.22     27.44      130.65     c.m"
"             Rainfall losses        22.388     5.443      18.830     mm"
"             Runoff depth           2.738      19.683     6.296      mm"
"             Runoff volume          11.25      21.49      32.74      c.m"
"             Runoff coefficient     0.109      0.783      0.251      "
"             Maximum flow           0.002      0.017      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.018     0.018     0.017     0.017"
" 52          CHANNEL DESIGN"
"        0.018   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        1.250   Basewidth    metre"
"        3.000   Left bank slope"
"        3.000   Right bank slope"
"        0.700   Channel depth    metre"
"        3.700   Gradient   %"
"             Depth of flow                  0.028    metre"
"             Velocity                       0.484    m/sec"
"             Channel capacity               7.148    c.m/sec"
"             Critical depth                 0.027    metre"
" 53          ROUTE    Channel Route 120"
"      120.00      Channel Route 120 Reach length   ( metre)"
"        0.498   X-factor <= 0.5"
"      186.134   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"
"      150.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                   0.014    c.m/sec"
"                     0.018     0.018     0.014     0.017 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               "
"             Maximum flow                   0.031    c.m/sec"
"             Hydrograph volume             81.946    c.m"
"                     0.018     0.018     0.014     0.031"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                     0.018     0.000     0.014     0.031"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   Catchment 201 north of the road"
"      33.000   % Impervious"
"       0.600   Total Area"
"      40.000   Flow length"
"       2.000   Overland Slope"
"       0.402   Pervious Area"
"      40.000   Pervious length"
```



```
"        2.000   Pervious slope"
"        0.198   Impervious Area"
"       19.701   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.109   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.800   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.032     0.000     0.014     0.031 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.402      0.198      0.600      hectare"
"             Time of concentration  44.106     2.068      11.171     minutes"
"             Time to Centroid       191.205    113.987    130.709    minutes"
"             Rainfall depth         25.126     25.126     25.126     mm"
"             Rainfall volume        101.00     49.75      150.75     c.m"
"             Rainfall losses        22.388     5.019      16.656     mm"
"             Runoff depth           2.737      20.107     8.469      mm"
"             Runoff volume          11.00      39.81      50.82      c.m"
"             Runoff coefficient     0.109      0.800      0.337      "
"             Maximum flow           0.002      0.032      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.032     0.032     0.014     0.031"
" 52          CHANNEL DESIGN"
"        0.032   Current peak flow    c.m/sec"
"        0.035   Manning 'n'"
"           0.   Cross-section type: 0=trapezoidal; 1=general"
"        0.750   Basewidth    metre"
"        3.000   Left bank slope"
"        3.000   Right bank slope"
"        0.700   Channel depth    metre"
"        1.000   Gradient   %"
"             Depth of flow                  0.075    metre"
"             Velocity                       0.437    m/sec"
"             Channel capacity               3.018    c.m/sec"
"             Critical depth                 0.053    metre"
" 53          ROUTE    Channel Route 120"
"      120.00      Channel Route 120 Reach length   ( metre)"
"        0.483   X-factor <= 0.5"
"      206.003   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"
"      150.000   Routing time step   ( seconds)"
"            1   No. of sub-reaches"
"             Peak outflow                   0.028    c.m/sec"
"                     0.032     0.032     0.028     0.031 c.m/sec"
" 40          HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               "
"             Maximum flow                   0.059    c.m/sec"
"             Hydrograph volume            132.762    c.m"
"                     0.032     0.032     0.028     0.059"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
                0.032     0.000     0.028     0.059"
33        CATCHMENT 202"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
      202   Catchment 201 - south of the road"
   15.000   % Impervious"
    1.500   Total Area"
   40.000   Flow length"
    2.000   Overland Slope"
    1.275   Pervious Area"
   40.000   Pervious length"
    2.000   Pervious slope"
    0.225   Impervious Area"
    7.059   Impervious length"
    2.000   Impervious slope"
    0.250   Pervious Manning 'n'"
   75.000   Pervious SCS Curve No."
    0.109   Pervious Runoff coefficient"
    0.100   Pervious Ia/S coefficient"
    8.467   Pervious Initial abstraction"
    0.015   Impervious Manning 'n'"
   98.000   Impervious SCS Curve No."
    0.786   Impervious Runoff coefficient"
    0.100   Impervious Ia/S coefficient"
    0.518   Impervious Initial abstraction"
                0.036     0.000     0.028     0.059 c.m/sec"
        Catchment 202          Pervious   Impervious Total Area "
        Surface Area           1.275      0.225      1.500      hectare"
        Time of concentration  44.106     1.117      20.028     minutes"
        Time to Centroid       191.205    112.729    147.251    minutes"
        Rainfall depth         25.126     25.126     25.126     mm"
        Rainfall volume        320.35     56.53      376.88     c.m"
        Rainfall losses        22.388     5.374      19.836     mm"
        Runoff depth           2.737      19.751     5.290      mm"
        Runoff volume          34.90      44.44      79.34      c.m"
        Runoff coefficient     0.109      0.786      0.211      "
        Maximum flow           0.005      0.036      0.036      c.m/sec"
40      HYDROGRAPH Add Runoff "
      4   Add Runoff "
                0.036     0.036     0.028     0.059"
52      CHANNEL DESIGN"
    0.036   Current peak flow    c.m/sec"
    0.035   Manning 'n'"
       0.   Cross-section type: 0=trapezoidal; 1=general"
    0.750   Basewidth    metre"
    3.000   Left bank slope"
    3.000   Right bank slope"
    0.700   Channel depth    metre"
    1.000   Gradient   %"
        Depth of flow                 0.080    metre"
        Velocity                      0.453    m/sec"
        Channel capacity              3.018    c.m/sec"
        Critical depth                0.057    metre"
53      ROUTE    Channel Route 120"
  120.00       Channel Route 120 Reach length   ( metre)"
    0.481   X-factor <= 0.5"
  198.571   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"
  150.000   Routing time step   ( seconds)"
```



```
        1   No. of sub-reaches"
        Peak outflow                  0.030    c.m/sec"
                0.036     0.036     0.030     0.059 c.m/sec"
40      HYDROGRAPH   Combine    100"
      6   Combine "
    100   Node #"
          "
        Maximum flow                  0.089    c.m/sec"
        Hydrograph volume           212.105    c.m"
                0.036     0.036     0.030     0.089"
40      HYDROGRAPH Start - New Tributary"
      2   Start - New Tributary"
                0.036     0.030     0.030     0.089"
33      CATCHMENT 203"
        1   Triangular SCS"
        2   Proportional to %"
        1   SCS method"
    203   203 - Parking Lot"
   90.000   % Impervious"
    0.300   Total Area"
   66.000   Flow length"
    2.000   Overland Slope"
    0.030   Pervious Area"
   66.000   Pervious length"
    2.000   Pervious slope"
    0.270   Impervious Area"
  594.000   Impervious length"
    2.000   Impervious slope"
    0.250   Pervious Manning 'n'"
   75.000   Pervious SCS Curve No."
    0.109   Pervious Runoff coefficient"
    0.100   Pervious Ia/S coefficient"
    8.467   Pervious Initial abstraction"
    0.015   Impervious Manning 'n'"
   98.000   Impervious SCS Curve No."
    0.807   Impervious Runoff coefficient"
    0.100   Impervious Ia/S coefficient"
    0.518   Impervious Initial abstraction"
                0.026     0.000     0.030     0.089 c.m/sec"
        Catchment 203          Pervious   Impervious Total Area "
        Surface Area           0.030      0.270      0.300      hectare"
        Time of concentration  59.565     15.961     16.605     minutes"
        Time to Centroid       211.640    135.206    136.336    minutes"
        Rainfall depth         25.126     25.126     25.126     mm"
        Rainfall volume        7.54       67.84      75.38      c.m"
        Rainfall losses        22.387     4.857      6.610      mm"
        Runoff depth           2.738      20.268     18.515     mm"
        Runoff volume          0.82       54.72      55.55      c.m"
        Runoff coefficient     0.109      0.807      0.737      "
        Maximum flow           0.000      0.026      0.026      c.m/sec"
40      HYDROGRAPH Add Runoff "
      4   Add Runoff "
                0.026     0.026     0.030     0.089"
52      CHANNEL DESIGN"
    0.026   Current peak flow    c.m/sec"
    0.035   Manning 'n'"
       0.   Cross-section type: 0=trapezoidal; 1=general"
    0.750   Basewidth    metre"
    3.000   Left bank slope"
    3.000   Right bank slope"
    0.700   Channel depth    metre"
    1.000   Gradient   %"
        Depth of flow                 0.067    metre"
```

```
"            Velocity                          0.409    m/sec"
"            Channel capacity                  3.018    c.m/sec"
"            Critical depth                    0.047    metre"
" 53         ROUTE    Channel Route 45"
"      45.00       Channel Route 45 Reach length   ( metre)"
"       0.458   X-factor <= 0.5"
"      82.493   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                      0.024    c.m/sec"
"                    0.026     0.026     0.024     0.089 c.m/sec"
" 40         HYDROGRAPH   Combine    100"
"           6   Combine "
"         100   Node #"
"               "
"            Maximum flow                      0.105    c.m/sec"
"            Hydrograph volume               267.651    c.m"
"                    0.026     0.026     0.024     0.105"
" 38         START/RE-START TOTALS 203"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                          3.920    hectare"
"            Total Impervious area                         0.932    hectare"
"            Total % impervious                           23.781"
" 19         EXIT"
```

APPENDIX E:
MAINTENANCE CHECKLIST

STORMWATER MANAGEMENT FACILITY MAINTENANCE CHECKLIST

WILDER LAKE SUBDIVISION
263512 SOUTHGATE ROAD 26
SOUTHGATE
GMBP FILE: 218173

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed by the owner on an annual basis.

	Yes	No	Date Completed
1. Is there any noticeable damage to the facility structures (i.e. catchbasins, overflow weirs)? If yes, complete the necessary repairs and/or installation of replacement structures.	☐	☐	
2. Inspect on-site catchbasins. Is cleanout required for: - accumulated sediment - trash/litter - debris (i.e. sediment, garbage, leaves, etc.). - any indication of a spill (frothy water, oily sheen) If yes, arrange for clean-out and disposal of contents as required.	 ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐	
3. Inspect Stormwater Management Facility. Is cleanout required for: - accumulated sediment - trash/litter - debris (i.e. sediment, leaves, etc.). - any indication of a spill (frothy water, oily sheen) If yes, arrange for clean-out and disposal of contents as required.	 ☐ ☐ ☐ ☐	 ☐ ☐ ☐ ☐	
4. Inspect the water level in the SWM pond. - Has the pond completely drained within 48 hours after a storm? If not, inspect the downstream structures and remove and dispose of any accumulated sediment, trash/litter and debris.	☐	☐	
5. Are any components of structures missing parts or are damaged?	☐	☐	

If yes, complete the necessary repairs or replacement in a timely manner.			

Should an accidental spill occur on-site, the Emergency Procedures and the site specific Spill Control and Clean Up would be implemented. As required by the Technical Standards and Safety Authority, the Spills Action Centre (Hotline #1-800-268-6060) would be contacted when necessary.

Signature of Inspector _____.

Date of Inspection _____.

APPENDIX F:
DRIVEWAY CULVERT CALCULATIONS AND STORM SEWER DESIGN SHEET

Driveway Culvert Sizing

Flows in Catchment 101 and 102 are conveyed only in ditches and culverts. Flows in Catchment 201 and 500 are conveyed in ditches and culverts and then conveyed in a storm sewer system.

The largest upstream area that flows through a driveway culvert is in Catchment 101 on the south-east side of roadway before the culvert that outlets to the Block 31 SWM Pond. This catchment area is 1.83 ha. The slope along this roadway is 0.5%. Driveway culvert diameters are 375 mm as per Southgate Municipal Standards minimum sizing.

Storm	Proposed Post-Development Flow Rate (m^3/s)	Maximum Flow in Culvert[1] (m^3/s)	Weir Flow over Driveway (m^3/s)	Flow Depth over Driveway[2] (m)
10 Year	0.121	0.124	0.0	0.0
Regional (Hurricane Hazel)	0.259	0.124	0.135	0.082

1) With 0.5% slope, the maximum capacity of the culvert is 0.124 m^3/s, based on MIDUSS modelling.
2) Weir flow calculation, assuming the driveway can be modelled as a rectangular weir with a width of 4 m.

The ditch was modelled as a channel using MIDUSS with 3:1 side slopes, total depth of 0.93 m, and a manning 'n' of 0.040. The peak flow rate of 0.259 m^3/s would result in a flow depth of 0.387 m. Therefore the culverts and driveway weirs determine the flow.

Therefore the flow can be conveyed in the ditches, culverts, and over driveway low points, without ponding on private property.

Storm Sewer Sizing (Catchment 201 and 500)

See attached Storm Sewer design sheet, completed with the 5 year storm and the 100 year storm

Pike Lake Loam – Hydrologic Soil Group B - loam

From MTO Design Chart 1.07, for 7% sloping lawns with soil between sandy and clay, runoff coefficient c 0.15 for pervious area. For impervious land, c = 0.9. With 30% imperviousness, c= 0.30, which is near the middle of the range for suburban residential areas.

The storm sewer is designed to convey up to and including the 100 year storm.

Design Storm	A	B
2 yr	21.9	-0.701
5 yr	**27.5**	**-0.693**
10 yr	31.2	-0.689
25 yr	35.9	-0.686
50 yr	39.4	-0.683
100 yr	**42.9**	**-0.682**

Where Q = 2.78 AIC and I = A x TcB (where Tc in hours)
Q = peak flow in litres per second (L/s)
A = area in hectares (ha)
I = rainfall intensity in millimetres per hour (mm/h)
C = runoff coefficient
A, B = design storm coefficients
Tc = time of concentration in minutes (MIN. 10.0 minutes)

ESTIMATED DESIGN FLOWS

STORM SEWER DESIGN SHEET
(Based on Mount Forest Rainfall Data)

DESIGN:	PROJECT:	SHEET NO.
IE & JS GM BluePlan Engineering Ltd	Wilder Lake Subdivision	1 of 1
DATE: OCT 2019	PROJECT: 218173	

LOCATION				AREA (ha)											SEWER DATA							
Catchment	STREET	FROM (STRUCTURE)	TO (STRUCTURE)	R = 0.30	R =	R =	R =	Individual 2.78 AC	Cumulative 2.78 AC	Time of Concentration Tc (minutes)	Rainfall Intensity I (mm/h)	Peak Flow Q (L/s)	Constant Flow (L/s)	Cumulative Constant Flow (L/s)	Total Flow (L/S)	Type of Pipe	Roughness Coefficient (n)	Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Full Flow Velocity (m/s)	Time of Flow (minutes)
5 year																							
500		CB-1	CB-2	1.15				0.96	0.96	10.00	95	91			91	PERF PE	0.0130	300	0.60	15.0	75	1.06	0.24
500		CB-2	CBMH-3	0.57				0.48	1.43	10.24	94	134			134	PERF PE	0.0130	375	1.30	100.0	200	1.81	0.92
201		CB-5	CB-4	0.62				0.52	0.52	10.00	95	49			49	PERF PE	0.0130	300	0.50	14.5	68	0.97	0.25
201		CB-4	CBMH-3	1.43				1.19	1.71	10.25	94	160			160	PERF PE	0.0130	450	0.50	27.0	202	1.27	0.36
600		CBMH-3	Outlet	0.20				0.17	3.31	11.16	88	292			292	PERF PE	0.0130	450	7.50	10.0	701	4.91	0.03
100 yr																							
500		CB-1	CB-2	1.15				0.96	0.96	10.00	146	140			140	PERF PE	0.0130	300	2.50	15.0	153	2.16	0.12
500		CB-2	CBMH-3	0.57				0.48	1.43	10.12	144	207			207	PERF PE	0.0130	375	1.40	100.0	207	1.88	0.89
201		CB-5	CB-4	0.62				0.52	0.52	10.00	146	75			75	PERF PE	0.0130	300	1.00	14.5	97	1.37	0.18
201		CB-4	CBMH-3	1.43				1.19	1.71	10.18	144	246			246	PERF PE	0.0130	450	1.00	27.0	285	1.79	0.25
600		CBMH-3	Outlet	0.20				0.17	3.31	11.00	136	452			452	PERF PE	0.0130	450	3.50	10.0	533	3.35	0.05

APPENDIX G:
GEOTECHNICAL INVESTIGATION, CMT ENGINEERING INC.

GEOTECHNICAL INVESTIGATION

WILDER LAKE DEVELOPMENT
263530 SOUTHGATE ROAD 26
TOWNSHIP OF SOUTHGATE, ONTARIO

CMT Project 18-368.R01

Prepared for:

H. Bye Construction Ltd.

December 12, 2018

CMT ENGINEERING INC.

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

December 12, 2018 18-368.R01

H. Bye Construction Ltd.
397 Church Street North
Mount Forest, Ontario
N0G 2L0

Attention: Mr. Harry Bye, P.Eng.

Dear Sir:

Re: Geotechnical Investigation
Wilder Lake Development
263530 Southgate Road 26, Southgate
Township of Southgate, Ontario

As requested, CMT Engineering Inc. conducted a geotechnical 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 allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours very truly,

Shawn Wheatley, M.Eng.

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TABLE OF CONTENTS

1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Mr. Harry Bye, P.Eng. of H. Bye Construction Ltd., to conduct a geotechnical investigation for a proposed residential subdivision located at 263530 Southgate Road 26 in Southgate, Ontario. The geotechnical investigation was carried out in conjunction with a hydrogeology study completed by GM BluePlan Engineering Limited, which will be provided by GM BluePlan under separate cover. The location of the site is shown on Drawing 1.

It is understood that the subject property has been previously developed as a golf course resort and that some of the golf lands will be redeveloped to an estate residential development, with some of the lots fronting onto Wilder Lake. Preliminary plans for the project comprise the construction of twenty-five (25) estate residential lots that will be serviced by individual wells and septic systems.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); dewatering considerations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; storm water infiltration; percolation rate (T-time); and a summary of the laboratory results.

2.0 EXISTING SITE CONDITIONS

The site is currently the Homestead Resort, and mainly comprises a golf course with light vegetation as well as mature trees. The site generally slopes down to the east towards Wilder Lake, with over 5.0 m change in elevation. The site is bounded by Wilder Lake to the east, Southgate Township Road 26 (Homestead Road) to the north, agricultural land to the west, and forested land to the south.

3.0 FIELD AND LABORATORY PROCEDURES

The drilling field investigation was conducted on July 27, 2018, and comprised the advancement of six (6) boreholes (referenced as Boreholes 1 to 6), utilizing a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc.

The borehole depths ranged from 6.10 m (20.0 ft) to 7.62 m (25.0 ft) below the existing ground surface elevations. Soil sampling was undertaken utilizing the Standard Penetration Test (SPT), as well as Macro Core (MC5) systems for Boreholes 1 to 6. Standard Penetration Testing (SPT) was generally conducted at 0.76 m (2.5 ft) intervals to a depth of 3.66 m (12.0 ft), after which SPT sampling was conducted at 1.5 m (5.0 ft) intervals to borehole termination. MC5 continuous sampling was conducted between the 1.5 m (5.0 ft) SPT sampling intervals. Technical staff from

CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each sample was placed in a sealed, marked jar for moisture content determinations.

As requested, representative samples from the following boreholes and depths were submitted to our laboratory for grain size analyses:

- Borehole 1 - depth 1.52 m to 2.13 m (5.0 ft to 7.0 ft)
- Borehole 2 - depth 1.22 m to 2.13 m (4.0 ft to 7.0 ft)
- Borehole 3 - depth 0.76 m to 1.37 m (2.5 ft to 4.5 ft)
- Borehole 4 - depth 0.76 m to 1.37 m (2.5 ft to 4.5 ft)
- Borehole 5 - depth 0.76 m to 1.37 m (2.5 ft to 4.5 ft)
- Borehole 6 - depth 0.76 m to 1.37 m (2.5 ft to 4.5 ft)

CMT Inc. may be contacted for additional laboratory testing on bagged samples should it be required. Samples are normally kept for three months, unless other arrangements are made.

The borehole logs are provided in Appendix A and the resulting grain size analyses can be found in Appendix B.

As requested, each borehole was equipped with 38 mm diameter monitoring well comprising a 3.0 m long prepack screen with a sand filter, then riser pipe backfilled with bentonite, a J-plug and then a locking monument style protective cover. The monitoring wells were installed according with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment (MOE), working for a contractor also licensed by the MOE. The monitoring wells are registered with the MOE in accordance with O.Reg. 903 and must be decommissioned in accordance with Reg. 903 when they are no longer required. CMT Drilling Inc. can provide the decommissioning services. The well log records are provided in Appendix C.

Wilson Ford Surveying conducted a survey of the site, including ground surface elevations at the borehole locations. The ground surface elevations at the borehole locations ranged from 425.26 m to 430.64 m. The locations of the boreholes are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes are described briefly below and a more detailed stratigraphic description is provided on the borehole logs in Appendix A.

4.1. Topsoil

Very loose to loose, dark brown, silty, organic topsoil was encountered at the surface of all boreholes. The topsoil was considered moist. The topsoil ranged in thickness from 150 mm to 250 mm (average 200 mm) at the borehole locations. Given the variation in topsoil thicknesses at the borehole locations, and the undulating nature of the topography, some variance in the topsoil thickness should be expected outside of the sampled areas.

4.2. Fill

Dark brown silt fill was encountered underlying the topsoil in Borehole 2. The fill was considered loose, with an SPT N-value of 7 blows per 0.30 m. The fill was considered moist, with moisture contents ranging from 6.4% to 8.3% (average 7.4%).

4.3. Silty Gravelly Sand

Brown silty sand and gravel or silty gravelly sand, with trace clay, was encountered underlying the topsoil in Boreholes 1, 3 and 4. Occasional sand layers were encountered in the silty gravelly sand in Borehole 4. The silty gravelly sand was considered very loose to compact, with SPT-N values ranging from 2 to 13 blows per 0.30 m (average 8 blows per 0.30 m). The silty gravelly sand was considered moist, with moisture contents ranging from 6.8% to 11.7% (average 9.5%).

4.4. Gravel and Sand

Brown gravel and sand with trace silt and clay was encountered underlying the topsoil in Borehole 6, the silty gravelly sand as well as the sand in Borehole 1, the sandy gravel in Borehole 4, and the sand and silt in Borehole 2. Occasional cobbles were encountered in the gravel and sand in Borehole 6, and occasional thin silt layers were encountered in the gravel and sand in Borehole 1. The gravel and sand was considered compact to very dense, with SPT N-values ranging from 10 to in excess of 100 blows per 0.30 m (average 52 blows per 0.30 m). The gravel and sand was considered damp to saturated, with moisture contents ranging from 2.4% to 14.4% (average 5.7%).

4.5. Sand

Brown medium-fine to coarse sand was encountered underlying the gravel and sand in Borehole 1. The sand was considered compact, with SPT N-values ranging from 18 to 23 blows per 0.30 m (average 20 blows per 0.30 m). The sand was considered damp to moist, with moisture contents ranging from 2.2% to 6.3% (average 4.3%).

4.6. Sandy Gravel/Gravel

Brown to grey sandy gravel with some sand to sandy, some silt, trace clay, and occasional cobbles, was encountered underlying the fill in Borehole 2, underlying the silty gravelly sand in Borehole 4, underlying the gravel and sand in Borehole 4, and underlying the topsoil in Borehole 5. Occasional sand layers and clay layers were encountered in the sandy gravel in Borehole 3. Brown gravel with some sand and silt, trace clay and cobbles, was encountered under the silty sand and gravel in Borehole 3. The sandy gravel and gravel was considered compact to very dense, with SPT N-values ranging from 10 to in excess of 100 blows per 0.30 m (average 33 blows per 0.30 m). The sandy gravel was considered damp to saturated, with moisture contents ranging from 2.1% to 18.8% (average 8.8%).

4.7. Sand and Silt

Brown sand and silt with trace gravel to gravelly, and trace clay was encountered underlying the gravel and sand in Boreholes 1 and 6, as well as underlying the sandy gravel in Borehole 2. The sand and silt contained occasional thin clay layers in Borehole 1, and occasional cobbles in Borehole 2. The sand and silt was considered compact to dense, with SPT N-values ranging from 13 to 31 blows per 0.30 m (average 23 blows per 0.30 m). The sand and silt was considered wet to saturated, with moisture contents ranging from 8.2% to 16.4% (average 11.0%)

4.8. Groundwater

As requested, all six (6) boreholes were each equipped with a monitoring well. The monitoring wells were installed and registered in accordance with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment (MOE), working for a contractor also licensed by the MOE.

GM BluePlan Engineering Limited staff measured the water levels on August 2, 2018. The following table summarizes the borehole number, ground surface elevation, elevation of water in the monitoring well, cave elevation, zone of saturation and the bottom of borehole elevation for each borehole.

Borehole No.	Ground Surface Elevation (m)	Measured Elevation of Water in Monitoring Well August 2, 2018 (m)	Zone of Saturation Elevation (m)	Bottom of Borehole Elevation (m)
1	425.64	420.97	420.76 to termination	419.54
2	430.64	(dry to bottom)	--	423.02
3	425.90	421.83	423.61 to 423.00 421.33 to termination	419.80
4	425.54	(dry to bottom)	--	417.92
5	425.26	421.88	422.21 to termination	419.16
6	427.30	421.64	422.27 to termination	421.20

It should be noted that the very dense and/or fine-grained, less permeable soils encountered in the boreholes have the potential to create perched water conditions. Perched water conditions are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. As such, provisions for site dewatering should be part of the site development and construction process. Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

5.0 DISCUSSION AND RECOMMENDATIONS

It is understood that the subject property has been previously developed as a golf course resort and that some of the golf lands will be redeveloped to an estate residential development, with some of the lots fronting onto Wilder Lake. Preliminary plans for the project comprise the construction of twenty-five (25) estate residential lots that will be serviced by individual wells and conventional septic systems.

Utilizing the information gathered during the geotechnical investigation and assuming that the borehole information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided.

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained from the boreholes, the following table provides the Serviceability Limit States (SLS) and Ultimate Limit States (ULS) pressures at the various elevations, including soil types:

Borehole No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Founding Elevations (m)	Depth Below Existing Grade to the Highest Founding Elevation (m)	Soil Type
1	425.64	150 (3,000)	225 (4,500)	424.88 to 419.54 (termination)	0.76	Gravel and Sand/Sand/Sand and Silt
2	430.64	150 (3,000)	225 (4,500)	429.42 to 423.02 (termination)	1.22	Sandy Gravel/Sand and Silt/Gravel and Sand
3	425.90	150 (3,000)	225 (4,500)	425.75 to 419.80 (termination)	0.15	Silty Sand and Gravel/Gravel
4	425.54	150 (3,000)	225 (4,500)	425.34 to 417.92 (termination)	0.20	Silty Gravelly Sand/Sandy Gravel/Gravel and Sand
5	425.26	150 (3,000)	225 (4,500)	425.11 to 419.16 (termination)	0.15	Sandy Gravel
6	427.30	150 (3,000)	225 (4,500)	427.05 to 421.20 (termination)	0.25	Gravel and Sand/Sand and Silt

Based on the bearing capacities and elevations provided in the table above, suitable founding elevations for conventional foundations designed with a minimum bearing capacity of 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS range below elevations 424.88 m to 429.42 m for Boreholes 1 to 6. It should be noted that the above-referenced elevations of soils capable of supporting foundations designed with a bearing capacity of 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS corresponds with depths ranging from approximately 0.15 m to 1.22 m below the existing ground surface at the borehole locations.

Soils capable of supporting foundations are generally encountered below the topsoil and upper zone of fill or loose native soils. Therefore, the topsoil, fill, and relatively loose native soils must be subexcavated in the areas of the proposed structures. The founding soil must be assessed at the time of construction by qualified geotechnical personnel in order to confirm their founding suitability. Alternatively, loose native soils encountered directly underlying the topsoil could be subjected to further compactive effort and testing, provided they contain no organic or other deleterious material, and provided the moisture content is suitable to achieve the specified compaction of 100% SPMDD.

Should footings be designed to be constructed at elevations higher than the elevations indicated in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. The serviceability limit pressure for structural fill placed and compacted in accordance with Section 5.4.4 of this report and constructed on approved competent native soils is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS. Alternatively, footings could be stepped down to bear on approved undisturbed founding soils.

Footings may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings are separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings. This must be taken into account for any deep structures such as sump pits.

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation (sufficient thermal insulation is required to protect all footings and slab-on-grades during construction until such a time that the structure is heated) in order to provide protection from frost action.

It should be noted that depending on the final grades, the native founding soils may be in a wet to saturated state; therefore, dewatering during construction may be required (see Section 5.8 of this report) along with the potential construction of a mud mat or granular drainage layer.

At the time of investigation, the proposed founding elevations were not available. CMT Inc. would be pleased to review design drawings when they become available and provide further recommendations with respect to bearing and foundation elevations.

5.2. Seismic Site Classification

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 7.62 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class D (stiff soil) for structures founded on the native soils at the recommended founding elevations provided in Section 5.1 of this report or on or structural fill placed in accordance with section 5.4.4 of this report. The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. Soil Design Parameters

The following table provides the soil design parameters for imported granular fill, as well as the native soils encountered on-site. The soil design parameters can be utilized for the design of perimeter shoring, foundations and retaining walls, as required:

Soil Type	Soil Density (kg/m^3)	Friction Angle (Degree)	Coefficient of Active Pressure (K_a)	Coefficient of Passive Pressure (K_p)	Coefficient of At-Rest Pressure (K_o)	Coefficient of Friction (μ)
Imported Gran 'A'/Gran 'B' (OPSS 1010)	2,100	34°	0.28	3.54	0.44	0.45
Silty Gravelly Sand	2,000	32°	0.30	3.25	0.47	0.41
Gravel and Sand	1,950	34°	0.28	3.54	0.44	0.45
Sand	1,850	31°	0.32	3.12	0.48	0.40
Sandy Gravel	1,900	31°	0.32	3.12	0.48	0.40
Sand and Silt	1,800	32°	0.30	3.25	0.47	0.41

5.4. Site Preparation

The site preparation for the proposed new residential development will include topsoil stripping, vegetation grubbing, the subexcavation of all fill and relatively loose native soils deemed not capable of supporting the design bearing capacity (or remedial action which may include air drying and the application of further compactive effort), the removal or relocation of any existing services (field tiles), followed by the placement of structural fill (as required) and site grading to achieve proposed grades.

5.4.1. Topsoil Stripping/Vegetation Grubbing

All topsoil must be removed from within the proposed building, road and driveway envelopes to expose approved competent subgrade soils. The topsoil may be used in landscaped areas where some settlement can be tolerated; otherwise it should be properly disposed of off-site. Due to the undulating topography and erosion, it should be expected that the thickness of topsoil may vary significantly throughout the site.

All vegetation and trees (including tree root structures as well as any loose soils that are typically associated with root structures) must be removed from within the proposed building and driveway envelopes to expose approved competent subgrade soils.

The volume of topsoil removed during the stripping process can be influenced by the equipment utilized for the stripping process as well as the moisture conditions at the time of stripping. If an excavator with a smooth bucket is utilized for stripping, there would generally be less potential for topsoil to become intermixed with the underlying, generally loose to very loose subsoil and therefore less concern of over-excavation to remove all topsoil. If the topsoil is stripped with wheeled equipment or bulldozers, then there is an increased potential for the topsoil and subsoil to become intermixed, subsequently requiring additional excavation to remove all topsoil. This is further influenced by rutting which can occur during wet conditions.

5.4.2. Fill/Unsuitable Soil Removal

The existing fill typically exists in a loose state and is not considered structurally sound to support foundations or the slab-on-grade for the proposed buildings. Therefore, all existing fill (including any existing trench backfill and sand from existing sand traps), as well as any native soil that has inadequate bearing capacity or has been disturbed by the golf course construction processes and is deemed unsuitable to support foundations or slab-on-grades, must be subexcavated from within the proposed building envelope and exterior sidewalks or concrete slabs to expose approved competent subgrade soils. It would also be sound construction practice to subexcavate all existing unsuitable fill from paved driveway areas; however, this may not be cost-effective. At a minimum, thorough inspection will be required at the time of construction to assess the existing fill to ensure there is no buried topsoil or other deleterious materials within the subgrade. Remedial action will also be required to further consolidate the existing fill if it is decided to leave it in place. If the existing fill is left in place, provisions for the alterations to the design of the pavement structure should be included in the tender documents.

Review of the subgrade and potential changes to the design of the pavement structure, as required, will be addressed at the time of construction.

Prior to reusing excavated material on-site as potential bulk fill in driveways and parking lots, thorough field inspection and approval from qualified geotechnical personnel would be required to ensure that existing fill materials do not comprise organics, topsoil or other deleterious materials.

5.4.3. Removal/Relocation of Existing Services

Any existing buried pipes that are no longer deemed necessary should be removed. This includes irrigation pipes, and any existing field tiles or existing subdrains that may be present. Any existing tile drains that may be located within the proposed building envelope, hard-surfaced areas and septic system areas must be completely removed to a minimum distance of 15.0 m (50.0 ft) outside of the building envelope. Ideally, depending on flow direction, any existing tile drains (if present) should be redirected outside of the building envelope, hard-surfaced areas and septic system areas in order to maintain flow and prevent subsurface accumulation of water. The locations of existing field tiles are commonly identified by relatively straight lines of buried topsoil within the subgrade soils and/or water boiling out of the ground following excavation. Any piping that is left in place that is no longer active must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids, which may result in potential settlement. All existing trench backfill material associated with any existing buried pipes must be subexcavated and the subsequent excavation must be backfilled with approved soils placed in accordance with Section 5.4.4 of this report.

The monitoring wells that have been installed to determine static water levels can be decommissioned by an MOE licensed well contractor with a Class 1, Class 2 or Class 3 license in accordance with Reg. 903. CMT Drilling Inc. would be pleased to provide these services when the monitoring wells are no longer required.

5.4.4. Site Grading

Following stripping of the topsoil, the removal of all trees roots (including all relatively loose soils associated with the tree roots) as well as the subexcavation of any fill and relatively soft native soils deemed unsuitable of supporting the design bearing capacity, the exposed subgrade must be proof-rolled, and any soft or unstable areas (including sand trap excavations) must be further subexcavated and replaced with approved fill materials.

The proposed finished floor elevations were not known at the time of preparation of this report; however, it is expected that some structural fill placement may be required. The fill materials required to achieve the design site grades should be placed according to the following procedures:

- Prior to placement of any structural fill or bulk fill, the subgrade for the proposed buildings and paved areas must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundation and pavement/concrete edge down to the approved competent founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill material) and 0.2 m (8") in depth for silts and clays (not recommended for this application), or the capacity of the compactor (whichever is less);

- Native granular soils as well as imported granular fill materials (OPSS 1010 Type I or Type III Granular 'B') can be compacted utilizing adequate heavy vibratory smooth drum or padfoot compaction equipment (compaction with padfoot equipment requires that structural fill be placed a minimum 0.3 m above the design footing grade in order to account for the disturbance of the founding soils from the pads on the compaction equipment);

- Approved fill materials must be at suitable moisture contents to achieve the specified compaction. The wet to saturated soils encountered in the boreholes would generally be considered difficult for use as structural fill as they would require extensive air-drying in order to achieve the specified density. Soil moisture will also be dependent on weather conditions at the time of construction;

- Approved structural fill materials that will support structures (including house foundations, interior slab-on-grades, sidewalks, large expansive exterior slabs, decks and exterior stairs) must be compacted to a minimum of 100% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for paved areas) must be compacted to a minimum 95% SPMDD;

- Granular 'B' subbase and Granular 'A' base materials for paved areas must be compacted to 100% SPMDD;

- It is recommended that compactive effort be applied to bulk fill in landscaped areas in order to reduce the effects of long term settlement.

Based on the subsurface conditions observed in the boreholes, wet soils may be encountered, depending on the depth of excavation. As such, for soils excavated from the zone of saturation, significant air-drying along with working of the soils may be required in order to achieve the specified compaction of 100% SPMDD for structural fill and 95% SPMDD for bulk fill for roads and driveways. Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

5.5. Foundation Subgrade Preparation

The native soils encountered in the boreholes are sensitive to change in moisture content and can become loose/soft if the soils are subjected to additional water or precipitation, as well as severe drying conditions. The native subgrade soils could also be easily disturbed if traveled on during construction. Once they become disturbed they are no longer considered adequate for the support of shallow foundations. To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade should be sloped or ditched to a sump (as required) located outside the building footprint (if feasible) in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation (the environmental consultant must be consulted prior to any on-site water being pumped and/or discharged to municipal outlets to ensure that proper procedures are followed). It is critical that all water be controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- Should the native subgrade soils at the design founding elevation in the proposed building envelope(s) comprise saturated soils, as was observed in some of the boreholes, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) may be required;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and any potential fill materials must be maintained above freezing;

- Prior to pouring concrete for the footings, the footing area must be cleaned of all disturbed or caved materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection and approval of the founding soils. The longer that the excavated soils remain open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be poured in order to protect the structural integrity of the founding soils.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade soils should be proof-rolled. Any soft or weak zones, as well as any potential unsuitable fill in the subgrade (field tile trenches), should be subexcavated and backfilled with approved fill materials (see Section 5.4.4 of this report).

The following table provides the modulus of subgrade reaction (k) for imported granular fill, as well as the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Imported Sand and Gravel (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Silty Gravelly Sand	20,000 kN/m^3 (75 lb/in^3)
Gravel and Sand	81,000 kN/m^3 (300 lb/in^3)
Sand	68,000 kN/m^3 (250 lb/in^3)
Sandy Gravel	81,000 kN/m^3 (300 lb/in^3)
Sand and Silt	61,000 kN/m^3 (225 lb/in^3)

Floor slabs can be founded on a minimum thickness of 100 mm (4") of coarse, clean granular material containing not more than 10% of material that will pass a 4 mm sieve in accordance with the current OBC. The clean granular material should be consolidated to prevent future settlement.

It is recommended that areas of extensive exterior slab-on-grade (sidewalks and accessibility ramps) be constructed with a Granular 'B' subbase (450 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to promote rapid drainage and reduce the effects of frost heaving. This is particularly critical at barrier-free access points. Alternatively, structural frost slabs could be designed and constructed, or sufficient thermal insulation could be provided, at all door entrances and areas of barrier-free access.

5.7. Excavations

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 3 Soils - In general, the existing native soils as well as the fill materials encountered in the boreholes in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, any wet to saturated soils would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

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

It should be noted that the native sandy gravel, as well as the gravel and sand soils encountered in the boreholes, contained large cobbles and became very dense in places (SPT N-values in excess of 50 blows per 0.30 m) and may prove difficult to excavate with conventional excavating equipment, impacting the production schedule. It is imperative that if the very dense soils are utilized as fill, the material must be broken down (pulverized) to minimize void space and reduce the potential for settlement.

5.8. Construction Dewatering Considerations

Wet to saturated soils were encountered in Boreholes 1, 3, 5 and 6 as described in Section 4.8 of this report. It should be noted that the relatively fine-grained and/or dense soils may have the potential to create perched water conditions. Groundwater conditions (particularly perched water) are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume. As such, provisions for site dewatering should be part of the site development and construction process.

Seepage control requirements during construction will depend upon the area of work on the site, the depth of the excavations, the time of year, the amount of precipitation and the control of surface water. As such, it is critical that provisions for site dewatering be part of the site development and construction process. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. However, if heavy seepage occurs, it may be necessary to increase the number of pumps during construction.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

5.9. Service Pipe Bedding

The native soils encountered in the geotechnical investigation are generally considered suitable for indirect support of the site service pipes. Should instability due to saturated soil conditions be encountered, it may be necessary to increase the thickness of the granular base and utilize 19 mm clear stone to create an adequate supporting base for the service pipes and/or manholes. Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSD, OPSS and OBC standards and guidelines and as follows:

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-803.031. The trench excavations should be symmetrical with respect to the centre-line 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 bedding should consist of 19 mm clear stone (meeting OPS Specifications) wrapped completely in a geotextile fabric such as Terrafix 270 or equivalent. The general contractor is responsible to protect service piping from damage by heavy equipment.

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

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining dry buildings with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m. Any surface discharge rainwater leaders must be constructed with solid piping that discharges with positive drainage at least 1.5 m away from the building foundations and/or beyond sidewalks to a drainage swale or appropriate storm drainage system.

The founding elevations for the proposed structures were not available at the time of preparation of this report. CMT Inc. can provide further recommendations for building drainage once the design drawings are completed and the founding elevations have been confirmed.

It should be noted that based on the observations in the boreholes, there is potential for perched water conditions. The construction of foundations, slabs-on-grade, and deep structures such as sump pits within or below zones of saturation will require design of site-specific waterproofing systems constructed in accordance with the 2012 OBC. If required, it would be recommended that a waterproofing supplier/specialist be consulted to recommend an appropriate product and installation requirements that would be suited to this site. It is recommended that a good quality sump pump be utilized, and that the system be equipped with a battery back-up in the event of power failure, (keeping in mind that a battery back-up system does not typically have a long run time).

If it is expected that the new residences will have basements, exterior perimeter weeping tile systems comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone and wrapped in geotextile filter fabric such as Terrafix 270R (or equivalent), must be installed at an elevation that is below the proposed basement slab-on-grade elevation and provided with positive drainage into a sump pit. The portion of the piping that connects the exterior weeping tile system into the sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. It may be prudent to install perforated drainage pipe in the interior basement as well to provide an outlet for any water that may collect in the subslab stone. It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). The rainwater leaders must not be connected to the perimeter weeping tile system.

In order to reduce the effects of surficial frost heave in areas that will be hard surfaced, it is recommended that the exterior foundation backfill consist of free-draining granular material such as approved on-site sand and gravel or imported Granular 'B' Type I or Type III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation walls and/or beyond perimeter sidewalks and entranceway slabs. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled, and the height of the wall is such that lateral support is required, or where the concrete strength has not been achieved, the wall must be braced or laterally supported prior to backfilling. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 100% SPMDD.

The native mineral soils, as well as approved fill materials (non-organic) are generally considered suitable for reuse as trench backfill and bulk fill in the driveways and parking lots; however, the wet soils may require air-drying in order to achieve the specified compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment (suited to soil type) should be used for the compaction and to break down any large blocky pieces of soil;
- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for silt soils or the capacity of the compactor (whichever is less);
- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas. Service trenches excavated within the zone of influence of footings for structures must be compacted to a minimum of 100% SPMDD;
- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;
- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;
- If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

5.11. Pavement Design/Drainage

All topsoil, vegetation (including tree roots and all loose/disturbed soils associated with tree roots) must be subexcavated from within driveway and road areas. It is recommended to either subexcavate any existing soft subgrade materials or provide further consolidation with vibratory compaction equipment in order to prepare a proper, stable subgrade. Prior to placement of the granular base, the subgrade must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable drier materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward the drainage outlet or curbline/edge of asphalt (provided that collection and proper gravity drainage to a suitable outlet is provided). When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance. The requirement for subdrains will be dependent on the composition of the prepared pavement subgrade soils. If the subgrade soils comprise fine-grained, frost-susceptible soils, then it is recommended to install minimum 100 mm diameter perforated subdrains to collect and redirect water beneath the pavement surface (provided positive drainage to a suitable outlet can be provided). Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain, then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent) and a factory installed filter sock is not required. Installation of rigid subdrains allows for better grade control and less potential for damage during installation; however, it would be expected that there would be higher cost implications associated with the installation of rigid subdrains over flexible subdrains. Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost heave. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that subdrains be along the curb lines. It is also recommended to install subdrains through any areas that cannot tolerate differential frost heave such as accessibility ramps/sidewalks. The subdrains should be installed in a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

Should the subgrade soils comprise free-draining granular soils (minimum 1.0 m thick with positive drainage at the interface with any relatively impermeable soils), then the installation of subdrains may not be required.

The subgrade soils could be easily disturbed if traveled on during construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

Should wet conditions be encountered during construction, site assessments may be required to determine what options can be undertaken to construct a modified pavement base. These options may include subexcavation of wet soils and increasing the thickness of the granular base, the use of reinforcing geotextiles, or a combination of both.

It is expected that driveways and parking lots will experience mostly light residential traffic (personal vehicles) and some heavy traffic (delivery trucks, as well as maintenance and emergency vehicles). Based on the anticipated vehicle loading, the following pavement design is provided:

Materials	Recommended Thickness for New Pavement
Asphaltic Concrete	HL3 40 mm (1.5") HL4 or HL8 - 50 mm (2.0")
Granular 'A' Base (OPSS 1010)	150 mm (6.0")
Granular 'B' Subbase (OPSS 1010)	450 mm (18.0")

Given the potential for wet subgrade conditions, site assessments may be required at the time of construction to determine what options can be undertaken to construct a stable road and driveway base. These options may include subexcavation and increasing the thickness of the Granular 'B' subbase, the use of reinforcing geotextile and/or geogrid, or a combination of all. As such, it is recommended that provisions for subexcavation and disposal of wet soils, importing and placing additional Granular 'B' (OPSS 1010), as well as supply and placement of a reinforcing geotextile (Terrafix 200W or equivalent) and geogrid (Tensar TX160 or equivalent) should be included in the tender documents.

Construction joints in the surface asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Where new asphalt is joined into existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 40 mm and a width of 150 mm as per OPSD 509.010. It is recommended that a tackcoat in conformance with OPSS 308 be applied to the edge and surface of all milled asphalt prior to placement of new asphalt.

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum 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 within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is

strongly recommended that the surface asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that currently, asphalt mixes tend to be more flexible, and as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The damage can occur from both passenger vehicles as well as delivery trucks and the condition is further intensified during hot weather.

5.12. Excess Soil Management

5.12.1. Chemical Testing was NOT Undertaken

Generally, if surplus soils are to be exported off-site, it will be necessary to perform chemical analysis of the soils. Chemical analysis was not undertaken as part of this geotechnical investigation. Should chemical analysis tests be required, the required tests vary and will be dependent on the disposal site utilized by the general contractor.

Most commonly, the soils are tested for the following:

- F1-F4, VOC's, BTEX as per O. Reg. 153/04 as amended by R511
- SVOC as per O. Reg. 153/04 as amended by R511
- Metals/Inorganics as per O. Reg. 153/04 amended by R511

The chemical analysis results are then compared to Ontario Regulation 153/04 - as amended by O.Reg. 511 – April 15, 2011 Standards = [Suite] – ON-511-T1/T2-SOIL-RPI. Specifically, the results were compared in *T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use*, *T2-Soil-Res/Park/Inst. Property Use (Coarse)* and *T3-Soil-Res/Park/Inst. Property Use (Fine)*.

5.12.2. TCLP Requirement

If soils are transported to a land fill facility, additional chemical testing in accordance with Ontario Regulation 347, Schedule 4, as amended to Ontario Regulation 558/00, dated March 2001, Toxicity Characteristic Leaching Procedure (TCLP) will be required.

When transporting soils off-site, the following is recommended:

- All chemical analyses and environmental assessment reports must be fully disclosed to the receiving site owners/authorities, whom must agree to receive the material;
- An environmental consultant must confirm the land use at the receiving site is compatible to receive the material;
- An environmental consultant must monitor the transportation and placement of the materials to ensure that the material is placed appropriately at the pre-approved site;
- The excess materials may not be transported to a site that has previously had a Record of Site Condition (RSC) filed, unless the material meets the criteria outlined in the RSC.

It should be noted that landfill sites will generally only accept laboratory test results that have been completed within 30 days of exporting. Therefore, it is recommended that provisions for chemical analysis be included in the tender documents. It should also be noted that the laboratory testing generally takes five (5) working days to process with a regular turnaround time.

5.13. Infiltration and Coefficient of Permeability/T-Time

As part of the geotechnical investigation, gradation analyses were performed on samples of the native sand, gravel/sandy gravel, silty gravelly sand, as well as the gravel and sand soils. The following table provides the borehole number, sample depth, estimated coefficient of permeability (k) and percolation rate (T-time), as well as soil type:

Borehole No.	Depth (m)	Estimated Coefficient of Permeability (k) cm/s	Estimated Percolation Rate (T) min/cm	Soil Type
1	1.52 – 2.13	3.2×10^{-3}	10	Sand, some silt, trace clay and gravel (SM)
2	1.22 – 2.13	8.4×10^{-4}	12	Sandy gravel, some silt, trace clay (GM)
3	0.76 – 1.37	3.9×10^{-3}	8	Gravel, some sand and silt, trace clay (GM)
4	0.76 – 1.37	4.8×10^{-4}	15	Silty, gravelly sand, trace clay (SM)
5	0.76 – 1.37	5.3×10^{-3}	8	Sandy gravel, trace silt and clay (GW-GM)
6	0.76 – 1.37	8.0×10^{-3}	8	Gravel and sand, trace silt and clay (GP-GM)

5.14. Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock and water. When radon escapes the earth in the outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most homes have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new home will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a home, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that "*Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control*".

6.0 SITE INSPECTIONS

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed development.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. 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.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

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

Prepared by:

Shawn Wheatley, M.Eng.

Reviewed by:

LICENSED PROFESSIONAL ENGINEER
Dec 13/18
R. KOOPMANS
PROVINCE OF ONTARIO

Robert Koopmans, P.Eng.
Consulting Engineer

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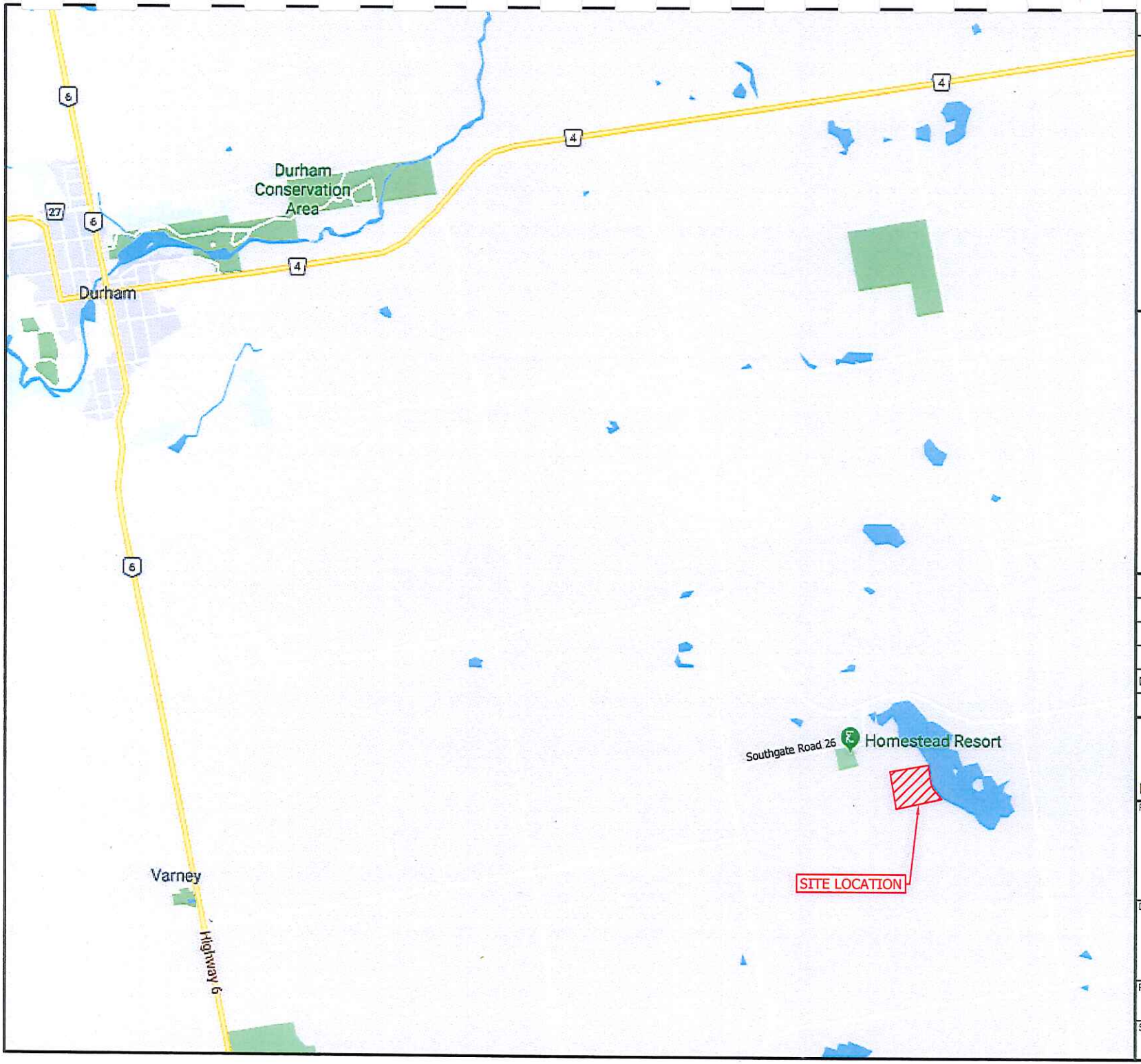

NOTES:

Base map provided by Google Maps

N

NO.	DESCRIPTION	DATE

REVISIONS

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St. Clements, Ontario N0B 2M0
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Fax: 519-699-4664
www.cmtinc.net

PROJECT:

Wilder Lake Subdivision
263530 Southgate Road 26,
Township of Southgate, Ontario

DRAWING TITLE:

SITE LOCATION MAP

PROJECT NO.:	DATE:
18-368	December 4, 2018
SCALE:	DRAWING NO.
N.T.S.	1

NOTES:

1. This drawing is for information purposes only. Locations and sizes of existing and proposed structures are approximate only, and should not be used for construction.
2. Base drawing is provided by Grey County GIS Viewer

N

NO.	DESCRIPTION	DATE

REVISIONS

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PROJECT:

Wilder Lake Subdivision
263530 Southgate Road 26,
Township of Southgate, Ontario

DRAWING TITLE:

SITE PLAN SHOWING
BOREHOLE LOCATIONS

PROJECT NO.:	DATE:
18-368	December 4, 2018
SCALE:	DRAWING NO.
N.T.S.	2

APPENDIX A

BOREHOLE LOGS

BOREHOLE 1

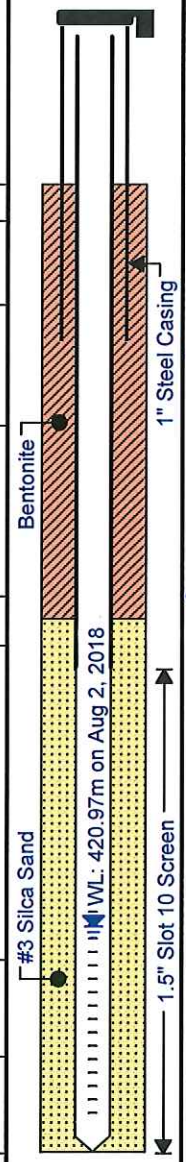
Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 425.64 m
Logged by: TS

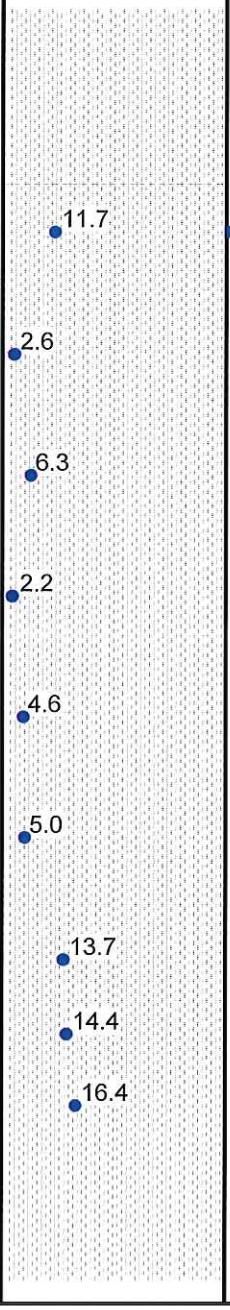
Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth
					Ground Surface (m)	425.64	
	SS		1		**TOPSOIL** Very loose, dark brown, silty organic topsoil, moist (230mm)		0.00
	SS		2		**SILTY GRAVELLY SAND** Loose, brown silty gravelly sand, trace clay, moist	424.88	0.76
	SS		3		**GRAVEL AND SAND** Dense, brown gravel and sand, trace silt and clay, damp	424.12	1.52
	SS		4		**SAND** Compact, brown medium/fine sand, some silt, trace clay, moist; Becoming coarse sand, damp	423.05	2.59
	SS		5		**GRAVEL AND SAND** Very dense, brown gravel and sand, trace silt and clay, damp; Occasional thin silt layers		
	MC5		6				
	SS		7		Becoming saturated	420.76	4.88
	MC5		8		**SAND AND SILT** Compact, brown sand and silt, trace gravel and clay, saturated, rapidly dilating; Occasional thin clay layer	420.15	5.49
					End of Borehole	419.54	6.10

Well Installation

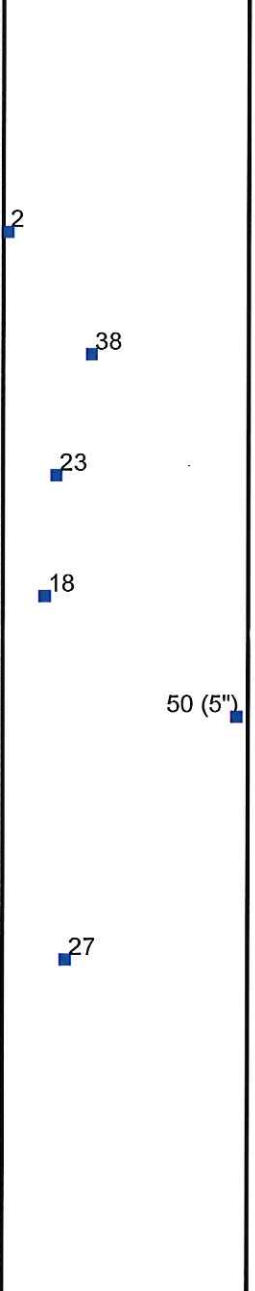


Moisture Content % (Wp [----X----] Wl): 10 20 30 40



Pocket Penetrometer kPa: 100 200 300 400

SPT (N) Blows/0.3 m: 20 40 60 80



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BOREHOLE 2

Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

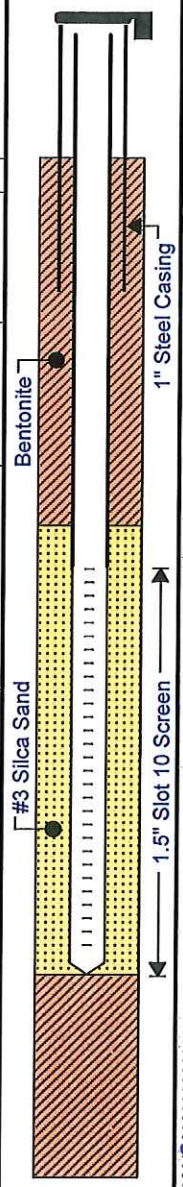
Elevation: 430.64 m
Logged by: TS

Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Moisture Content % (Wp [----X----] Wl) 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	430.64		
	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (250mm)	0.00	8.3	7
	SS		2		**FILL** Loose, dark brown silt fill, some topsoil, moist	429.42 / 1.22	6.4	19
	SS		3		**SANDY GRAVEL** Compact, brown sandy gravel, some silt, trace clay, occasional cobbles, moist	428.35 / 2.29	9.5	26
	SS		4		Becoming dense		8.0	33
	SS		5				8.6	50 (2")
	MC5		6		**SAND AND SILT** Compact, brown, sand and silt, some gravel, trace clay, occasional cobbles, wet	426.68 / 3.96	10.4	
	SS		7				10.2	26
	MC5		8				10.9	
	SS		9		Becoming dense	424.54 / 6.10		31
	MC5		10			423.32 / 7.32	2.8	
					GRAVEL AND SAND Dense, brown gravel and sand, trace silt and clay, damp	432.02 / 7.62		
					End of Borehole			

Depth scale: ft / m

Well Installation:



Well dry to bottom Aug 2, 2018

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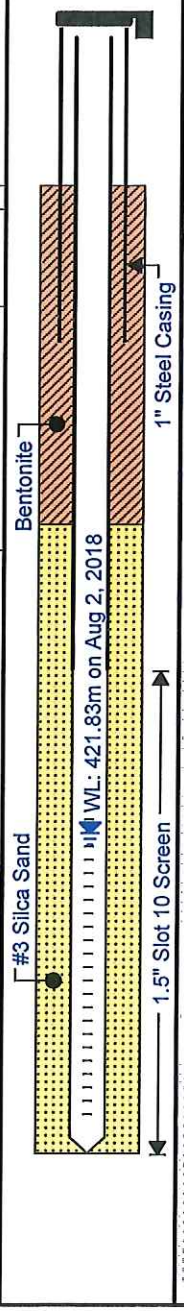
BOREHOLE 3

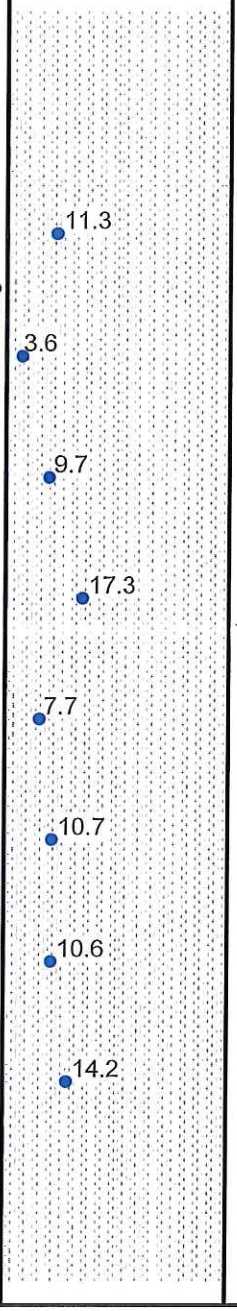
Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

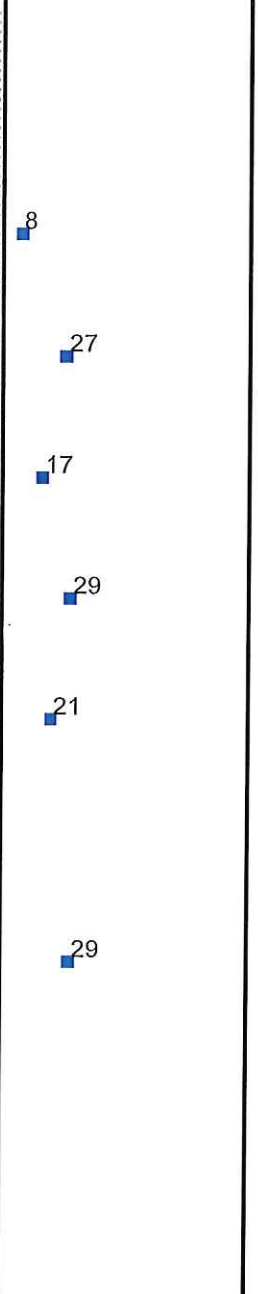
Elevation: 425.90 m
Logged by: TS

Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Depth
					Ground Surface (m)	425.90	
	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (150mm)		0.00
					SILTY SAND AND GRAVEL Compact, brown silty sand and gravel, trace clay, moist	425.14	0.76
	SS		2		**GRAVEL** Compact, brown gravel, some sand and silt, trace clay, occasional cobbles, moist		
	SS		3				
					Becoming very moist to wet, occasional sand layer	423.61	2.29
	SS		4				
	SS		5				
	MC5		6				
					Occasional clay layer, wet	421.33	4.57
	SS		7				
					Becoming saturated	420.72	5.18
	MC5		8				
					End of Borehole	419.80	6.10







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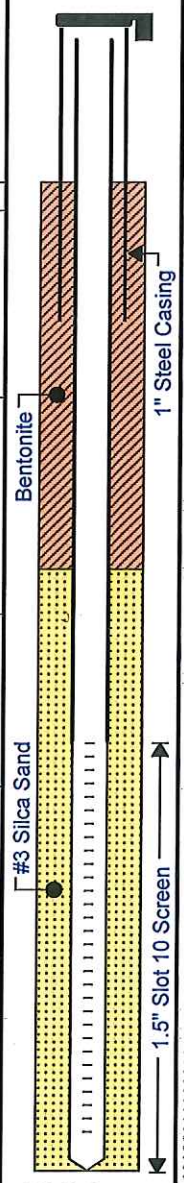
BOREHOLE 4

Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 425.54 m
Logged by: TS

Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Moisture Content % (Wp [----X----] Wl) 10 20 30 40	Pocket Penetrometer kPa 100 200 300 400 / SPT (N) Blows/0.3 m 20 40 60 80
					Ground Surface (m)	425.54		
	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (200mm)	0.00	8.2	9
	SS		2		**SILTY GRAVELLY SAND** Compact, brown silty gravelly sand, trace clay, moist Occasional sand layers	424.02 / 1.52	6.8	13
	SS		3		**SANDY GRAVEL** Compact, brown sandy gravel, some silt, trace clay, occasional cobbles, moist		8.7	15
	SS		4				6.5	24
	SS		5		Becoming dense	422.49 / 3.05	8.3	50 (2")
	MC5		6				4.0	
	SS		7		**GRAVEL AND SAND** Dense, brown gravel and sand, trace silt and clay, damp	421.27 / 4.27	8.3	47
	MC5		8		**SANDY GRAVEL** Dense, brown sandy gravel, some silt, trace clay, occasional cobbles, moist	420.05 / 5.49	12.4	
	MC5		9		Becoming very moist	419.44 / 6.10	10.4	
					End of Borehole	417.92 / 7.62		



Well dry to bottom Aug 2, 2018

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

BOREHOLE 5

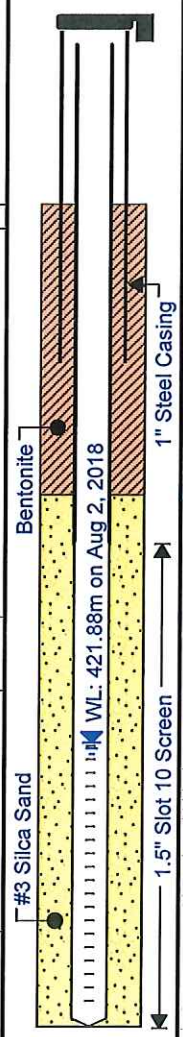
Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

Elevation: 425.26 m
Logged by: TS

Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation	Moisture Content % (Wp [----X----] Wl)	Pocket Penetrometer kPa	SPT (N) Blows/0.3 m
					Ground Surface (m)	425.26			
0	SS		1		**TOPSOIL** Loose, dark brown, silty organic topsoil, moist (150mm)	0.00	4.7		11
1	SS		2		**SANDY GRAVEL** Dense, brown sandy gravel, trace silt and clay, occasional cobbles, damp		3.2		41
2	SS		3				2.1		37
3	SS		4		Becoming compact	422.67 / 2.59	3.2		24
4	SS		5		Becoming saturated	422.21 / 3.05			12
5	MC5		6				18.8		
6	SS		7		Becoming grey	420.69 / 4.57	12.9		10
	MC5		8				8.0		
					End of Borehole	419.16 / 6.10			

Well Installation



CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

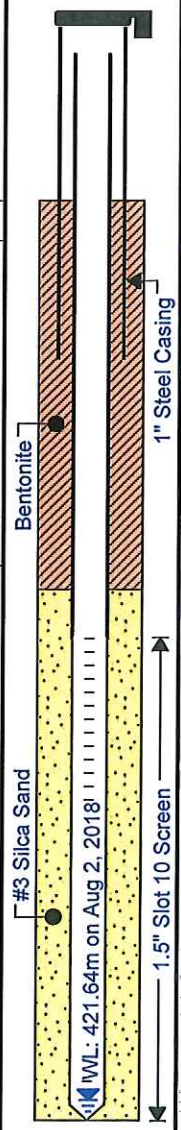
BOREHOLE 6

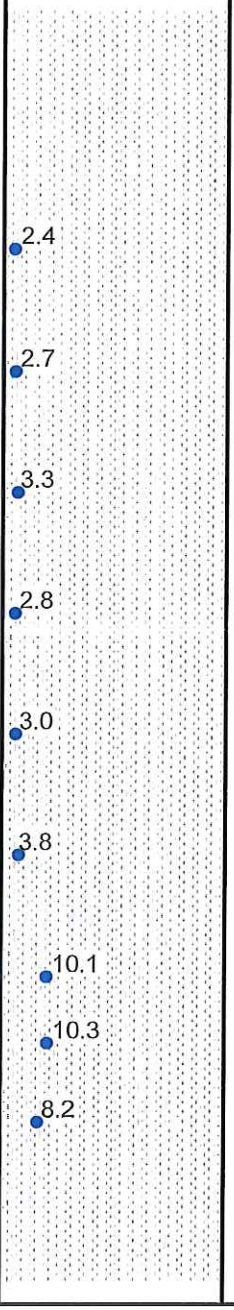
Date Drilled: July 27, 2018
Rig: Geoprobe 7822DT
Contractor: CMT Drilling Inc.
Drilling Method: SPT

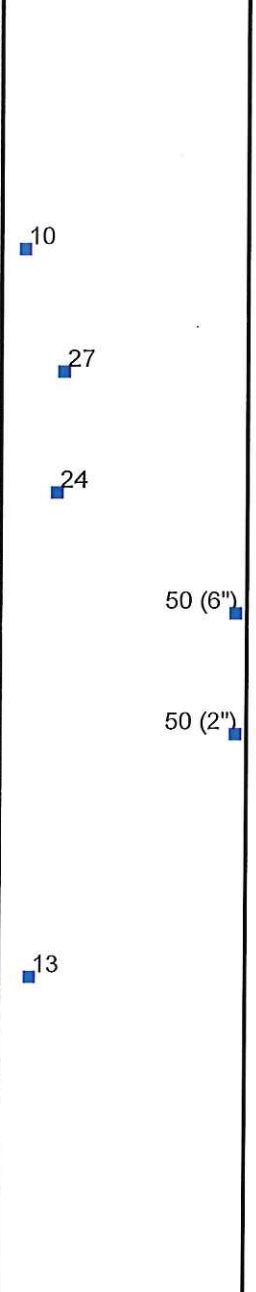
Elevation: 427.30 m
Logged by: TS

Project No.: 18-368
Project: Wilder Lake Subdivision
Location: 263530 Southgate Road 26, Southgate, Ontario

Depth (ft/m)	Sample Type	Recovery (%)	Sample Number	Symbols	SOIL DESCRIPTION	Elevation (m)
					Ground Surface (m)	427.30
					TOPSOIL Loose, dark brown, silty organic topsoil, moist (250mm)	0.00
	SS		1		**GRAVEL AND SAND** Compact, brown gravel and sand, trace silt and clay, occasional cobbles, moist	
	SS		2			
	SS		3			
					Becoming very dense	425.01 / 2.29
	SS		4			
	SS		5			
	MC5		6			
	SS		7			422.27 / 5.03
					SAND AND SILT Compact, brown sand and silt, some gravel, wet	
	MC5		8		Becoming gravelly	421.66 / 5.64
					End of Borehole	421.20 / 6.10





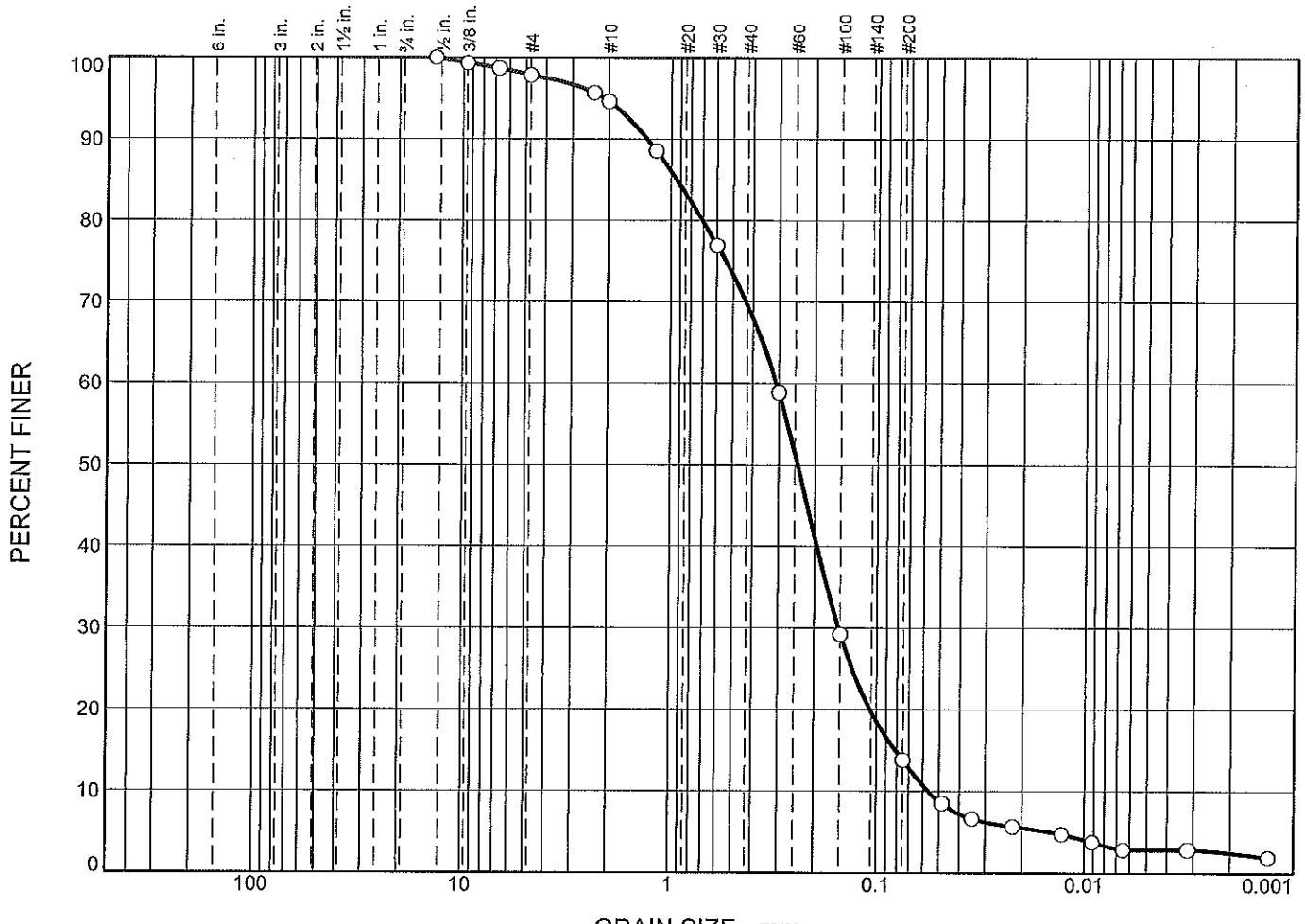


CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
phone 519-699-5775 fax 519-699-4664
www.cmtinc.net

APPENDIX B

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.1	3.3	25.1	55.7	11.3	2.5

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH1	3	1.52-2.13m	sand, some silt, trace clay and gravel	SM
				Estimated Percolation Rate; T = 10 min/cm	
				Estimated Coefficient of Permeability; k = 3.2 x 10^{-3} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

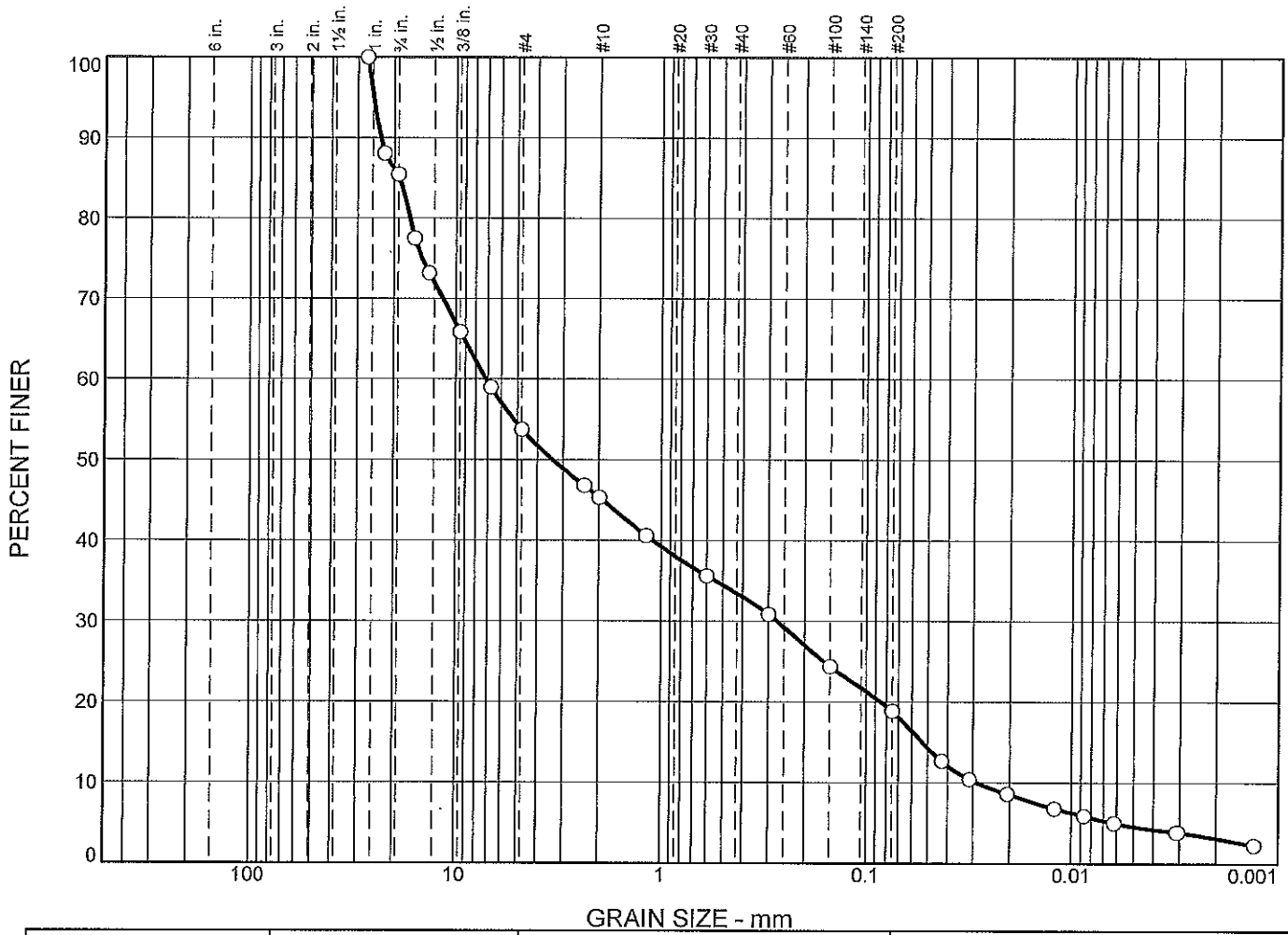
St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368 **Figure** 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	14.5	31.8	8.4	11.9	14.6	15.7	3.1

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH2	3	1.22-2.13m	sandy gravel, some silt, trace clay	GM
				Estimated Percolation Rate; T = 12 min/cm	
				Estimated Coefficient of Permeability; k = 8.4 x 10^{-4} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

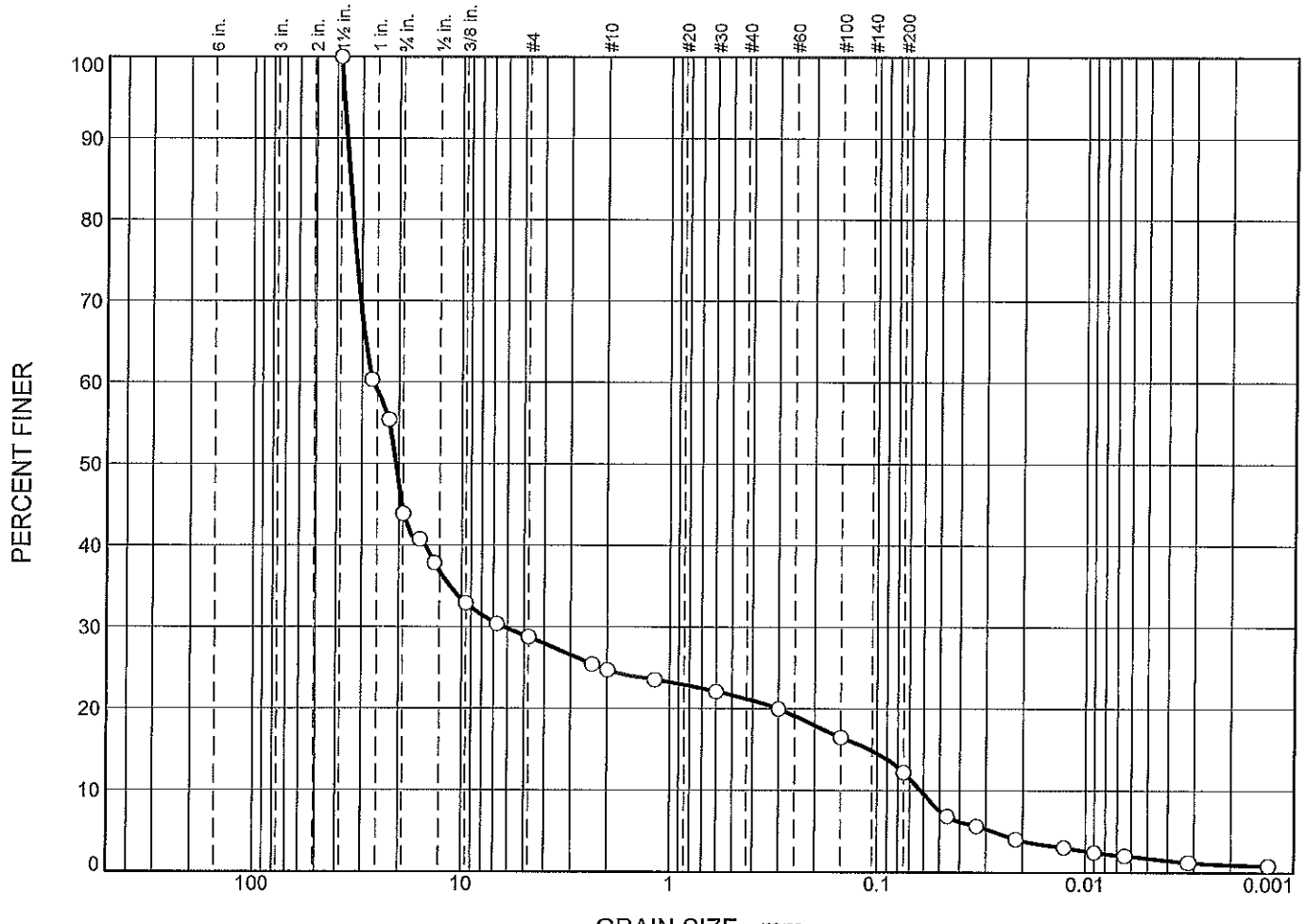
St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368 **Figure** 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	56.1	15.1	4.1	3.5	9.0	11.3	0.9

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH3	2	0.76-1.37m	gravel, some sand and silt, trace clay	GM
				Estimated Percolation Rate; T = 8 min/cm	
				Estimated Coefficient of Permeability; k = 3.9 x 10^{-3} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

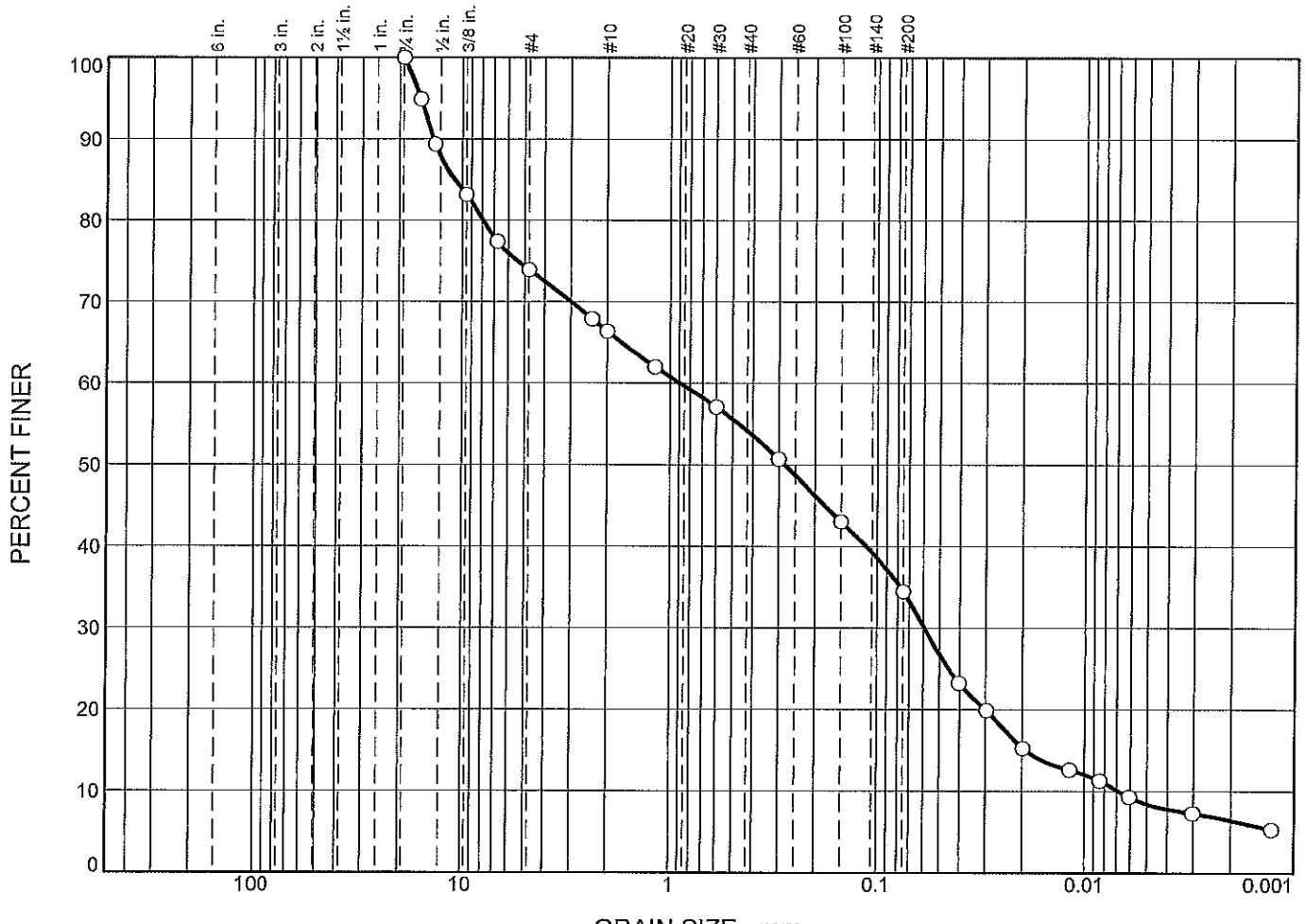
St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368 **Figure** 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	26.1	7.5	12.3	19.7	28.0	6.4

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH4	2	0.76-1.37m	silty, gravelly sand, trace clay	SM
				Estimated Percolation Rate; T = 15 min/cm	
				Estimated Coefficient of Permeability; k = 4.8 x 10^{-4} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

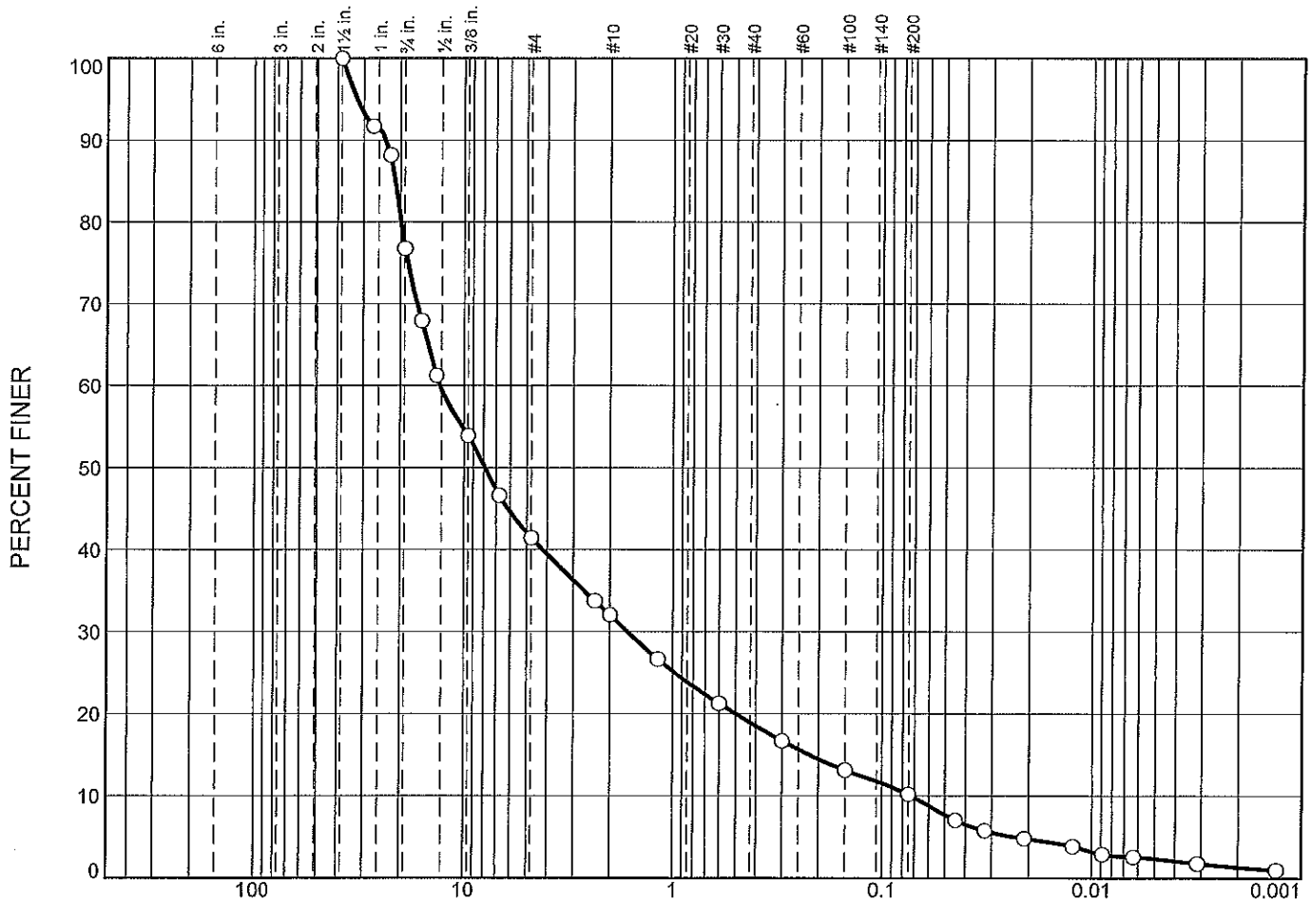
St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368 **Figure** 4

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	23.2	35.4	9.4	13.1	8.7	8.9	1.3

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH5	2	0.76-1.37m	sandy gravel, trace silt and clay	GW-GM
				Estimated Percolation Rate; T = 8 min/cm	
				Estimated Coefficient of Permeability; k = 5.3 x 10^{-3} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

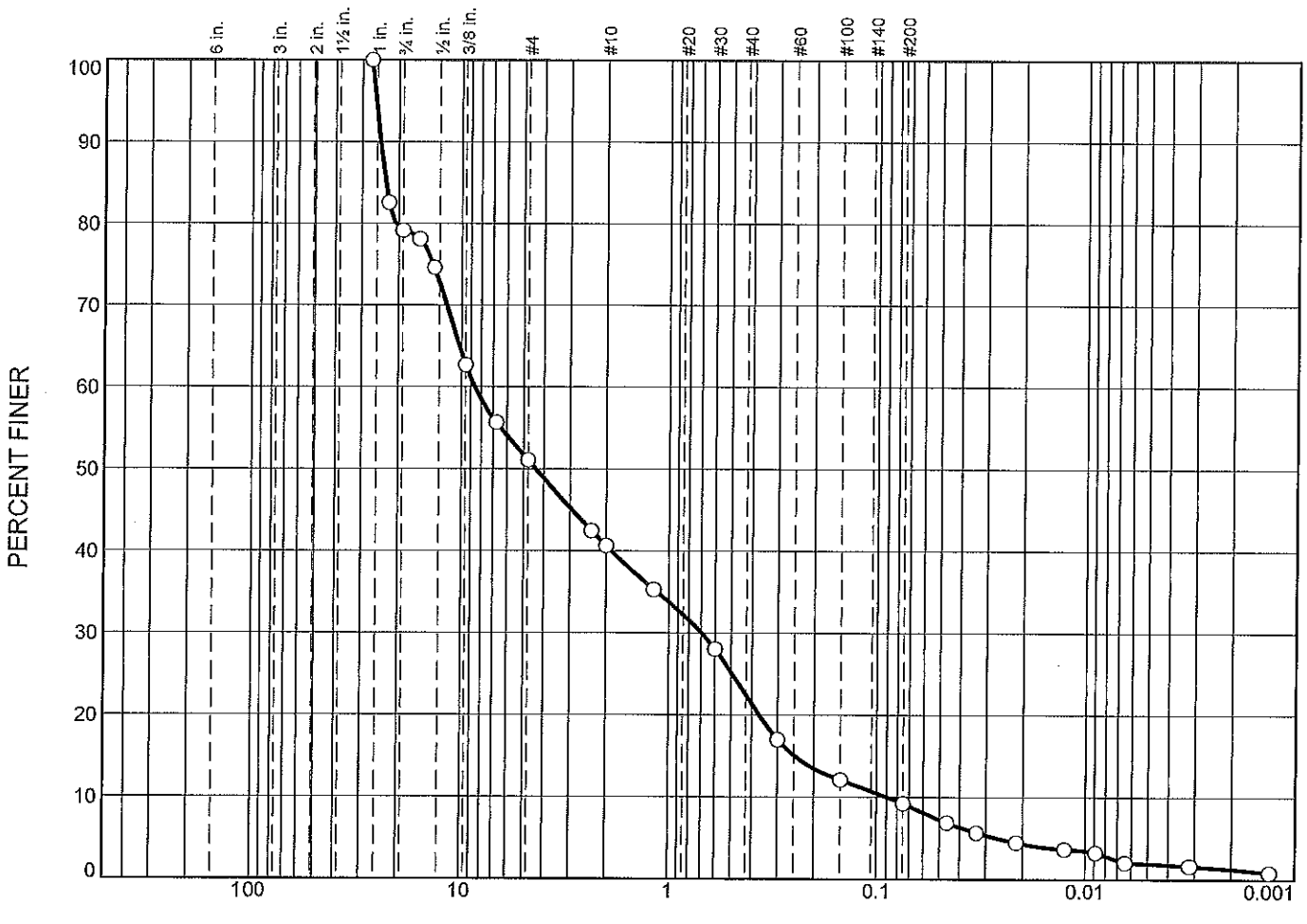
St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368 **Figure** 5

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	20.8	28.2	10.4	18.2	13.2	8.0	1.2

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH6	2	0.76-1.37m	gravel and sand, trace silt and clay	GP-GM
				Estimated Percolation Rate; T = 8 min/cm	
				Estimated Coefficient of Permeability; k = 8.0 x 10^{-3} min/cm	
				Tested by JM of CMT Engineering Inc., August 1, 2018	

CMT Engineering Inc.

St. Clements, ON

Client: H. Bye Construction

Project: Wilder Lake Subdivision
263530 Southgate Road 26, Southgate Twp, Ontario

Project No.: 18-368

Figure 6

APPENDIX C

WELL RECORDS

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A249088

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	H. BYE CONSTRUCTION LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
395 CHURCH ST N	MOUNT FOREST	ON	N0G2L0	519 323 1520

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
263530 SOUTHGATE TWP RD 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	DURHAM	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	520704	4888760		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL			0	0.3
BROWN	SAND	GRAVEL		0.3	6.7

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
0	2.7	3/8 HOLEPLUG	<1
2.7	6.7	#2 SAND	<1

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☑ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* _____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3.8	PLASTIC		0	3.6

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	PLASTIC	10	3.6	6.7

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* _____
☐ Other, *specify* _____

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☑ Gas ☐ Other, *specify*
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.7	10

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, *specify* _____

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
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	

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP FOR #4

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CLIT DRILLING INC	7316

Business Address (Street Number/Name)	Municipality
1011 INDUSTRIAL CRES	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2M0	cmtinc.net

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
519 884 5775	BLACK, CHRIS

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3111		2011 08 08

Well owner's information package delivered ☐ Yes ☐ No

Date Package Delivered: YYYY MM DD

Date Work Completed: 2011 08 27

Ministry Use Only

Audit No. Z273196

Received

0506E (2014/11)

Contractor's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A249064

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	H.BLE CONSTRUCTION LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
395 CHURCH ST N	MOUNT FOREST	ON	N0G2L0	5191323115210

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
263530 SOUTHGATE TWP RD 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	DURHAM	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	521071811	4818791013		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL			0	0.3
BROWN	SAND	GRAVEL		0.3	5.1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	1.5	3/8 HOLEPLUG	<1
1.5	5.1	#2 SAND	<1

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ___ hrs + ___ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
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	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☒ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, specify

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3.8	PLASTIC		0	2.1

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, specify
☐ Other, specify

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	PLASTIC	10	2.1	5.1

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP PER 115

Water Details

Water found at Depth (m/ft)	Kind of Water	
☐ Gas	☐ Fresh ☐ Untested	☐ Other, specify
☐ Gas	☐ Fresh ☐ Untested	☐ Other, specify
☐ Gas	☐ Fresh ☐ Untested	☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	5.1	10

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CHT DRILLING INC	7316

Business Address (Street Number/Name)	Municipality
1011 INDUSTRIAL CRES	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2M0	CHTINC.NET

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196441577	BUCK, CHRIS

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3711		2011/08/08

Comments:

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☐ Yes ☐ No		Audit No. Z273195
	Date Work Completed 2011/07/27	Received

0506E (2014/11) Contractor's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: [x] Metric [ ] Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A249099

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	[ ] Well Constructed by Well Owner
	H. BHE CONSTRUCTION LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
395 CHURCH ST N	MOUNT FOREST	ON	N0G2L0	5193235120

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2603530 SOUTHGATE TWP. RD 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	DURHAM	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	521081	4887788		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL			0	0.3
BROWN	SAND	GRAVEL		0.3	5.7

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	2.1	3/8 HOLEPLUG	<1
2.1	5.7	#2 SAND	

Results of Well Yield Testing

After test of well yield, water was: [ ] Clear and sand free [ ] Other, specify

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

Well production (l/min / GPM)

Disinfected? [ ] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
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	

Method of Construction

[ ] Cable Tool [ ] Diamond
[ ] Rotary (Conventional) [ ] Jetting
[ ] Rotary (Reverse) [x] Driving
[ ] Boring [ ] Digging
[ ] Air percussion
[ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used
[ ] Domestic [ ] Municipal [ ] Dewatering
[ ] Livestock [ ] Test Hole [x] Monitoring
[ ] Irrigation [ ] Cooling & Air Conditioning
[ ] Industrial
[ ] Other, specify

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
38	PLASTIC		0	2.7

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	PLASTIC	10	2.7	5.7

Status of Well

[ ] Water Supply
[ ] Replacement Well
[ ] Test Hole
[ ] Recharge Well
[ ] Dewatering Well
[x] Observation and/or Monitoring Hole
[ ] Alteration (Construction)
[ ] Abandoned, Insufficient Supply
[ ] Abandoned, Poor Water Quality
[ ] Abandoned, other, specify
[ ] Other, specify

Water Details

Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify
Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify
Water found at Depth (m/ft)	Kind of Water: [ ] Fresh [ ] Untested [ ] Gas [ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	5.7	10

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP FOR #6

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CHT DRILLING INC	7316

Business Address (Street Number/Name)	Municipality
101 INDUSTRIAL CRES	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2W0	CHTINC.NET

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5196665475	BLACK, CHRIS

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3711	[signature]	2018/08/08

Well owner's information package delivered	Date Package Delivered	Date Work Completed
[ ] Yes [ ] No	YYYY MM DD	2018/07/27

Ministry Use Only

Audit No. Z273194

Received

0506E (2014/11)

Contractor's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A249065

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	H. BHE CONSTRUCTION LTD		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
395 CHURCH ST N	MOUNT FOREST	ON	N0G2L0	5193231520

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
263630 SOUTHGATE TWP RD 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	DURHAM	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	520516	4887910		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
BLACK	TOPSOIL		LOOSE	0	0.3
BROWN	SAND	GRAVEL		0.3	6

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	2.1	3/8 HOLEPLUG	2.1
2.1	6	#2 SAND	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☑ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify* ____

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3B	PLASTIC		0	3

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	PLASTIC	10	3	6

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* ____
☐ Other, *specify* ____

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
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	

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP FOR #3

Comments:

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* ____ ☐ Gas
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☑ Untested ☐ Other, *specify* ____ ☐ Gas
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify* ____ ☐ Gas

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6	10

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CMT DRILLING INC	7316

Business Address (Street Number/Name)	Municipality
1011 INDUSTRIAL CRES	WATERLOO

Province	Postal Code	Business E-mail Address
ON	N0B2H0	CMTINC.NET

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5199995775	BLACK, CHRIS

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
37111	[signature]	2011/08/08

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☐ Yes ☐ No	Y Y Y Y M M D D	Audit No. Z273197
	Date Work Completed: 2011/07/27	Received

0506E (2014/11) **Contractor's Copy**

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A237410

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	H. Bye Construction Ltd.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
395 Church St N	Mount Forest	ON	N0G2L0	519 323 1520

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
263530 Southgate Twp Rd 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Durham	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	520526	4887589		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Black	Topsoil			0	0.3
Brown	Sand	Gravel		0.3	6.1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
0	2.7	3/8 hole plug	<1
2.7	6.1	#2 sand	<1

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time *(min)*	Water Level *(m/ft)*	Recovery Time *(min)*	Water Level *(m/ft)*
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	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☑ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3.8	Plastic		0	3.1

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	Plastic	10	3.1	6.1

Water Details

Water found at Depth (m/ft)	Kind of Water	
☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	
Water found at Depth (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	
Water found at Depth (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.1	10

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP FOR #2

Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CMT Drilling Inc	7316

Business Address (Street Number/Name)	Municipality
1011 Industrial Cres	Waterloo

Province	Postal Code	Business E-mail Address
ON	N0B2L0	cmtinc.net

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
519 699 5775	Black, Chris

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3711	C. Black	2011 08 08

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☐ Yes ☐ No	Y Y Y Y M M D D	Audit No. Z273198
	Date Work Completed: 2011 08 24	Received

0506E (2014/11) **Contractor's Copy**

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☒ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A249100

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	H. Bye Construction Ltd.		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
395 Church St N	Mount Forest	ON	N0G2L0	519 323 1520

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
263530 Southgate twp Rd 26			

County/District/Municipality	City/Town/Village	Province	Postal Code
	Durham	Ontario	N0G1R0

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	521091	4887625		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
Black	Topsoil		Loose	0	0.3
Brown	Sand	Gravel		0.3	6.4

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft^3)
0	1.5	3/8 holeplug	<1
1.5	6.4	#2 Sand.	

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
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	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☒ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
3.8	Plastic		0	3.3

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
4	Plastic	10	3.3	6.4

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Map of Well Location

Please provide a map below following instructions on the back.

SEE MAP FOR #1

Comments:

Water Details

Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*
Water found at Depth (m/ft)	Kind of Water: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.4	10

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
CMT Drilling Inc	7366

Business Address (Street Number/Name)	Municipality
1011 Industrial Cres	Waterloo

Province	Postal Code	Business E-mail Address
ON	N0B2M0	cmtinc.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
519 669 5775	Block, Chris

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3711	[signature]	2011 08 08

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☐ Yes ☐ No	Y Y Y Y M M D D	Audit No. Z273199
	Date Work Completed: 2011 07 27	Received

0506E (2014/11)

Contractor's Copy

263530 Southgate Township Road 26